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Science and Literary Culture during Spain's *Edad de Plata* (1923 – 1936)

by

Anna Eva Hiller

A dissertation submitted in partial satisfaction of the

requirements for the degree of

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of the

University of California, Berkeley

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by Anna Eva Hiller

Abstract

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Doctor of Philosophy in Hispanic Languages and Literatures

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“Science and Literary Culture during Spain's *Edad de Plata* (1923 – 1936)” is a five-chapter study of the dissemination, expression and manipulation of scientific ideas within Avant-garde literature. In it I advance the hypothesis that science and its associated imagery served as a metaphor for the process of modernity and modernization in Spain. I begin the study with a history of the unique trajectory of Spanish science as it developed between the Enlightenment and the outbreak of the Civil War in 1936. Thus established the historical grounding, I take up two of the main organs of cultural production in the 1920s and 1930s, José Ortega y Gasset's *Revista de Occidente* and Ernesto Giménez Caballero's *La Gaceta Literaria*, examining the presence and presentation of overt scientific content therein. Based on my findings within the periodicals, I then construct a discursive framework that establishes the way in which scientific discoveries and ideas of progress were both embraced and critiqued by the Spanish avant-garde, I conclude the dissertation with two chapters dedicated to the examination of a specific literary corpus, comprised of a variety of genres and authors, whose construction of science as a cultural phenomenon is symptomatic of the wider discussion(s) of modernity and its implications for Spain both internally and internationally. In the final analysis, I approach works by Pedro Salinas (*Víspera del gozo*), Federico García Lorca (*Así que pasen cinco años* and *Poeta en Nueva York*), Jorge Guillén (*Cántico*), Rafael Alberti (*Cal y canto* and *Sobre los ángeles*), Ramón Gómez de la Serna (“El dueño del átomo), and Valentín Andrés Álvarez (“Telarañas en el cielo” and *¡Tararí...!*) using a scientific lens based on the principles of Einsteinian physics, quantum theory, and the controversy over the rise in importance of technology during the early 20th century. My principal conclusion is that science was a vital part of cultural discourse during these years, and that by examining the ways in which scientific ideas were disseminated and transformed by literary production, we can understand more clearly the aesthetic, social and—as a consequence of these—the ideological complexion of the era in question.

To Mark, who believed

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Introduction: Science and Literature in a Changing Universe—Two Cultures in a Shared Space

In 1941, Gerardo Diego, one of the preeminent poets of the Spanish *vanguardia*, published a collection of poetry titled *Alondra de verdad*, a work comprised of forty-two poems written between 1926 and 1936, years that witnessed the zenith of the *vanguardista* movement as well as its decline and decadence (Gallego Morell 76). Diego, classified frequently during the early 1920s as a disciple of Chilean poet Vicente Huidobro's *creacionismo*, and later, much to his own chagrin, as *un poeta fascista* by Ernesto Giménez Caballero,¹ showed an enormous flexibility in his work. He had an equal passion for form and experimentation, often willing to extend the boundaries of poetics, and was one of the major promoters of the *vanguardia* who contributed to its solidification through the publication in 1932 of his *Poesía española: antología (1915 – 1931)*.² Of this flexibility, which some perceived as inconsistency, the poet wrote in the prologue to the *Primera antología de sus versos (1918 – 1941)*, that he was not responsible for the fact that

me atraigan simultáneamente el campo y la ciudad, la tradición y el futuro; de que me encante el arte nuevo y me extasíe el antiguo... Todas estas inquietudes se reducen en mí a dos únicas intenciones. La de una poesía relativa, esto es, directamente apoyada en la realidad, y la de una poesía absoluta o de tendencia a lo absoluto, esto es, apoyada en sí misma, autónoma frente al universo real del que sólo en segundo grado procede... (Diego "Prólogo" 15-16)³

In *Alondra de verdad*, there exists a stunning instance of this duality in Diego's poetry—the poem "Eclipse parcial de sol (playa al amanecer)" and its immediate successor, "Variante del eclipse". While both poems are sonnets, adhering to the strictures of form, they are prime examples of the way that Gerardo Diego, *poeta vanguardista*, managed to embrace a form that could simultaneously conform to and challenge the traditional paradigms of poetry.

Mostly, however, these two poems address the issue of the changing conceptions of the universe in the early 20th century, ones that invaded the cultural matrix—a term that will be fully explained in Chapter Four, used to describe a field model for cultural history—and permanently altered the manner in which scientists conducted their research. The image of the eclipse is significant in that it was via a total eclipse of the sun that Sir Arthur Eddington confirmed Einstein's theory of relativity. Both sonnets contain several verses that appear to reference the new significance of the eclipse. In the first version, the final stanzas, we have the following:

Qué lejanías, cuántas libertades,
qué ilimitadas elasticidades
la débil luz naranja ahondarme quiso

¹ See Ernesto Giménez Caballero, "'Gerardo Diego, poeta fascista,'" *Visitas literarias de España (1925-1928)*, ed. Nigel Dennis (Madrid: Pre-Textos, 1995).

² See Gerardo Diego, *Poesía española, antología, 1915-1931: Unamuno. M. Machado. A. Machado [y otros]* (Madrid: Editorial Signo, 1932).

³ Cited in J. Bernardo Pérez, *Fases de la poesía creacionista de Gerardo Diego*, eds. Alva V. Ebersole and Vicente Soler (Valencia: Albatros Ediciones Hispanófila, 1989) 24.

para el verde emigrar de mi mirada.
Nunca vi tan distante el paraíso,
perdida en el confín la última grada.
(“Eclipse parcial de sol (Playa al amanecer)” vv. 9 – 14)

In the second poem, a significant variation after the first two verses:

Qué lejanías, cuántas libertades,
qué ilimitadas elasticidades
para el verde emigrar de mi mirada.

Nunca vi tan sin fin el firmamento
como a la luz de aquella madrugada,
luna en el sol, eclipse a barlovento.
(“Variante del eclipse” vv. 9 – 14)

In the poems, there is a distinction made between the universe of “lejanías”, “libertades” and “elasticidades”—all words that suggest the new shaping of space by relativity, a theory that astounded physicists and the educated public alike with knowledge of the great distances of the cosmos, as well as of the way that light and space bend when they encounter matter—and traditional concepts of “firmamento” or “paraíso”, which conjure up antiquated, baroque notions of a pre-Copernican universe, or the Christian belief in heaven. In Gerardo Diego’s “Eclipse,” we therefore witness a universe in transition—and a poetics in transition as well. What sonnet of the Golden Age of Spanish literature would include words such as “isoscélica” to describe the unfurled sail of a ship? This was a new poetry of precision that often appeared to reflect a similar precision in the fields of mathematics, chemistry, and physics as scientists struggled to measure the seemingly infinite and the infinitesimal quantities of the known universe.

Science is often construed as a sterile pursuit,⁴ in the sense that it lacks moral value, is by nature agnostic if not atheistic, and has the reputation for being (at least with regard to the so-called “hard sciences”) “inhuman”—a cold world of facts amid the lively chaos of existence. In contrast, literary culture, at its most basic, is meant to be a reflection of our human nature, that which is unquantifiable and intuitive rather than empirical. “Human nature,” in the view of most humanists, is not the sum of our organs, the chemistry of our blood—rather it is that ineffable essence that we, as creative beings, struggle to express through, in large part, the arts. While science can indubitably tell us, for example, that we have an illness and are dying, it is the responsibility of the arts and philosophy to interpret and communicate that dying from our individual experience of it, opening it to a wider public understanding that will, in turn, provide an exegesis for that interpretation. Science gives us facts; literature gives us a context for those facts. The two disciplines appear to be at loggerheads, as they have been for hundreds of years, with each successive generation taking up the dichotomy and shaping it according to the times in which they find themselves. The “Two Cultures” debate is one that, though it may shift in scope and face mighty challenges, refuses to disappear entirely.

⁴ Or, in the words of one of Thomas Kuhn’s critics, Brian Maricle, “dry and mundane.” See Brian Maricle, *Thomas Kuhn: In the Light of Reason* (S.I.: The Author, 2008) 102.

Two cultures: science and the arts; more specifically, science and literature, which exist in opposition, according to mid-20th-century critics such as C.P. Snow and F.R. Leavis in their respective works, *The Two Cultures* and *Two Cultures?: The Significance of C.P. Snow*. Snow and Leavis were continuing the tradition of juxtaposing science and culture that began in the 19th century with Matthew Arnold and Thomas Huxley. Every generation, it seems, has had its theoreticians of the Two Cultures debate, and that is because the question persists: Where, considering the disparity between the manner and means of literature and science, can these two disciplines find common ground? Can literature even purport to address science at all, lacking as it does the mathematical language that best expresses it? And does science have any use for literature's "humanity" in its experimental processes and constant advances? Was there ever a moment in which these supposed antagonists shared any sort of space—visual, historical, textual, etc.—or a moment that could facilitate significant contact and interaction between them?

Setting aside any divisive notion of the significance of the word "humanity" for the time being, let us consider that neither science nor literature is produced in a vacuum, nor is either produced *ex nihilo*. Both science and literature possess their own histories; both are, if not precisely the result of cumulative knowledge, then at the very least aggregates of that knowledge. What some would call "progress" in science and "development" in literature, are similar in that each discipline moves forward through the selection and articulation of preceding events (their respective discoveries, experiments, texts and contexts). In other words, science and literature each have their ancestors, which are both revered and rejected by turns. Literature is perhaps more of a product of its context than science, as it is both a cultural and culturally produced phenomenon—that is, the social and historical context of literary output is a significant factor in its production and, later, its interpretation. Current critics would have it⁵ that science is acultural, and that scientific discourse is produced without regard to social or historical constructions. It is true that pure scientific discourse—the language of experiment, of the mechanistic article, of mathematical precision—has very little to do with its contextual and/or historical moment. However, we must ask ourselves: does there exist the possibility of a discourse that can open up science to its contextual moment, that is, writing about science rather than just "writing science". In "writing science" language is incidental and subordinate to the equations that it seeks to explain. However, when one writes about science (meta-scientific discourse), language, of necessity, regains its power, a power that is posited by the existence of a general, non-specialized public. Mathematical language is often confined to its own practitioners, speaking to a very specific audience of experts and students of the discipline in question.

⁵ See the writings of Alan Sokal, a critic whose 1996 faux essay "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity" successfully satirized the idea of the social construction of scientific knowledge, accepted and published as a serious article by the influential periodical *Social Text*. The controversy that it spawned when the essay was revealed as a fraud sparked a lively debate frequently referred to as "the Science Wars". Sokal later published a book that took up the issue of postmodernism's "abuse of science" within its theoretical apparatus. The importance of Sokal's article and stance will be discussed further in Chapter 4. For the full article see either Alan Sokal, "Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity," *Social Text* 46-7 (1996). Also Alan Sokal and Jean Bricmont, *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York: Picador, 1998).

Addressing science as discourse is a dangerous proposal, for a variety of reasons.⁶ For the purposes of this project, I will not be entering into these debates as to whether the practice of science is culturally and linguistically bounded. I will leave this for other critics whose sense of scope is much larger than mine. The context of my project is limited to a span of about thirteen years, between the installation of the dictatorship of Primo de Rivera in 1923 and the outbreak of the Spanish Civil War in 1936, years that also happen to coincide with the publication run of José Ortega y Gasset's formative periodical, the *Revista de Occidente*. Therefore, I will be dealing expressly with Spain, its domestic agenda, and its self-concept in relation to the rest of Europe.

Within this context of Spain in the early 20th century, I will be using the terms "science" and "literature" to refer to specific activities, rather than as the generalizations often implied by the Two Cultures debate. The reason for this is that Spain presents a unique case in history when compared with scientific development in the rest of Europe and North America during the centuries following the Enlightenment. Spain's supposed "backwardness" has often been categorized as an almost retrograde motion with regard to modernization, progress and scientific advancement. This "*atraso*" existed due to centuries of dictatorial rule by both Church and Crown, political instability following the overturning of the monarchy, and the entrenched conservatism of those in power, thus making Spain's position diverge from the larger context of Western industrialization and modernization.

In Chapter One, "Spanish Science from the Enlightenment to the Civil War", I will outline how it was that science emerged from a state of chronic neglect by both government and academy to assume a powerful role in the "regeneration" of Spain. Science became the icon of progress, and, after the war of 1898, was eagerly embraced as a means by which Spain could renew its status among the European nations in particular. The creation of institutions such as the *Junta para Ampliación de Estudios e Investigaciones Científicas* (1907) allowed for young Spanish scientists to gain the education they required to bolster their careers by sending them as *becarios* to more scientifically advanced countries in Europe, in particular Germany, France and Britain. These scholars then returned to Spain and, after several years, a competent professorate began to form, and the nation started to produce native talent that would gain international renown. Names such as Blas Cabrera, Julio Rey Pastor, Miguel Ángel Catalán, Santiago Ramón y Cajal would gain familiarity on the European and American stages during the first third of the 20th century. These same men of science would later be censured or exiled as Franco went about the systematic destruction of the educative scientific apparatus after his victory in 1939. Nonetheless, their acceptance as peers within the cadre of powerful scientists who held the world in thrall with discoveries such as relativity and quantum theory testifies to the fact that Spain's attempt to advance the cause of scientific education did indeed bear fruit, even if the full flowering was cut short by the Civil War.

⁶ Daniel Cordle writes that this danger consists of the problem that "[b]y treating science as a discourse, the critics they attack also make, by implication, sweeping claims about what science is and is not... It is not sufficient to justify the cultural analysis of science merely by stating that it is a discourse, and then going on to treat it exactly the same as any other use of language... We need to be aware of exactly *how* it is (and is not) a discourse, how this discourse is shaped by the context of the natural world it describes, and how it relates to the culture in which it finds expression. Daniel Cordle, *Postmodern Postures: Literature, Science and the Two Cultures Debate* (Brookfield, VT: Ashgate Publishing, Ltd., 2000) 50.

For Spain's new generation of scientists, the *Junta* provided support that was essential to their work and their understanding of new developments in the field. These developments represented more than mere change in the way science was conducted—they were full-blown revolutions in the understanding of the surrounding universe which prompted enormous changes in the collective worldview. These changes were generally communicated via written popularizations of scientific topics, as well as the news media, and, a smattering of important publications that functioned as organs of cultural production, as will be discussed in Chapters Two, “The *Revista de Occidente*, the New Physics, and Spain's *Edad de Plata*,” and Three, “Zones of Contact—Science as Culture in *La Gaceta Literaria*.” The *Revista de Occidente* (1923 – 1936) and *La Gaceta Literaria* (1927 – 1932) were two such literary and/or cultural periodicals that published scientific content with some regularity. The two magazines were directed by men of enormous prestige within artistic and intellectual circles: the philosopher José Ortega y Gasset founded the *Revista de Occidente* as a platform for publicizing the so-called “great ideas” emerging from the West at that time; Ernesto Giménez Caballero (along with Guillermo de Torre) established *La Gaceta Literaria* as a mouthpiece for the very active and quite promising artistic *vanguardia* that reached its apogee during the first two years of the *Gaceta*'s run. The adoption of scientific content by the *Revista de Occidente* and *La Gaceta Literaria* provided a context in which the literary vanguard and the latest discoveries in science could interact and share intellectual (as well as physical) space. These were unique forums for the exchange and interplay of ideas, and a powerful means by which to disseminate the news of the day, literary and scientific. Each publication, of course, had its own agenda for doing so: the *Revista*'s primary interest was the integration of Spain into the main currents of contemporary European thought through the exposure to outside developments, with the hope of encouraging Spain's modernization process; the *Gaceta*, on the other hand, was not interested in international acceptance so much as it was in promoting Spanish nationalism, which it did by favoring (in terms of scientific content) local over imported or translated articles.

In Chapters Four, “Literature as Investigation and Discovery,” and Five, “Maleficent Modernity,” I will discuss how the formation of a cultural matrix which encouraged the free play of ideas allowed for scientific notions to penetrate the literary sphere. With a “scientific lens” based in Einsteinian physics and quantum theory (to a lesser extent), I will examine a variety of literary works from the period, by authors such as Federico García Lorca, Jorge Guillén, Pedro Salinas, Rafael Alberti, and Valentín Andrés Álvarez, that illustrate the manner in which the revolutions in the New Physics manifested themselves within literature. The foundation for this analysis is the presence of parallel purities in the literature of the *vanguardia* and the physical sciences; certain artists chose to embrace the challenges of science and reflect their enigmas of time, space and being in their work, often playfully (Salinas's *Víspera del gozo*), joyfully (Guillén's *Cántico*), and dramatically (Lorca's *Así que pasen cinco años*). Lorca's shifting attitude towards science, as well as his frequently ambiguous explorations of the topic, provides us with a very special instance of how often ambivalence prevailed in popular attitudes towards science. Whereas in *Así que pasen cinco años*, Lorca quietly explores the limits of traditional concepts of time and space, gesturing favorably to the questions raised by Einsteinian relativity, in his surrealist, lyrical work *Poeta en Nueva York*, he displays quite the opposite attitude, vituperating against the emptiness of science and its corrosive byproduct, technology. Thus in Chapter Five I will examine negative attitudes towards science as reflected in the postures of

nostalgic reverie for a more innocent time, or in apocalyptic visions of a catastrophic future plagued by the malignant power of technology.

The goal of this study is to call attention to and examine the manner in which science and literature shared cultural space during a specific period in Spain's history. I hope to show definitively that science, in particular theoretical physics, wielded a certain amount of power within cultural spheres due to the way in which figures such as Einstein had managed to capture the educated public's imagination. The ability of science to alter the accepted worldview virtually demanded a response from circles of cultural production. In this study, I will show how it was that science managed to penetrate the popular imagination, and how literary culture reacted to the explosion of new scientific knowledge and its technological by-products. I will then elaborate upon the conduits which made this communication between disciplines possible, and then offer several concrete examples of literary interpretations of the scientific revolutions that characterized the first third of the 20th century.

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I would like to express my appreciation to those who made this process of investigation and discovery as fruitful as it has turned out to be. First and foremost, I would like to thank both of my advisors, Professors Milton Azevedo and Dru Dougherty, for their guidance during my years at Berkeley, and for their encouragement with regard to my decision to pursue this particular topic. I would also like to thank my parents for their patience and support throughout my graduate career. And I would be entirely amiss if I did not acknowledge the unwavering and extraordinary friendship offered by Mark Pritchard, whose belief in my work and my goals inspired me to continue in the face of frequent adversity.

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It was a joy to work with each and every one of you. Thank you, again, for the many ways in which you all contributed to the conception, development, and conclusion of this project. To all of you, I am deeply grateful.

Chapter One: Spanish Science from the Enlightenment to the Civil War

Introduction: An Empire Lost, a Nation Adrift

In all of its most important aspects, Spain in the Modern Age was characterized by one thing: Empire. The accidental discovery, creation, development and eventual (traumatic) loss of the *imperio de ultramar* definitively shapes the historical narrative of Peninsular Spain along the lines of domination and decadence from the 15th until the late 19th centuries. The years surrounding *el Desastre* of 1898 would be those of reckoning in which the imperialist mirror into which Spain had gazed for so long would be shattered, and the country would have to finally come to terms with itself as something other than a global power: Spain would have to become European, after centuries of mutual neglect, marginalization, mistrust, violence and misunderstanding. Turning her gaze away from the Atlantic and directing it largely to the north,¹ to the highly industrialized societies of France, England and Germany, Spain would find herself a step behind these nations in terms of her ability to modernize and mobilize the structures of State and society. Under the influence of a toxic blend of various authoritarian institutions—the Church and the reign of Fernando VII in particular—and the popular impulse towards a lionization and glorification of Spain’s imperial past, these internal structures had begun to intractably fossilize under the aegis of a desire to both maintain and promote “tradition” in all its many guises, but all somehow essentially Spanish. The question of Europeanization was not merely political: it was a struggle to redefine Spain’s previous imperial identity in the face of its current position, much weakened, a situation rife with contradiction. The central problem at the turn of the century was the question of how (or if) to move Spain forward, what modernization of the state would mean for the traditional ways of living, and if what was most desirable was a new form of (European) internationalism, the more nationalist-oriented *regeneracionismo* that cast a wary eye on Europe, or the philosophical and intangible *españolización* of Europe as proposed by Unamuno.

Among the many issues at the center of the discourse on Spain’s internal development and its placement among the greater collectivity of Western nations was the need for an expanded national scientific platform for both education and research. The “question of science”—the *problem* of science—in Spain, as it was being discussed by the political and social pundits of *fin de siglo* Spain, was already well established by the time Eduardo Vincenti, a *diputado* of the Spanish parliament (*las Cortes*), proclaimed in 1899 that the United States had defeated Spain not on the battlefield, but in its laboratories.² The implication was, of course, that Spain’s empire had crumbled due principally to lack of modern weaponry and outdated military

¹ With the exception, of course, of the colonial wars in Morocco.

² From a speech made to the *Cortes* on 23 June 1899. Vincenti states that “No ha habido lucha. Se nos ha vencido en el laboratorio y en las oficinas, pero no en el mar o en la tierra.” Cited in José Manuel Sánchez Ron, *Cinzel, martillo y piedra: Historia de la ciencia en España (siglos XIX y XX)* (Madrid: Taurus, 1999) 175.

components, visible in their wooden fleet that was flatly overrun and outgunned by the mechanized and steel-clad U.S. Navy. Had Spain been able to keep pace technologically, Vincenti says, perhaps the nation would not be in the state of general crisis (intellectual, psychic, economic, diplomatic) with which it entered the 20th century (though admittedly he still clings to the idea of Spain as a powerful military force, even in defeat). And so the question was posed as to why it was that while the rest of Western Europe and North America were suiting up for an age of comprehensive scientific discovery, Spain failed to take sufficient notice of the importance of this race for new intelligence, venturing only weak-willed attempts at reform and advancement during the whole of the 19th century.

Historians of science have offered a number of explanations for Spain's abortive scientific program,³ a polemic that is too extensive to be taken up in these pages.⁴ Of interest here is the discussion revolving around the sciences as they attempted to establish themselves in Spain, from the age of the Enlightenment up until the outbreak of the Civil War in 1936. Central to that discussion was the essential tension between *técnica* and *ciencia*, as it shaped Spain's process of modernization, as well as its sense of nationhood and identity in the face of a changing world.

La ciencia útil: The Politics of Discovery in the Age of Empire and Enlightenment

“Muy señor mío: A vuelta de las expresiones de sentimiento que Vmd. hace en la suya de los cortos, y lentos progresos, que en nuestra España logran la Física, y Matemática, aun después que los Extranjeros en tantos libros nos presentan las grandes luces, que han adquirido en estas Ciencias... No es una sola, señor mío la causa de los

³ See in particular the works and anthologies of José María López Piñero, José Manuel Sánchez Ron, and Ernesto García Camarero for a more comprehensive discussion of the reasons behind Spain's supposed backwardness in the sciences from the age of Newton until the early 20th century.

⁴ For example, it is widely acknowledged that Spain's scientific weakness was not universal: the biomedical disciplines, in fact, were extensively nurtured and encouraged (examples include the works by Sánchez Ron (especially the introduction to *Ciencia y sociedad en España*), Antoni Roca Rosell's biography of Esteban Terradas, or Luis Enrique Otero Carvajal's *La destrucción de la ciencia en España: Depuración universitaria en el franquismo*). The Nobel Prize-winning research of Santiago Ramón y Cajal generally serves as the finest example of the successes experienced in the biomedical sciences during the 19th and 20th centuries. Mathematics was also an area that was given some attention by the academic establishment, albeit nowhere near the scale of the biomedical sciences. The achievements of mathematicians such as José Echegaray and Zoel García de Galdeano received less attention on an international scale, and are therefore often overlooked for their importance. But for all of the successes of a Ramón y Cajal, it cannot be denied that other major areas of investigation—physics, chemistry, and their attendant subdisciplines—suffered immeasurably from lack of funding, the absence of a trained professorate, and an generally poor and antiquated infrastructure within the university system (to name surely just a few principal factors in their underdevelopment). It is this particular weakness in the hard sciences—hereby defined as being comprised of the conglomeration of physics, chemistry and mathematics—upon which I wish to focus during the course of this study, the issue of the study and development of the life sciences being sufficiently distinct from the polemic of the hard sciences so as to fall outside the scope of the current investigation.

cortísimos progresos de los Españoles en las Facultades expresadas, sino muchas; y tales, que aunque cada una por sí sola haría poco daño, el complejo de todas forman un obstáculo casi absolutamente invencible.

—Fr. Benito Jerónimo Feijoo
“Causas del atraso que se padece en España en orden a las Ciencias Naturales”
Cartas eruditas y curiosas, Tomo II, Carta XVI

Let us, for the moment, set aside the question of the extent of Spain’s participation in the principles and ideals of the Enlightenment—frequently Spain’s Enlightenment has been characterized as being, metaphorically speaking, rather “pale”—and its accompanying negative assessment of the period (what *didn’t* happen during the 18th century, in comparison with other nations, especially France and Germany). Instead, let us focus our attention on certain developments within Spain itself at that time, specifically in the area of the sciences. I am choosing to begin this narrative of scientific development at a species of cultural crossroads, with a letter written by Fr. Benito Jerónimo Feijoo. Feijoo’s significance as a philosopher and commentator of Spanish society is well established—he is *the* intellectual figure of the 18th century in Spain. Feijoo’s philosophy and cultural commentary had an unusually wide reach, and I begin with him because in the sixteenth letter of the *Cartas eruditas y curiosas*, he—a man of letters—addresses the polemic of scientific progress in Spain.

By the time the letter was written in 1745, the aforementioned *atraso* was already a matter of public debate, the age of the *novatores* of the 16th and 17th centuries having ended.⁵ The *novatores* were scientists—mathematicians and astronomers, mostly—who were instrumental in disseminating the work of other scientists such as Tycho Brahe, Kepler, Copernicus and Galileo, frequently incurring the animosity of the Church (and at times the Inquisition). In the words of Sánchez Ron, the work of the *novatores* was that of the “importación de la [ciencia] producida en otros países. Una importación, además un tanto tardía, a remolque de los sucesos” (Sánchez Ron *Cinzel, martillo y piedra* 35). Regardless of their originality, however, the *novatores’* work did allow Spain to stay somewhat abreast of scientific developments elsewhere in Europe, and, in more recent history, are frequently cited as evidence of Spain’s participation in the growth of Western science, a point to which I will return in the conclusion of this chapter. One cannot ignore the contributions or even the presence of the

⁵ Santiago Garma, in his article on mathematical development in the 19th century, insists that the discussion about the state of Spanish science began with an article by M. Nicolas Masson de Morvilliers, “Geographie Moderne”, in the French publication, the *Encyclopedie Methodique* in 1782. Perhaps this is when the discussion took on an international dimension and gained visibility in Spain itself, but Feijoo’s letter from 1745 clearly demonstrates that there was an existing polemic previous to the Morvilliers article. Santiago Garma, “Cultura matemática en la España de los siglos XVIII y XIX,” *Ciencia y sociedad en España*, ed. José Manuel Sánchez Ron (Madrid: Ediciones El Arquero / CSIC, 1988) 93.

novatores; but if we follow the logic of Sánchez Ron's assessment of their work, it is clear that neither should we overstate their importance solely in Spain, not even in the rest of Europe. Competing ideologies have frequently played a large part in how the *novatores* and the sciences during the early modern period have been portrayed. Despite these differing viewpoints, however, it is difficult to deny—as Feijoo's *Carta XVI* attests—that after the reign of the *novatores*, science fell into rapid decline, so that by the mid 18th century, the state of the sciences in Spain was truly lamentable.

What, we might ask, constituted this scientific poverty that Feijoo decries in his letter? He enumerates six specific problems in *Carta XVI* that he feels are the principal causes of the *atraso*. The reasons offered are the following:

1. “el corto alcance de algunos de nuestros profesores”
2. “la preocupación, que reina en España contra toda novedad”
3. “el errado concepto de que cuanto nos presentan los nuevos Filósofos, se reduce a unas curiosidades inútiles.”
4. “la diminuta, o falsa noción, que tienen acá muchos de la Filosofía Moderna, junta con la bien, o mal fundada preocupación contra Descartes.”
5. “un celo, pío sí, pero indiscreto, y mal fundado: un vano temor de que las doctrinas nuevas, en materia de Filosofía, traigan algún perjuicio a la Religión.”
6. “la emulación (acaso se le podría dar peor nombre), ya personal, ya Nacional, ya faccionaria.”

Feijoo's understanding of the situation confronting Spain was multilayered and multi-causal: the antiquated university system that engaged in a vicious cycle of inadequacy; the resistance to new ideas emerging from institutions such as the Church and also societal traditionalism; the fact that many of the hard sciences—physics, in particular—were still grouped with the philosophical disciplines rather than having their own space in the university; and the strange problem of “emulación”, which I am reading as the inability of Spanish scientists to do anything more than import and (partially, weakly) disseminate the discoveries of other nations.

The historian Santiago Garma in his essay “Cultura matemática en la España de los siglos XVIII y XIX” analyzes this passage from Feijoo's letter, saying that:

En este relato de causas del atraso científico intenta Feijoo mostrar a los sectores más conservadores de los estamentos que gobernaban y administraban España que su actitud y comportamiento, después de todo, les perjudicaban a ellos principalmente, y descalificaban a un órgano de control religioso, social y político, como era el Santo Tribunal. Por otro lado no comprendía (ni creo que pudiera comprenderlo) que las causas de los atrasos estaban implícitas en el fondo y forma del pensamiento de unos estamentos sociales, nobleza y clero, y que habían elaborado este conjunto de ideas que les servían para seguir gobernando cómodamente a pesar del atraso económico, industrial y comercial, político y social. (96)

Garma chooses to highlight a very important point, one that characterizes the 18th century approach to scientific discovery: it was explicitly tied to government policies, especially military actions, and the business of maintaining the empire. The science being worked in Spain had to be *useful*; thus we see many historians refer to a politics of *la ciencia útil*, or, as I will be referring to it, *técnica*, or applied sciences. The technologies springing from science could be employed immediately for important ventures such as navigation, the concerns of infrastructure, mining, bettered war materials, agricultural processing, etc., all of which should have had the effect of strengthening the Spanish Empire. Eugenio Portela and Amparo Soler note that the Bourbonic reign and its passion for useful science actually followed the French model, and included the “reclutamiento de científicos y técnicos extranjeros para ejercer la docencia en España, para la explotación minera o para la dirección de las Reales Fábricas de nueva instalación” and “la creación de laboratorios o escuelas... interesad[os] en el aprovechamiento agrícola e industrial de los nuevos conocimientos” (90). Science, under the Bourbons, was undeniably important, as we can see, but limited in its vision principally to the premise of utility, and in this aspect, showed science to be mostly a political undertaking, not an end in itself.

For all the enthusiasm of the Bourbons towards science,⁶ there was little effort to encourage a scientific tradition based in research and “*lo inútil*”—pure science. Sánchez Ron notes that the Bourbons, especially Carlos III, were full of excitement about the possibilities of science and there were plenty of initiatives to promote science (“Introducción” 10). But these efforts were diminished by the Spanish Enlightenment’s characteristic “*pugna*”, to use Sánchez Ron’s term, between the Scholastic tradition and the need for useful technology (“Introducción” 11). Thus, there was no significant development within the fields of pure research. However, certain societies and academies, such as the *Real Academia de Ciencias y Artes* (1770) and the *Real Jardín Botánico* (1755)⁷, were founded during these years. These would serve as an important foundation for later developments, even if they produced little in the vein of original research. In terms of *técnica*, the 18th century saw the foundation of institutions such as the *Gabinete de Máquinas* (1788) and the *Escuela de Caminos y Canales* (proposed in 1785, but did not open until 1802), to name only two, wherein an intense interest developed in disciplines such as hydraulics, mechanization, metallurgy, mineralogy, applied chemistry, and pharmacology.⁸

⁶ “Los Borbones, desde el primer gobierno de Felipe V fueron conscientes del atraso cultural y científico de una sociedad que no era capaz de competir en estos terrenos con el resto de los países europeos. Por lo que se plantearon una política de creación de instituciones, aunque ésta fuese muy criticable, que quería proporcionar los recursos sociales y legales, los medios materiales y el apoyo económico necesario para conseguir técnicos y profesionales que les sirvieran en sus proyectos económicos y políticos. Al mismo tiempo iniciaron una exigencia a las instituciones existentes, especialmente a las universidades, para que cambiasen sus costumbres y aceptasen la que entonces se llamó ‘el modo francés’.”Ibid. 96.

⁷ Botany was considered to be of great importance under the Bourbons. According to A. González Bueno, it was “una herramienta política borbónica... [El] interés de los ilustrados españoles por la Botánica debe considerarse, en sus inicios, como una actitud política más que científica.” The Bourbon’s imperial policies and connections and/or rivalries with France led to this tendency. For a discussion of the importance of botany in Enlightenment-era Spain, see A. González Bueno, “Penetración y difusión de las teorías botánicas en la España Ilustrada,” *Ciencia, técnica y estado en la España Ilustrada*, eds. Joaquín Fernández Pérez and Ignacio González Tascón (Zaragoza: Ministerio de Educación y Ciencia, 1990) 383.

⁸ For a truly exhaustive treatment of science and technology in 18th century Spain, see Antonio Rumeu de Armas, *Ciencia y tecnología en la España Ilustrada: La Escuela de Caminos y Canales* (Madrid: Ediciones Turner, 1980).

Técnica, at the close of the 18th century, was a heady force in Spanish government, and science seemed to be gaining ground in both the government's and the public's estimation.

Tragically, however, this momentum in the government's promotion of the sciences and also some initial university reform would end abruptly with the *Guerra de la Independencia*, following which the authoritarian monarchy of Fernando VII proceeded to squelch any further progress in this area. Under the rule of the absolutist monarch, most of the Enlightenment ideals concerning the promotion of knowledge withered and died, as the ruling philosophy became, to use the words of a letter written to Fernando VII by the University of Cervera, "lejos de nosotros la funesta manía de pensar,"⁹ and the country shrouded itself in the perpetuation of a traditional way of life in which Church and King were supreme, and the possibilities held forth by ideas of progress and modernization were cast aside indefinitely.

19th Century Science in Spain: The "Three Periods" Model

1. "En cualquier caso, la producción científica sufrió una paralización casi total: observatorios, jardines botánicos, gabinetes de física y química y toda suerte de centros desaparecieron o vegetaron de modo lamentable."

— Pedro González Blasco, José Jiménez Blanco and José María López Piñero, writing about the state of science during the *Guerra de la Independencia* and the ensuing reign of Fernando VII (75).

2. "Las circunstancias vigentes en la España isabelina no fueron óptimas para el cultivo de la ciencia, pero es innegable que mejoraron en comparación con las de la etapa anterior. El retorno de los exiliados liberales y las mayores facilidades para la edición y circulación de publicaciones científicas pesaron de forma notable. Los exiliados importaron los conocimientos y las técnicas que habían aprendido durante sus años de destierro, las publicaciones extranjeras se difundieron ampliamente, aumentó de forma espectacular la edición de libros, sobre todo los traducidos, y se consolidó el desarrollo del periodismo científico, que influyó decisivamente en la información continuada y al día de las corrientes europeas."

⁹ Letter cited in Luis E. Otero Carvajal, *La destrucción de la ciencia en España: Depuración universitaria en el franquismo*, 1. ed. (Madrid: Editorial Complutense, 2006) 16.

—José María López Piñero, regarding the “*etapa intermedia*” of scientific development in Spain during the reign of Isabel II (15).

3. “Los años siguientes a la Revolución del 68 significaron, por último, una decisiva liberación de la opresión ideológica a que se había llegado durante la parte final del reinado de Isabel II. Muchas cuestiones directa o indirectamente relacionadas con la ciencia fueron entonces, por vez primera, discutidas de un modo abierto e incluso estruendoso: el evolucionismo darwinista es quizá el mejor ejemplo. Todo ello permitió una serie de esfuerzos cuyos resultados se manifestarían en las condiciones de tranquilidad y continuidad que trajo el aquietamiento político de la Restauración.”

—Pedro González Blasco, José Jiménez Blanco and José María López Piñero, discussing the years following *La Gloriosa*, including the ensuing Restoration period, laying the foundation for a true flowering of the sciences in Spain in the 20th century (77).

In creating an outline of the scientific landscape of the 19th century, I thought it best to begin with three exemplary quotes that outline the basic trends that defined progress during that epoch. Each quote corresponds to the numbered sections below. About the three-period structure that López Piñero uses, I have yet to find a model in my other research of the 19th century that is as efficient as this one, which is highly contextualized historically and sets the trends in science firmly within the coetaneous political and social developments. From a critical standpoint, however, it does perhaps oversimplify things, as scientific progress in the 19th century was in general very uneven, with the biomedical disciplines and the schools of engineering (especially the *Escuela de Caminos y Canales*) generally being given significantly more privilege than their counterparts in the research-based hard sciences, the division of “*útil*” and “*inútil*” not disappearing completely, as the model would have us assume.¹⁰ I would ask the reader to keep in

¹⁰ Looking backward from the 20th century from the perspective of the *Junta para Ampliación de Estudios* (JAE), founded in 1907 with the purpose of promoting scientific research in Spain, and which will be very important in our analysis in the next section of this chapter, Sánchez Ron reminds us that “...no debe hacernos olvidar, u oscurecer, el hecho de que en el caso que ahora estamos considerando, el de las ciencias biomédicas, existía un tradición investigadora—que en el caso de Cajal alcanzaba niveles de excelencia—*previa* a la creación de la JAE... En otras palabras, que lo que hizo la Junta fue, y no es poco desde luego, facilitar, extender, “apropiarse” si se quiere, las

mind that the tripartite structure is, more than anything else, a convenient model to describe what really is an otherwise nuanced and unbalanced process towards achieving a more modern scientific infrastructure.

Catastrophe

We begin with what José María López Piñero characterizes as “*el período de catástrofe*”: the years between 1808 and 1833 (14). As we have seen, during this time of authoritarian rule, science languished, intentionally neglected by the traditionalist and retrogressive regime. The main technical school, *La Escuela de Caminos y Canales*, was closed between 1808 and 1814, and the *Gabinete de Máquinas* plainly disintegrated until it was also closed in 1814. Even with the expulsion of the French, however, little was done to aid these establishments in their rehabilitation under Fernando VII. The liberal reforms of 1820 did manage to reestablish the Escuela de Caminos y Canales, but in the end “[volvió] Fernando VII al disfrute integral de sus poderes soberanos, y la primera medida que tomó fue restaurar el llamado *viejo régimen*, arrumbando las instituciones nacidas del espíritu reformador de los nuevos tiempos” (Rumeu de Armas 402). The practicality of disestablishing even the rudiments of technological inquiry demonstrates how thoroughly out-of-step the Spanish monarchy under Fernando VII actually was. The net result of the destructive governments and wars of the early 19th century was not only the almost complete annulment of the advancements made under the Bourbon rulers, but also the annihilation of the spirit of discovery that had almost succeeded in reforming the Spanish scientific *atraso*. When the absolutist period came to an end, there was very little left to resuscitate—the exiled professors and scientists would have quite a task before them as they trickled back into Spain in the 1830s and 1840s. One of these voyagers, Julián Sanz del Río, returning from Germany in 1843, would be responsible for the introduction of Krausism in Spain, with wide implications for the horizons of Spanish science, as we will see in the following pages.

The Isabeline Years: A Cautious Rebuilding

The second period that López Piñero outlines is the “*etapa intermedia*”, from 1834 until 1868. Generally speaking, this was a period of recognition, reform, and rebuilding, in which the Spanish government finally saw that the sciences as they were being taught in the universities were suffering under an extremely antiquated system that still, for example, held physics as a

investigaciones biomédicas realizadas en España, pero no crearlas *ex nihilo*.” The 18th and 19th centuries were the time in which this particular tradition found its footing. For this reason I have used the word “uneven” to describe the scientific advances of the mid-19th century, and would use this opportunity to remind the reader that my principal interest is in the development of the hard sciences, especially physics. José Manuel Sánchez Ron, “Introducción,” *Ciencia y sociedad en España*, ed. José Manuel Sánchez Ron (Madrid: Ediciones El Arquero / CSIC, 1988) 14.

philosophical discipline. The hard sciences were, to put it mildly, misunderstood as individual disciplines, independent of their philosophical background—Descartes, Leibnitz, Newton. Antoni Roca Rosell and José Manuel Sánchez Ron write in their biography of 20th century physicist-engineer Esteban Terradas that:

Una de las características del siglo XIX español es la precaria situación que tuvieron que soportar las distintas disciplinas científicas. Es posible, evidentemente, establecer diferencias entre las distintas ciencias; no ocurrió lo mismo en las de índole taxonómica, o en las biomédicas, que en la Astronomía, la Química o la Matemática, pero, aun aceptando esas variaciones, en general no hay duda de que el panorama fue, tomado en su conjunto, eminentemente sombrío. (171)

In spite of this “somber panorama” described above, progress was indeed being made towards a distinct plan for the sciences in the university system, the first step of which was the so-called *Plan Pidal* of 1845, named after the government official Pedro José Pidal.

The *Plan Pidal* of 1845 established in a very general way the individual disciplines of the hard sciences as independent entities. Perhaps the discipline most greatly affected by the plan was physics, the courses for which were divided into *Física con su ampliación*, *Física matemática*, *Mecánica racional*, and *Astronomía Física y de observación*; not only was physics finally separated from philosophy in this plan, but it finally became possible to pursue a doctorate in the physical sciences without necessarily having to study Latin (Moreno González “De la física” 55). Two years later, in 1847, the *Sección de Ciencias Exactas* in the *Real Academia de Ciencias* in Madrid would be established—another recognition by the government of the fact that the intellectual topography of the sciences had changed significantly. The *Real Academia* played a large role in the dissemination of ideas, as did the publishing industry; in 1850 we see the *Revista de los Progresos de las Ciencias Exactas, Físicas y Naturales* published and distributed for the first time. At this point in the 19th century it is important to note that there existed a certain separation of powers: the university system and the system of the *Reales Academias*, each operating independently of each other, with little bearing on the other’s structure, function or output. This division is highly characteristic of the pattern of development in Spanish science, and it is here that we see the first stark division of authority. Maintaining scientific education separate from pure research had its drawbacks. Regardless, for an entire century, up until the Spanish Civil War, it was the path that Spain chose for the pursuit of scientific advancement, as abrupt and halting as that journey may have been.

And so we begin to see the wedge being driven between the relatively independent royal academies and the university system, perhaps instigating a bit of competition that resulted, ultimately in a very important reform in the structure of higher education, known as the *Ley Moyano*. The *Ley Moyano* was passed in 1857, picking up where the *Plan Pidal* left off, permanently separating physics and the other hard sciences from their philosophical roots. Antonio Moreno González sums up the importance of this law, which still is essentially in effect today, in terms of the structure of Spanish universities. Moreno González celebrates the fact that the *Ley Moyano* “creó, por fin, la *Facultad de Ciencias Exactas, Físicas y Naturales*. Esta nueva Facultad, despojada del carácter menor de su antecedente, la de Filosofía, es el comienzo del

tratamiento de la física no sólo como un medio para otros estudios sino con un fin en sí mismo” (“De la física” 57). This is an important transition, and marks the beginning of the rejection of “*la ciencia útil*” in favor of pure scientific research, especially in physics.¹¹ Physics, chemistry, and mathematics had found their individual places in the university, and within the larger institutionalized epistemological structures that were also experiencing reform within wider circles of influence. They had also achieved a greater collective estimation of their worth as independent disciplines, especially among liberals, which is not to say that controversies about the problem of science in Spain were resolved. In fact, the controversies—Darwinism, relativity—were still quite a ways away. In the face of largely conservative attitudes towards technology and modernization, science still had a long path to travel before it would gain the public imagination, let alone the public *trust*; the question remains as to whether science ever actually did accomplish this goal. Franco’s anti-scientific policies would indeed bring into doubt the assertion that, by the time of the Civil War, science had made significant inroads into the traditionalist mentality. But before we deal with one sort of revolution, we must first deal with the effects of *La Gloriosa*.

Revolution, Republic and Restoration: The Period of Liberation, Debate, and Reform

López Piñero suggests in the third citation that opens this section of the chapter that the years after the Revolution of 1868 were ones of liberation, and one would think, gathering from his tone, that this was an enduring effect, but in fact it was fairly short lived in certain respects, especially with regard to Darwinism. Certainly between 1868 and the end of the First Republic in 1874, there dawned an openness with regard to controversial subjects, and the spirit of reform was running high. However, with the restoration of the monarchy, this period of relative freedom of thought came to an end.

Before we examine the effects of the Restoration, however, it is important to note that in the universities, a significant shift was taking place under the “*efímera Primera República*”—a shift from the French university model to the Germanic one.¹² This was mainly brought about by figures such as Sanz del Río, who had returned from Germany in the 1840s replete with ideas about educational reform along Krausist lines. It was a time in which *la ciencia inútil* was about

¹¹ Perhaps it is a coincidence—I have not found any real indication of this in my research—but I find it interesting that pure science would find a place in the university system in the years following the loss of the colonies in South and Central America, and at a moment in time when Spain’s military prowess was in a state of significant decline. This strikes me as being a double-edged sword and somewhat paradoxical, in that the lack of emphasis on *la ciencia útil* may have contributed to the loss of the remaining colonies in 1898. However, it is that specific loss that would go on to spur Spain’s greatest attempts at modernization, culminating in the scientific *Edad de Plata*, which would definitively bring Spain into the European investigative fold and (at least in part, and temporarily) redeem its reputation for being behind the times scientifically. In any case, it would be a relationship worthy of future exploration, but lies beyond the parameters of this chapter.

¹² For a discussion on the differences between the French and German University models, see Antonio Moreno González, “De la física como medio a la física como fin: Un episodio entre la Ilustración y la crisis del 98,” *Ciencia y sociedad en España*, ed. José Manuel Sánchez Ron (Madrid: Ediciones El Arquero / CSIC, 1988) 64.

to receive it's due, and in physics this meant, to quote the title of the article by Antonio Moreno González, the emergence of physics as an end rather than a means. Unfortunately, these reforms never took effect, precisely due to the short half-life of the First Republic, which disappeared within two years of its founding. Still, a seed had been planted that all was not right within the university, despite the advancements made under the *Plan Pidal* and the *Ley Moyano*.

After the fall of the First Republic and the restoration of the monarchy in 1874-1875, another attempt at university reform took place, headed up by the *ministerio de Fomento*, under Eduardo Chao, which

dispuso por Decreto de 2/6/1875 la reorganización de las enseñanzas de las Facultades de Ciencias y de Filosofía y Letras. La propuesta... suponía desdoblamientos que sólo afectaban a las facultades de Madrid, consideradas como centros piloto para la experiencia, y novedades muy destacables en las asignaturas. Todo ello planteado como continuación de la interrumpida reforma universitaria de los ilustrados a quienes evocan con admiración en la exposición de motivos del decreto. (Moreno González "De la física" 64)

As the Enlightenment ideals were adopted as the basis for these reforms, which were based on the French university model, it can be assumed that the Germanic model which had been popular under the First Republic was rejected. The *Plan Chao* was meant to be experimental, and as such, never gained much sway among university officials, and was eventually rendered mute, leaving the *Ley Moyano* firmly in place.

The Restoration had rather deleterious effects on the university system as a whole, not only in terms of aborting the reforms of the *Plan Chao*. Several years of open discussion of Darwinism had infuriated the conservative forces within the government and within the university. On the 27th of February, 1875, the *Circular de Orovio* was published in the *Gaceta de Madrid*, prohibiting the discussion and instruction of Darwinist principles in the *Facultades de ciencias*. This was put in place by the new *Ministro de Fomento*, the *marqués de Orovio*, "reconocido representante del sector intransigente del catolicismo español" (Otero Carvajal 17). One result of the *Circular de Orovio* was the "separation" (read: expulsion) of a sector of the professorate who refused to obey the decree, and continued to teach the theories of Darwin in Madrid's university.¹³ While initially this may seem like a real tragedy for the future of the study of the sciences in Spain, it ironically had the opposite effect, as the expelled professors went on to form the very influential *Institución Libre de Enseñanza* (ILE). The ILE, based in the Krausist principles imported by Julián Sanz del Río and continued by Giner de los Ríos, would go on to shape the minds of the most prominent scientists of the 20th century. According to some¹⁴, it was the founding of the ILE that allowed for the founding of the *Junta para*

¹³ This came as a result of measures against one Professor González Linares, whose refusal to obey the *Circular* resulted in a sweep of the departments of science in the university. See the discussion in Otero Carvajal, *La destrucción de la ciencia en España: Depuración universitaria en el franquismo* 16-17.

¹⁴ Sánchez Ron implies so much in his Introduction to *Ciencia y Sociedad en España*: the ILE "contribuyó de manera destacada a la regeneración científica que tuvo lugar en España a finales del XIX y comienzos del XX." Sánchez Ron, "Introducción," 12. However, among the conservative and antimodern circles in the early 20th

Ampliación de Estudios in 1907, an institution that was instrumental in bringing about the scientific *Edad de Plata* of the 20th century. Mariano and José Luis Peset have characterized the years of the Restoration as being “una etapa de vaivenes” in which liberals and conservatives took turns at reforming the university system, with little net effect overall in terms of structure, but certainly having the outcome of drawing much needed attention to the sciences (38). According to Thomas F. Glick, the conflict between the Conservatives and the Liberals over the direction(s) the university system should take, showed one level of agreement: both “favored the autonomy of the university, believing that their ideas would fare better with decentralization than under the tutelage of the state” (7). However, Mariano and José Luis Peset write that in terms of the *content* of what was to be taught, tensions remained, especially with regard to the new and controversial theories that had emerged in the sciences during the 19th century:

La Restauración canovista supuso, sin embargo, la definitiva entrada de las ciencias modernas en la Universidad, si bien esta intromisión en la vieja estructura administrativa y clerical no se hizo sin tensiones. La vieja enseñanza humanista no veía con buenos ojos a los nuevos saberes, y conservadores y neocatólicos no podían dejar de ver peligrosos enemigos en los cultivadores de las ciencias. Por ello, su entrada se hará con dificultades... (39)

The return of the liberals in the 1880s brought back the professorate that had been expelled previously; they returned from the *Institución Libre de Enseñanza* to their posts in the universities in 1881. In the next decade, there would follow a series of royal decrees aimed at creating further reforms in the university, with additional attention to the scientific specialties and subspecialties—especially in the biomedical sciences—that were gaining ground.¹⁵ In the years 1886 and 1887, the *Laboratorio Microbiológico Municipal* was founded and constructed in Barcelona, putting the city proverbially “on the map” in terms of its scientific production. This was the time—the 1880s and 1890s—in which renaissance engineers and mathematicians such as José Echegaray (also a playwright) and Zoel García de Galdeano were doing the greatest volume of their work, and in which great scientists such as Santiago Ramón y Cajal, August Pi i Sunyer (also written as “Súñer”) and Blas Cabrera were being trained in their fields; surely, the attention paid to the sciences during this time, as uneven as it was, would bear rich fruit.

century, this link between the ILE and the JAE was seen as pejorative, and was often used to make a case against the continuation of funding for the JAE. See Otero Carvajal, *La destrucción de la ciencia en España: Depuración universitaria en el franquismo* 45.

¹⁵ “Gaining ground” being a relative term—José Manuel Sánchez Ron notes in his biography of Miguel Catalán that “La cátedra de Química biológica de Madrid, que atendía a las Facultades de Medicina, Farmacia y Ciencias no tuvo ningún presupuesto para laboratorios desde su establecimiento en 1887 hasta 1901.” Considering how essential laboratory work is to the industry of scientific discovery, this fact is rightfully shocking and entirely demonstrative of the state of Spanish science in the 19th century: first, that there was no position for biochemistry until 1887, and secondly, that it was significantly underfunded until 1901, after another series of university reforms. José Manuel Sánchez Ron, *Miguel Catalán: su obra y su mundo*, Estudios sobre la ciencia (Madrid: Fundación Ramón Menéndez Pidal: Consejo Superior de Investigaciones Científicas, 1994) 14-15.

One of the accusations leveled at the institutions that promoted the study of the sciences was that they were producing nothing original. Sánchez Ron, in his important study of science in the 19th and 20th centuries in Spain, *Cinzel, martillo y piedra*, states that

Si hubiera que caracterizar de alguna manera los productos de tales individuos [interesados, profesionales o practicantes *amateurs* de esas ciencias], yo recurriría a la expresión “carencia de originalidad”. El ámbito en el que se movieron los físicos, químicos y matemáticos españoles de aquella centuria fue, con muy pocas excepciones, el de la enseñanza, una enseñanza en general de carácter poco avanzado. Se trataba sobre todo de enseñar, y así las publicaciones de nuestros científicos del XIX se limitan en general... a textos compuestos con materiales tomados de diversas fuentes. (Sánchez Ron *Cinzel, martillo y piedra* 94)

Thus we can only conclude that the 19th century, while it provided Spain with its first real opportunity to regain the ground lost between the Enlightenment and the end of Fernando VII's regime, did not truly succeed in being much more than derivative, especially in the hard sciences. To return to the earlier quote from Vincenti, who implicitly decried the retrogressive policies towards science that had led to the defeat of the Spanish military in Cuba, the vehemence with which he denounced the establishment that had failed to produce scientific advancements that would have helped Spain to win the Spanish-American War, was perhaps a little misplaced and histrionic—how could Spain possibly produce anything new and useful when it was still attempting to create a viable system of education for those who wished to study science? If anything characterizes the 19th century, aside from this lack of originality, it is the frustrating dynamic of political entities attempting to create an infrastructure for education in subjects about which they knew nothing, and for which they had either an entrenched distrust or an excess of enthusiasm. The quarrels of liberal vs. conservative took shape not only in the *Cortes* but in the classroom.

To conclude this section on the history of Spanish science in the 19th century and to open the discussion on the results of *el Desastre* and the dawn of the 20th century in Spain, I would like to cite José Luis Peset's succinct analysis of the situation:

En fin, la falta de medios económicos que impedía la dedicación del profesorado, la estructura universitaria que tendía a favorecer la mera copia de modelos extranjeros, la falta de demanda social que prefería la importación de técnicas y saberes foráneos y la obsesión por un control tan rígido como inoperante, no permitieron a la universidad del Ochocientos crear su propia ciencia. Fueron duros años para la ciencia española, que tan sólo con lentos y esforzados trabajos individuales consiguió preparar un siglo XX más fecundo, en cuyas primeras décadas tanto la sociedad española como sus gobernantes comprendieron la importancia de apoyar a sus científicos. Por unas décadas la ciencia española dejó de ser mera copia y dependencia del exterior, consiguiendo desarrollar saberes útiles y de primera línea. ("Educación y ciencia en el fin del Antiguo Régimen" 24-25)

Modernization, Integration, Reform: *La Edad de Plata* in Spanish Science

En torno al '98: En cuanto a la ciencia, "...jamás la ha habido"

"La conmoción del 98 sacudió todos los ámbitos de la cultura, también de la ciencia, y, en consecuencia, se puso un énfasis especial en la reforma educativa para hacer España permeable a la ciencia."

—L. Español González "Rey Pastor ante la Ciencia de su tiempo" (99)

In the last decade of the 19th century, a nation came to terms with its weaknesses. Tired, traditional art forms became freshly invigorated by the challenges of *modernismo*. And the floundering sciences found themselves caught in the political crossfire between traditionalism and modernization as the discourse surrounding *regeneracionismo* mounted; in 1898 the cries of "decadence!" were fatally echoed by the defeat of the Spanish forces by the United States in Cuba. After several centuries of decay, Spain finally had to answer to its failures, and decide what the future held for it as a nation. The years between 1898 and 1936 were tumultuous, polyphonic, nearly cacophonous years of debate about the path Spain should take. It was a debate that would be sorted out in the pages of books, in political speeches, in the prolific and partisan press, on canvasses, and in laboratories. Modernity, modernization, Europeanization, a new internationalism—these themes were the rubric under which all the various discourses fell, and once again the question was taken up about science (seen as one of the hallmarks of the advancement of modern society).¹⁶ According to Menéndez Pelayo there had never been science

¹⁶ While this is an appropriate point at which to engage "*la polémica de la ciencia*" in Spain, due to the restrictions of time, space and theme, it is not possible to go into great detail. However, for a succinct summary of the time, we can turn to José Manuel Sánchez Ron, who, in his introduction to *Ciencia y sociedad en España*, gives a brief outline of the themes surrounding the debate as it existed around the year 1898: "A pesar de los elementos positivos que para la ciencia en particular, y para la sociedad en general, se pueden identificar en el último tercio del siglo pasado, no hay duda de que se puede hablar de una crisis finisecular, crisis agudizada por la derrota del 98. A partir de entonces cobró especial vigor el movimiento a favor de una 'regeneración nacional'. Resonaron vibrantes manifestaciones de hombres como Ganivet, Leopoldo Alas 'Clarín', Unamuno, o de Joaquín Costa lanzando la palabra 'europeización' y la fórmula 'Despensa y escuela'... De especial relevancia para esta ocasión, es que de la mano de semejante crisis colectiva se renovó la antigua polémica de la ciencia española, tan frecuentemente mencionada en las páginas de la presente obra... Fue ésta, además, una renovación en absoluto académica; no se trataba de satisfacer ningún impulso chauvinista, por muy erudito que fuese el ámbito de la discusión, sino de

in Spain: “*jamás la ha habido*” (Cited in Español González 101). As we have seen, this sad reflection by Menéndez Pelayo is only partially true; however, it was just this type of rhetoric that accelerated Spain’s attempt to recover what little science there was and had been, prompting a new age for science—a veritable *Edad de Plata*.¹⁷

Rapid Development in a New Century: 1900 – 1919

A trend began in the 18th century and was continued in the 19th that has not yet been explored in detail, which is the separation of the university system from other government and independent institutions founded in the hopes of promoting scientific growth in Spain. The *Real Jardín Botánico* is one example of an Enlightenment institution that made its way intact to the 20th century; there were also many others that existed outside of the discussion over the need for reform in the educational system. These other institutions—such as the aforementioned *Real Academia de Ciencias de Madrid* or the *Laboratorio Microbiológico Municipal*, or the schools of engineering (*Escuela de Caminos*, *Escuela de Minas*, and the Academy of Military Engineers)—had government support (albeit some more than others), but were essentially free of the tug-of-war between Liberals and Conservatives over the directives that were governing or should govern instruction at the university level. The 20th century would see a proliferation of these independent institutions, and it would be they that provided Spain with the momentum it needed to re-launch the platform of scientific inquiry that had been dismantled nearly a century earlier by the despotic French rule and the authoritarian government of Fernando VII. As the tide of *regeneracionismo* reached its full swell, attention to the need for the renovation of the Enlightenment ideals of science (and technology) was finally effectively drawn—and heeded.

The year 1900 saw two significant developments: the creation of the *Ministerio de Instrucción Pública y Bellas Artes* and also significant university reform under the *Plan García Alix*. The *Ministerio de Instrucción Pública y Bellas Artes* was created as an attempt to reverse the lack of attention paid to science, to fix one of the causes of “la sempiterna escasez de recursos públicos, el escaso desarrollo económico del país y el anquilosamiento de las estructuras universitarias [que] hacían prácticamente inviable la investigación científica” (Otero Carvajal 2). This problem was also addressed by the university reforms under Minister García Alix, whose plan pushed through the division of the *Facultades de Ciencias Exactas, Físicas y Naturales*,

identificar las causas de la derrota militar. Y fue el retraso científico una de las causas seleccionadas.” Sánchez Ron does well to point out the academic nature of the debate, as well as its major players. It is worth noting as well that this was the ambience in which the major voices of the *Generación del '14*—especially José Ortega y Gasset—would have their formation, and whose adaption of the discourse of *regeneracionismo* to the cause of modernization would have a large effect on Spain’s development in the following four decades. Sánchez Ron, “Introducción,” 13-14.

¹⁷ “*La Edad de Plata*”: a term used most frequently to describe the years in which a new species of artist emerged in Spain—los *ultraistas*, los *vanguardistas*, los *creacionistas*, los *del '27*: an energetic, revolutionary wave of innovation rejuvenated Spanish culture in art, music, and literature. Many have chosen to use the term “*Edad de Plata*” as referring to an exclusive domain of the arts, neglecting to notice a parallel resurgence in the field of the sciences, and some would argue, in politics as well, as critical civil discourse about the state of the State flourished.

established under the *Ley Moyano*, into now four separate sections: *Exactas*, *Físicas*, *Químicas* and *Naturales*. The *Plan García Alix*, in its formulation, took note of the need for the separation of mathematics from physics, and the autonomy of chemistry; the biomedical sciences had always been strong in Spain, so their separation was no less than a given, and would, in the long run, provide them with even more support and strength. For the hard sciences, this division would prove to be an intrinsic part of their revitalization, allowing them to turn out more students at the bachelor's and even doctoral levels.

Outside of the university system, however, even greater reforms and achievements were about to occur: 1903 saw the formation of the *Sociedad Española de Física y Química*, whose first elected president was José Echegaray; and in 1907, we have the foundation of the fundamentally influential, instrumental *Junta para Ampliación de Estudios* (JAE), with Santiago Ramón y Cajal as president, where he would serve as such until 1934. Of the creation of the JAE:

La JAE fue creada por un Real Decreto el 11 de enero de 1907. Su presidente fue Santiago Ramón y Cajal hasta su muerte. Desde un principio la JAE tuvo que lidiar con la animadversión del conservadurismo español, tanto desde el Gobierno como desde la Universidad. A los pocos días de su constitución, el 25 de enero de 1907, los liberales fueron sustituidos en el Gobierno por los conservadores, bajo la presidencia de Maura. La formación del Gabinete encabezado por Antonio Maura en enero de 1907, con Faustino Rodríguez San Pedro al frente del Ministerio de Instrucción Pública y Bellas Artes, estuvo a punto de dar al traste con la JAE, dada la oposición enconada que encontró en los sectores conservadores y católicos, tanto políticos como universitarios, que veían en ella un instrumento para poner en práctica el ideario de la Institución Libre de Enseñanza en la universidad española. (Otero Carvajal 22-23)

The JAE was centered in Madrid, where most of the scientific facilities would eventually be built. The JAE had on its initial board of directors some of the foremost men of science in Spain at the time—Blas Cabrera, the physicist; José Echegaray, the mathematician; Marcialino Menéndez y Pelayo, Ramón Menéndez Pidal, José Rodríguez Carracido, Leonardo Torres Quevedo, and a dozen others.¹⁸ The *Junta para Ampliación de Estudios* was an important step forward in Spanish science because it essentially freed it from the inadequate resources and incomplete reforms of the university system. It allowed these men of science to go on with their investigations in all areas and disciplines without being hindered by the shortcomings of the outdated institutions which produced them. But most importantly, the JAE granted scholarships to study abroad. Otero Carvajal describes this function:

Dos fueron los ámbitos en los que la acción de la JAE resultó fundamental. El primero de ellos, el impulso y gestión de las estancias en el extranjero de los profesores y jóvenes científicos españoles, con el fin de completar su formación académica y científica, a

¹⁸ For a complete listing of the original members of the JAE, see Sánchez Ron, *Cinzel, martillo y piedra: Historia de la ciencia en España (siglos XIX y XX)* 178-79.

través de una política de pensiones—el equivalente a las becas actuales—que permitieron la toma de contacto con las líneas de investigación puntera de la ciencia internacional y, a la vez, establecer contacto con las instituciones científicas extranjera. El otro gran cometido de la Junta fue la creación de instituciones científicas que permitieran dar continuidad a la formación adquirida en el extranjero por los pensionados y rentabilizarla mediante la fundación de Institutos de Investigación que hicieran realidad el despegue de la Ciencia en España. (2)

With these scholarships, the young *becarios* could go to the major centers of learning—especially in Germany, France and Britain—and bring back to Spain the latest in not only *ciencia* but in *técnica* as well. The significance of this function can hardly be overlooked—Spain began to actively *import science* once the JAE was founded, and Madrid began to find a place for itself on the international stage, but more importantly, began to nurture its own scientists by providing them with the resources essential for the development of a culture of science.

The years following the creation in 1907 of the JAE and its ratification by Royal Decree in 1910 were ones of pure construction: new institutions for investigative study cropped up in Madrid, frequently linked to the JAE, which was rapidly becoming *the* intellectual center of Spanish science. In 1910, the *Instituto Nacional de Ciencias Físico-Naturales* was founded, again with Ramón y Cajal and Blas Cabrera at the helm. According to Thomas F. Glick, “modern physics in Spain dates to 1910, when the *Junta para Ampliación de Estudios* created the Institute of Physical Research in the Hippodrome of Madrid,” a statement which attests to the power of the JAE, and to the strong-willed desire of Spanish physicists to create a presence for themselves if not internationally, then at least within their own country (30). Along these same lines, strong effort by the engineer Leonardo Torres Quevedo resulted in the founding of the *Asociación de Laboratorios* (Sánchez Ron *Miguel Catalán: su obra y su mundo* 68-69), of which the most notable was the *Laboratorio de Investigaciones Físicas*, whose role would be “decisive” in the development of a mature and interconnected system of laboratories in Spain (Otero Carvajal 34). The year 1915 saw the formation of the *Laboratorio Seminario Matemático*, directed by internationally renowned mathematician Julio Rey Pastor; 1916 the *Laboratorio de Fisiología General*, with Juan Negrín in charge.

But Barcelona was not to be left out of the equation: in the same year as the establishment of the JAE in Madrid, 1907, the highly important *Institut d’Estudis Catalans* was founded in June. At the *Institut*, the polymath Esteban Terradas—physicist, mathematician, and engineer—served as one of the founding members of the *Secció de Ciències*, created in 1911 (Roca Rosell and Sánchez Ron 33-34). The scientific community was significantly smaller than in Madrid, where laboratories were being renovated and built anew in most cases, but Barcelona proved to be an important player in the move towards the creation of innovative science in Spain. Also in 1911 the *Sociedad Astronómica de España y América* was founded (Roca Rosell 234). The director of the *Sociedad Astronómica* was on Josep Comas Solà, who would become a rather notorious opponent of the theory of relativity, and who had an international presence, mostly due to a kerfuffle about the presence of the so-called Martian canals, which he felt were a myth—surprisingly progressive for the arch-conservative Solà, who would give Einstein (and the

Spanish press) so much grief in 1923.¹⁹ Barcelona also had working in its laboratory of microbiology as well as in the Institut the well-known biologist August Pi i Sunyer. Ramón Turró and August Pi i Sunyer founded the *Societat de Biologia* and its associated journal, *Traballs de la Societat de Biologia*, in 1912. The following year, the suggestions of Eduard Fontserè—astronomer and meteorologist—were heeded by the *Secció de Ciències*, and they created the *Estación Aerológica de Barcelona*.

In 1923, Einstein would visit Spain and pay a visit to only three cities—Madrid, Zaragoza, and Barcelona, each in its own way a center for the growing emphasis on science. While more attention will be paid to Einstein in the next section, it is important to note that it was in 1908, only three years after Einstein’s *Annus Mirabilis* that produced the Special Theory of Relativity, that Esteban Terradas and Blas Cabrera expounded this theory for the first time in Spain at the First Congress of the *Asociación Española para el Progreso de las Ciencias* (Otero Carvajal 37). This association was modeled on similar institutions in Britain and Germany; it has been said that its contribution to Spanish science did not go much further than to “acoger [una] multitud de trabajos en sus congresos y publicarlos en sus actas” (Roca Rosell and Sánchez Ron 33). This was not, however, a mean activity, as it had the effect of disseminating much more information to the scientific community than had been previously possible, as Roca Rosell and Sánchez Ron note in their biography of Esteban Terradas. In this case, even imitation and translation, often decried as being of little merit, posed real value for the burgeoning enterprise of scientific investigation in Spain.

The years between 1907 and 1920 were undeniably ones of rapid growth, but this is not to say that Spanish science was immediately “redeemed” by all this activity. Many problems still plagued the system, most notably the “muro infranqueable” of the university system that symptomatically rejected the scholars of the JAE as they returned from their sponsored studies abroad (Sala Catalá 176). In the University of Madrid’s *Facultad de Ciencias*, where most of the *becarios* of the JAE would look for employment, the conditions for experimentation had not improved since its construction in the 19th century. In his biography of the physicist Miguel Catalán, José Manuel Sánchez Ron provides us with a vivid description of one of the physics laboratories at the *Universidad Central de Madrid*.

El exceso de ventanas y el poco espesor de los muros hacían que las oscilaciones termométricas fuesen muy grandes en todas las estaciones. La circunstancia de estar asentados los pisos sobre vigas de gran longitud, producía vibraciones tan marcadas que impedían la instalación de aparatos que requiriesen firmeza y estabilidad (no obstante, al estar los laboratorios en la planta baja se pudieron instalar pilares con cimentación propia). (*Miguel Catalán: su obra y su mundo* 64)

¹⁹ For more on the controversy over the canals on Mars, see Antoni Roca Rosell and José Manuel Sánchez Ron, eds., *Esteban Terradas (1883 – 1950): Ciencia y técnica en la España contemporánea* (Madrid: Fundación Banco Exterior 1991) 57-60.

The JAE did not suffer such penury of funding and facilities; with the ever-increasing funding from the government²⁰ and with its complete independence from the university system, the JAE was able to attract the best young minds and give them a formidable training. The best example of a JAE beneficiary is perhaps that of Miguel Catalán, who was a *becario* and *pensionista* of the JAE who went on to become a member of the *Laboratorio de Investigaciones Físicas* in 1915, and would later elaborate a phenomenon of quantum physics and superior algebra, the multiplet, and would become one of the best-known names within the field of Spanish physics, along with his mentor Blas Cabrera.

The Einstein Years 1919 – 1925

By 1919, the Great War had ended—an event that had had only a small effect on the continued progress of the JAE and its *pensionistas* and *becarios* who studied abroad during that time—and, more to the point, the theory of relativity had been confirmed by experiment (we will discuss this in more detail in Chapter Two of this study). As previously mentioned, the theory of relativity was first expounded in Spain in 1908 by Esteban Terradas and Blas Cabrera. The story of the acceptance of relativity is best outlined by Thomas F. Glick in his book, *Einstein in Spain: The Recovery of Spanish Science*; it would be redundant to summarize his entire argument here in these pages. However, it is important to note that Einstein and relativity had a significant impact on Spanish science and society. We will be examining its broad impact on society in Chapters Two, Three and Four—for now, we shall focus on the specific impact on the scientific community.

First and foremost, it must be pointed out that the controversy over relativity within scientific circles, while certainly heated, was nowhere near as diffuse and intense a phenomenon as the battles over Darwinism that occurred during the 19th century (and continued well into the 20th). There were, nonetheless, definite opponents of the theory of relativity, and they were rather outspoken. The most recognizable of these opponents were José Echegaray, the consummate man of both science and letters, and Josep Comas Solà. Of José Echegaray's negative reaction to relativity at a conference given in 1910, Otero Carvajal writes the following:

Valga como ejemplo la postura de Echegaray, por entonces presidente de la *Academia de Ciencias de Madrid*, que conociendo la teoría de Einstein en 1910, como consecuencia de presidir el acto de ingreso en la Academia de Blas Cabrera, cuyo discurso trató sobre la relatividad, mantuvo a lo largo de toda su vida un silencio despreciativo por la nueva teoría, en función de su apego a la Física tradicional de raíz newtoniana, expresada paradigmáticamente en la siguiente exclamación *¡Cuántos capítulos de la vieja mecánica habría que modificar profundamente si se aceptase como buena esta última negación* [se refiere a la eliminación del éter]! (41)

²⁰ For actual figures regarding funding for the JAE, see, for example Sánchez Ron, *Miguel Catalán: su obra y su mundo* 17.

It was precisely this “problem of the ether” that was troublesome for many Spanish scientists, who did not want to give up the Newtonian paradigms of absolute space and time, which had significant religious implications. And so it was that well into the 1920s, astronomers such as Josep Comas Solà continued with their ether-drift experiments, and proposed *ad hoc* schemes that would allow for preservation of the ether, such as his “emissive-undulatory” hypothesis that maintained that the speed of light is *not* an unchanging value, but also relative.²¹ Comas Solà believed it was impossible to prove the existence of the ether, and that therefore its existence could not be rejected; furthermore, according to Comas, “experiments on the earth’s surface have demonstrated that it does not exist. The only solutions are the complete surpression of aether, as in special relativity, or the admission that physical energy is emissive, without ceasing to be undulatory” (Glick 152). This emissive-undulatory hypothesis preserved Newtonian Mechanics. But in reality, the fact that ether-drift experiments were still being conducted—or even that there was a discussion of the ether at all in the 1920s—showed that Spain, though improving its scientific prowess, was not going to kowtow to the new ideas, especially when they threatened the traditions of Catholicism.

In more, perhaps, “enlightened” circles, relativity caught fire and continued to blaze throughout the 1920s, when it was taken up by non-scientists and spread through popularizations to the community at large. Within academia, however, relativity showed itself to be at its peak of attraction between the years 1919 and 1925. In 1920 and 1921, Esteban Terradas gave a course on the theory of relativity in Barcelona. In 1921, the Italian mathematician Levi-Civita came to Spain to lecture about the absolute differential calculus (Glick 72), as did the German mathematician Hermann Weyl (Roca Rosell and Sánchez Ron 162-63).²² Then in 1923, Albert Einstein himself came to Spain to give a lecture tour in Madrid (at the *Residencia de Estudiantes*—an institution that was a part of the JAE), Barcelona and Zaragoza. The reaction to Einstein as a person and as a representative of *lo nuevo* was overwhelmingly positive among the public; however, the reaction to his science was that of complete mystification. Thomas Glick recounts in his book how reporters, when asked to summarize the goings-on at the Einstein lectures, would often resort to describing Einstein’s physical appearance, his halting delivery in French, or even whether he drank water or not during the lecture itself (242-43).²³ The lectures were beyond the grasp of the average consumer; but Einstein himself was a phenomenon, inspiring cartoons and popularizations of his ideas in all corners of cultural life. Glick notes that by 1925, the Einstein phenomenon had begun to die down, and that “from a high point in 1922, scientific publications fell off sharply from 1925-26 on” (287). However, Glick also points out that Einstein’s visit to Spain opened up the way for Spain’s move towards a new internationalism (at least in the realm of the scientific establishment):

By the mid-1920s, therefore, the Spanish scientific community had become accustomed to relatively frequent exposure to foreign scientists of the highest caliber, particularly

²¹ These scientific concepts will be addressed in much greater detail in the coming chapters.

²² The fact that these were men of mathematics points directly to the fact that physics, with the advent of the special and general theories of relativity, had become heavily mathematical in nature. Even the best-trained physicists struggled with the complex non-Euclidean geometries required to understand Einsteinian physics.

²³ Here Glick is referring to the reporting on Einstein’s Barcelona lecture series done in *El Noticiero Universal*.

Germans and Italians. After Einstein's trip, subsequent lecture tours by Henrick Lorentz and Wolfgang Ostwald (in 1925), Eddington and Vito Volterra (in 1932), and Francesco Severi (1928 and 1935) simply added to the newly acquired patina of international scientific respectability, whereby Madrid and Barcelona had become stops on the international lecture circuit... Einstein's visit... was the crucial episode that converted scientific prestige into a broad popular awareness of, and support for, pure science. (72-73)

Therefore, it is possible to conclude that by the mid-1920s, Spain had at last come into its *Edad de Plata* in the sciences. While the term "*Edad de Plata*" implies a high level of scientific production, we must always keep in mind that Spain was late to the game, in this case, of modern physics, chemistry and mathematics. But compared to the near Dark Ages of the 19th century in these disciplines, the 1920s must have appeared as miraculous to those who could remember a time when the *Facultades de Ciencias* barely even existed. Compared to the strides being made in Germany, however, Spain's progress was actually close to minimal. However, in Spain's defense, all of this happened to be, if you'll pardon the expression, perfectly relative.

Plena Edad de Plata: 1925 – 1936

Between 1925 and 1936 Spain experienced something that had been a long time coming: the establishment and success of a system of what has come to be known, in Kuhnian terms, as "normal science"—that is, the process by which science itself progresses, the daily experiments, the *industry* of scientific investigation. Truly, when we look back over the trajectory of the development of Spanish science, it could be said that the struggle in which scientists engaged each other and the government was for the establishment of just this, normal science, which in itself implies a healthy system of inquiry, education and output. As if in recognition of Spain's accomplishment, the International Scientific Commission of the Solvay International Institute of Physics had as a participant in its 1928 conference Blas Cabrera, by then seen as the premier figure of Spanish science, and whose work was valued beyond the borders of his own country. In 1931, Enrique Moles Ormella, a Spanish chemist, was designated the secretary of the International Commission on Atomic Weights, a part of the International Union of Pure and Applied Chemistry. The richest plum, however, would be awarded on the 6th of February, 1932 when the *Instituto Nacional de Física y Química* was inaugurated, with the financial backing of the Rockefeller Foundation in the United States. The director of the *Instituto Nacional* was Blas Cabrera, whose recognition not only by European scientists, but also those of the technology-heavy and flourishing United States, proved that Spanish scientists had at last been received into the fold of the international scientific community.

This flowering, however, was to be short-lived. The outbreak of the Spanish Civil War in 1936 proved disastrous to scientific activity in all parts of Spain, and especially to the *Junta para Ampliación de Estudios*, which would be formally dissolved by the Francoists in 1939 in the wake of the Nationalist victory. Sánchez Ron notes that the Civil War's destruction of the newly-

formed scientific establishment in Spain was especially tragic, because it was only in those ten years previous to the Civil War that science had effectively come into its own. He writes, thinking of what may have been:

La Guerra Civil puso un abrupto final a esfuerzos realizados y logros alcanzados. Una vez más, las fuerzas de intolerancia regaron con generosa inhumanidad la en esta ocasión fértil huerta hispana. Cuando, en 1939, las armas callaron, eran muchos, demasiados, los que faltaban. Hasta qué punto, no obstante, sin la guerra la ciencia española de los, digamos, años cuarenta habría alcanzado, tomada en su conjunto, un nivel auténticamente internacional, es una pregunta a la que teniendo en cuenta nuestro escaso conocimiento actual de la infraestructura existente en España en 1936 (dotaciones, legislación, instalaciones, número y distribución de investigadores, profesores y alumnos, desarrollo industrial, relación universidad/ciencia-industria), no podemos todavía contestar. (“Introducción” 16)

Clearly, neither can this present study answer these questions, but we can postulate that, given the strides Spanish science was making towards both autonomy (as an industry) and integration (within Europe and the Americas), that Franco’s regime—highly retrogressive in matters of *ciencia* (but not necessarily *técnica*)—could only effect a dissolution of most if not all of the accomplishments achieved by the politically-suspect JAE (which, as previously discussed, was viewed as having its roots in the liberal *Institución Libre de Enseñanza*). What is remarkable though is that in the first three decades of the 20th century Spain managed to successfully negotiate a solution (albeit temporary) to the aforementioned “question of science”. It was a complex process of university reform and creation of institutions external to the university system that allowed for scientific progress to occur. It would be naïve to say that the hallmarks of scientific progress were universally embraced by the Spanish people; but for the intellectual community, the enthusiasm for science that started under the Enlightenment and resurfaced as part of the program of *regeneracionismo*, in effect generated an entirely new sector of industry and investigation as the system of Spanish science matured.

Conclusion: Where Does the Problem Lie? A Popperian Approach to an Historical Dynamic

The current literature that attempts to elucidate the *atraso* of the sciences in Spain, while taking pains to be extraordinarily accurate in its assessments of scientific activity in post-Enlightenment Spain, frequently still finds itself engaged in a certain type of historiography that is peculiar to Spain’s circumstances since 1975. Beginning in the 1970s, and certainly more pronounced after Franco’s death, came a flood of national histories of science that confronted the issue at hand with terms such as “*problema*”, “*polémica*”, “*cuestión*”, along with others such as

“backwardness” “lag” or even “absence”.²⁴ These words, frequently negative, implicitly comparative, and arguably pejorative, suggest a need to commit to a reevaluation of the past from a perspective not blinkered by the ideological barriers built into Franco’s platform of *nacional-catolicismo*. It could be argued that the volatile combination of historians that would alternately offer a paean to the successes of Spanish science—digging deep into Spanish history for obscure figures and willfully overlooking the barren landscapes of pure research and discovery²⁵; or those who would deliberately skew the narrative towards the negative—have created a proverbial minefield for those who wish to attempt a straightforward analysis of the state of Spanish science between the 18th and 20th centuries. Nothing written about science, it would seem, can be interpreted away from the ideological fabric of which it is semi-clandestinely composed. José María López Piñero discusses this historiographical tension in the introduction to an anthology of essays about science in 19th-century Spain. He states:

Como es sabido, esta polémica no fue nunca una controversia entre estudiosos del tema, sino un enfrentamiento de posturas ideológicas. A lo largo de sus distintas fases, la postura panegirista ensalzó las “glorias de la ciencia española”, intentando justificar unas estructuras socioeconómicas, una organización política y un sistema de valores que la postura pesimista trataba [de] invalidar, negando a cualquier precio todo lo que pusiera en peligro negro su imagen de “látigo, hierro, sangre y rezos”. La primera utilizó la retórica triunfalista, revestida en ocasiones de fáciles alardes de erudición postiza. La segunda, aparentemente más crítica, se limitó de hecho a entonar lamentaciones de todos los matices, sin realizar tampoco el menor esfuerzo por aclarar una realidad histórica cuyo desconocimiento era su gran argumento frente a los pintorescos excesos de los apologistas. (11)

When we stop to consider the dilemma posed here by López Piñero—that the history/histories of science in Spain are tainted by the ideological postures that produced them—and juxtapose it with the assertion of Raquel Álvarez Peláez that “[I]as teorías científicas, al igual que las posturas de los intelectuales, no son neutras. Se desarrollan y son expresadas dentro de un contexto y con una carga ideológica, aunque en algunos momentos esta no sea evidente” (204),

²⁴ This is not to say that *la polémica de la ciencia en España* did not present itself at all before Franco’s death. In 1970, an anthology was published under that precise title by Alianza Editorial, edited and with an introduction by Ernesto and Enrique García Camarero. Also not to be neglected is the wide-ranging influence of physician-author Pedro Laín Entralgo, whose *España como problema* (1956) similarly confronts these issues, among others, that were affecting national progress, not to mention national identity. What I wish to suggest is not that the polemic did not exist before Franco’s death—the actual discussion goes back to the 18th century—but rather that there is a qualitative difference that emerges with the transition to democracy that Spain experiences in the last quarter of the 20th century, in which a new critical vocabulary emerges that allows for a right appraisal of the damages wrought by centuries of neglect, as well as by Franco’s blatant destruction of the scientific investigatory infrastructure during the 1940s.

²⁵ This is often called “el método de las *grandes figuras*” and dates to the 18th century. See Chapter 1 of Antonio Moreno González, *Una ciencia en cuarentena: Sobre la física en la universidad y otras instituciones académicas desde la Ilustración hasta la crisis finisecular del XIX*, Estudios sobre la ciencia (Madrid: Consejo Superior de Investigaciones Científicas, 1988) 15-35.

what we find is an ideological *mise en abîme* in which the context of production—be it scientific, para-scientific, or historiographical in nature—dominates the interpretive field, displacing the content of the “message”, as it were, in favor of an analysis of the power forces that produced it.

Admittedly, in this aspect, we are on shaky ground, in the sense that it is this precise type of polemic that started the so-called “Science Wars” in the 1990s.²⁶ However, without necessarily ascribing to the theory of the “exceptional history” of Spain—its lying outside and apart from general trends of Western development—a case can be made for the argument that, within the highly polarized political environment of the first four decades of the 20th century, science—the pursuit of it—has a social value, as its presence (within discussions of national *regeneracionismo*) and its absence or weakness (within greater institutions of higher learning) more than hint at the profoundly political tensions that volatilized the totality of Spanish society during these same years. The same case for science’s social value in other national and trans-national contexts has surely been made by historians, social epistemologists, and Science and Technology Studies (STS) scholars worldwide.

With this basis in mind, we must ask: What is it about science— its development, its instruction, and its reception by the public—that makes it so vital in estimating—to use a weighted word—the *progress* of that society? It could be argued that science has become one of the most common (but not always and not necessarily the most accurate) ways of evaluating the stages of evolution, implied, towards a more “modern” state, of any given community, from tribe to nation. In the analysis of Karl Popper, philosopher of scientific discovery, the development of science in a given context becomes a question of epistemology. Determining the ways in which human knowledge has developed is necessary in order to understand the mechanisms of the collective mind. Popper states that “[the] central problem of epistemology has always been and still is the problem of the growth of knowledge. *And the growth of knowledge can be studied best by studying the growth of scientific knowledge*” (xix).²⁷ If we hold this assessment to be true—that scientific knowledge serves as the best means by which to *measure* the growth of knowledge within a given context—then, in the context of *fin-de-siglo* Spain, we are granted another possible way of understanding the frequently polemicized *atraso* that characterized Spain’s painfully slow movement towards modernization after a late-arriving (and leisurely-paced) Industrial Revolution. Following Popper’s estimation of the usefulness of science as

²⁶ The “shaky ground” I am referring to is the possibility for excess in interpretation of context, such as was parodied by Alan Sokal in his pseudo-article “Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity” that appeared in the Spring/Summer issue of *Social Text*, and also to the controversy within the field of Science Studies about the nature of the role played by social constructs in the discovery and shaping of scientific knowledge. Attributing an ideological value to arguably neutral scientific facts (to use a term some would reject) is not unquestionable. However, it is my contention that, within the boundaries of this individual study, the body of scientific discoveries that revolutionized 20th century existence (quanta, relativity, the Uncertainty Principle and basic quantum mechanics) due to their popularization within society, do indeed have the ability to convey ideological positions. To state the issue clearly: while I do believe that science was used for ideological purposes throughout history, I do not believe that scientific discoveries are inherently, by the nature of their being and in their epistemological value, natural expressions of any one ideology or the other. In other words, I ascribe to the idea of the neutrality of scientific phenomena; their expression, however, within a society or societies, by the scientists who study them and translate the significance of those phenomena to a listening public, remains open for debate.

²⁷ Emphasis in the original.

measurement, we can put ideological and apologetic arguments either for or against scientific development on hold, and look at the process by which scientific knowledge was acquired in Spain, and compare it to the trajectories of other nations within the same historical circumstance. By this empirical measure, it is difficult—if not impossible—to deny that Spain lagged behind other Western countries with regard to its ability to produce—and this is key—original scientific thought (Ramón y Cajal’s Nobel Prize-winning work, seen in this light, rather being the exception that proves the rule.)²⁸ But, as we have seen, it does not appear that original scientific thought was really the prize that was sought during these years, but rather the simple establishment of a stable system for the daily business of conducting scientific inquiry. In this sense, the history of early 20th-century Spain was indeed a success.

It has been necessary in these last pages to establish an historical foundation for this discussion so as to show why it is of particular interest to us that there would appear in otherwise literary venues articles about science and its progress. In the coming chapters Two and Three, I will be taking a look at the ways in which science came to communicate with other disciplines through its presence in the magazines *Revista de Occidente* and *La Gaceta Literaria*, directed by José Ortega y Gasset and Ernesto Giménez Caballero respectively. We will examine the specifically *cultural* valence of the new 20th-century science, in particular, the effects and presence of the theory of relativity and the eruption of quantum mechanics in the late 1920s. In this way, we will begin our discussion of science and literature as they coexisted during these years, 1923-1936, the mutual *Edad de Plata*.

²⁸ I’m sure Popper would argue about this proof-by exception, as his philosophy of science revolved around the principle of *falsifiability*. However, in that we are discussing the history of science rather than scientific discovery itself, Popper’s theories of falsification need not apply here.

Chapter Two: The *Revista de Occidente*, the New Physics and Spain's *Edad de Plata*

Introduction: The *Revista de Occidente* and Its Founder: A Brief Sketch of a Profound Tension.

Publication of the *Revista de Occidente* began in 1923, just as Spain was entering into an extremely fertile period of intellectual and artistic growth and renewal that would come to define its Interwar years. The goal of the *Revista de Occidente* and its founder, José Ortega y Gasset, was one of cultural illumination. At its best, the magazine was to incorporate within its pages the most influential ideas of the day, direct from the leading authorities, and translated by the most prominent Spanish intellectuals and collaborators in the magazine itself. The scope of the magazine was unusually broad, not limiting itself to literature or art or other cultural phenomena; the magazine, metaphorically speaking, was omnivorous, publishing articles in many diverse disciplines from poetics to paleontology. Ortega y Gasset's *Revista de Occidente* was and remains one of the most important periodicals published in Spain in the early 20th century, as the sum of its articles capture with stunning precision the prevalent and relevant debates of the time, and the modes of knowledge that served as their grounding.

The *Revista de Occidente*, published between the years 1923 and 1936, appeared during an especially dynamic moment in history. The political configuration of Europe was still adjusting after the trauma of the Great War, quietly seething beneath the scars of the new national geographies that blessed some and cursed others. Politically neutral, Spain had muddled through sharp internal conflicts during the first decades of the 20th century, a result of the confrontation between a predominantly traditional, Catholic, absolutist government and the secular, cosmopolitan, and future-oriented generation that was born out of the failed First Republic (1873-74), the post-colonial destitution of *el Desastre* (1898), the Krausist *Institución Libre de Enseñanza*, a fascination with technology, and an increased awareness of Spain's intellectual, cultural and nearly *temporal* disconnect with the rest of Europe. As the war sank into its trenches in the fields of Belgium, France, and Germany, Spain saw “*lo tradicional*” and “*lo moderno*” enter into a bitter feud that would ultimately find its culmination in the triumph of Franco's Nationalist army and the installation of an extreme right-wing, Catholic, traditionalist dictatorship that would last until 1975. Publication of the *Revista de Occidente* would cease in July of 1936 with the outbreak of the Civil War and the murder of one of its most famous contributors, Federico García Lorca, a death highly symbolic of the destruction of the artistic and intellectual elite by the Nationalist rebellion.

*

The *Revista de Occidente* was the leading platform for the advancement of ideas, and also a significant crucible in which the poetics of an (oft-debated) generation would be formed.

Literary interests were of utmost importance in the *Revista de Occidente*, but they were not of necessity given primacy. Equal space was devoted to the explorations of other various fields, as previously mentioned, with the goal of both capturing the intellectual moment and simultaneously educating and informing the public of the modern metropolis, *européizante* and greedy for knowledge of a world beyond the Pyrenees. Spanish concerns do figure in the *Revista de Occidente*, as the presence of many historical studies of the Moorish, Medieval and Golden Ages will testify. But the bulk of the magazine's pages are dedicated to expanding the scope of Spanish concerns and make them European concerns—incorporation above all, into the rest of Europe, to be accomplished through the creation of an enhanced awareness of these extra-Iberian issues within the readership. By putting essays with explicitly Spanish themes within a larger discourse of the accomplishments of contemporary Western civilization, Ortega demonstrated that Spain existed within the European context, rather than outside of it as an exotic addendum to the continent.

The goal of reaching a specific (educated) audience with articles that represent the essence of *actuality*¹ on the Continent, within a variety of disciplines, had distinct implications, both cultural and political. Culturally, the objectives of the magazine were in concert with Ortega y Gasset's postulation of an elite, informed minority, whose responsibility it would be to interpret and actualize the new currents in art and aesthetic theory. And while it has been asserted that the project of the *Revista de Occidente* was explicitly apolitical² with reference to the active and polemical political movements of the times—communism, anarchism and fascism in particular³—it is difficult to reconcile this supposed political neutrality with Ortega y Gasset's aggressive stance in favor of Spain's modernization and integration into the rest of Europe. Modernity itself is a politically charged concept, especially within a society that placed such value on tradition. Ortega y Gasset was acutely aware of the conflict between the entrenched conservative nationalist-monarchists and those who wished for a restructuring of Spanish society that would be more in line politically, economically and technologically with the country's European neighbors. Ortega, also aware of the limitations on discourse imposed by an absolutist

¹ I will be using this word (actuality) to describe the contemporary environment in which the *Revista de Occidente* was published, rather than variations of the word "modern", as the latter is fraught with ambiguity and multiple meanings. "Actuality" will serve for the "present moment" of the magazine, meaning the years between 1923 and 1936.

² Evelyn López Campillo writes in her book *La «Revista de Occidente» y la formación de minorías* that the magazine itself, as a work by a collectivity of intellectuals, could not afford to be restrained by the "divisiones sociales y políticas del país". Her assessment of this neutrality is that it provided a stabilizing force that allowed the magazine to continue to be published in a country under dictatorship. But she also states that this resulted in a decrease in the efficacy of the *Revista de Occidente* to induce political and cultural change. Her statement would imply that the magazine was *not* indeed politically neutral, in spite of its restraint in publishing politically controversial content. López Campillo chooses to call this motion by Ortega "política cultural", a concept that deserves further exploration in this study. Evelyn López Campillo, *La «Revista de Occidente» y la formación de minorías (1923 - 1936)* (Madrid: Taurus, 1972) 56.

³ Supporting this statement, it is interesting to note that it is not until 1936 that any reference is made to German National Socialism, and even then, the reference to Hitler is made in passing, and is—somewhat contrary to the magazine's supposed neutrality—rather derogatory and condescending: "Esto nos dice Hitler con su tono aldeano (*seichter... eingebildetes Topf...*), corroborándonos que esas naciones adolescentes, de lo que adolecen es de historia." Eugenio Imaz, "En busca de nuestro tiempo," *Revista de Occidente* 52.154 (1936): 77-78.

government, found himself in a moment when perhaps the most viable option was for him a “*política cultural*”: the effecting of change through cultural advancement and education (López Campillo 55).

In accordance with this idea, Rockwell Gray writes in his book *The Imperative of Modernity* that Ortega’s “critical distance combined with a passionate concern for ultimate values, [along with] Ortega’s biographical circumstances... place him in tension between culture and politics” (18). While it would be somewhat specious to conflate Ortega’s personal outlook with the ultimate goals of the *Revista de Occidente* at large, one cannot ignore that this “tension” is present from the outset. In the “Propósitos” of the *Revista*, the editor, Ortega y Gasset, writes that the mission of the magazine will be to bring together great thinkers in an exploration of *occidentalidad*—what it means to be an intellectual in the Western world which had recently been plunged into turmoil by the extremes of *la Gran Guerra*. He states:

La occidentalidad del título alude a uno de los rasgos más genuinos del momento actual. La posguerra, bajo adversas apariencias, ha aproximado a los pueblos. Los vocablos de hostilidad no impiden que hoy cuenten más los unos con los otros y, aunque de mal humor, se penetren y convivan. Antes de la guerra existía, en cambio, un internacionalismo verbal y de gesto, un cosmopolitismo abstracto, engañoso, que nacía previa anulación de las peculiaridades nacionales. Era el cosmopolitismo obrerista, bancario, de Hotel Ritz y sleeping-car. Tras él pervivían los pueblos en rigurosa incomunicación. El cosmopolitismo de hoy es mejor, y en vez de suponer un abandono de los genios y destinos étnicos, significa su reconocimiento y confrontación. (2)

According to this description, the *Revista de Occidente* would promote a true internationalism and cosmopolitanism based on an intellectual understanding of the limits and benefits of culture, as well as the various “ethnicities” (perhaps better stated as “nationalities”) that would have to work in concert in order to transcend the damages of war. Honesty between nations, a dialogue of minds outside of the usual national boundaries—the magazine would both offer and promote these things, a gesture of good will in pursuit of the higher aims of culture.

In truth, the *Revista de Occidente* acted in the moment as a barometer of the intellectual life not only of Spain, but of most of Europe as well, and today serves as a rich resource for expanding our understanding of the cultural climate and interests of Spain’s educated middle- and upper-classes that constituted its main readership.⁴ Gray writes: “He intended the review to rescue the general literate public from the threat of intellectual and spiritual chaos he discerned in the postwar period” (137). Ortega addresses his intended readership and his goals for their enlightenment in the first pages of the initial volume of the *Revista de Occidente*, acknowledging the existence of “un número crecido de personas que se complacen en una gozosa y serena contemplación de las ideas y del arte” (“Propósitos” 1).

⁴ Gray notes that the *Revista* “reached a relatively restricted public (its press run was three thousand copies per issue between 1923 and 1936), but it was clearly, after *El Sol*, the most influential of Ortega’s projects.” Rockwell Gray, *The Imperative of Modernity: An Intellectual Biography of José Ortega y Gasset* (Berkeley: University of California Press, 1989) 137.

“..de las ideas y del arte”: in this juxtaposition we see reflected a possible tension similar to that described by Gray’s assessment of Ortega’s position within the intelligentsia. “Ideas”, meaning those topics of either a more social or scientific bent, are placed in harmonious complement with their would-be rivals in the artistic world. Where others would see a potential animosity between these two differing approaches to reality—the analytic and the belletristic—Ortega managed to devise a forum in which the two would not compete, but rather adapt to and complement each other. Surprising connections between fields of inquiry tend to surge forth from the *Revista de Occidente*, through the careful juxtaposition of contemporary thought and art.

The result of this careful outlay of ideas is a magazine intended for those with a wide range of interests, not limited to literary or philosophical pursuits. Thus, the *Revista de Occidente* would have as its target audience those who wished to know more about the state of the intellectual affairs of Western culture. The *Revista*’s scope with regard to such intellectual affairs was wide-ranging; most important however is that it was not limited to an exploration of contemporary issues, but also addressed a certain *history* of ideas, exploring the ways that the past had uniquely contributed to the development of modern actualities. It should be noted that this illustration of the history and development of ideas in the West had as one of its primary motivators the idea of progress within Spain, and therefore, while addressing past and present, it could be said that the real preoccupation of the *Revista de Occidente* was the *future* of Spain, within the future of the rest of Europe.⁵ Only a forward-looking Spain would be able to integrate itself into the quick-moving tides of European development. And one of the fastest currents that was pacing this development was to be found in the world of the hard sciences—physics, mathematics, chemistry—where the revolutions of the first decades of the 20th century would have unimaginably profound consequences in the years to come.

The Forward-Thinker: Ortega y Gasset’s Relationship with *Ciencia*

Ortega’s unique outlook on the life of the mind in twentieth-century Europe is what would make his magazine so successful and respected world-wide. Rockwell Gray notes that Ortega’s expansive perspective would make him Spain’s “guide toward the future” (18). While this perhaps overstates Ortega’s overall importance in Spain’s progress towards modernity and modernization, it does allude to the fact that Ortega felt most comfortable at the cutting edge of contemporary thought and development. His ability to provide the public with a sense of the great achievements of their own time was unparalleled in Spain. Domingo Marrero confirms this opinion, remarking:

⁵ A fine example of such an article is the previously cited essay “En busca de nuestro tiempo” by Eugenio Imaz, which looks at Spain within the context of Europe, and then looks at Europe within the context of its own *history* in order to gain an understanding of the forces that had already started to push Europe towards the Second World War. Imaz, “En busca de nuestro tiempo,” 54-78.

Desde la cátedra magistral de la *Revista de Occidente*—la editorial y la revista—promovía las nuevas concepciones culturales y difundía con rigor la más seria problemática. Ortega era la más sensible antena cultural de nuestro mundo hispánico incitada por la más ávida curiosidad intelectual que existía en la cultura de Occidente. Luego difundía sus preocupaciones, problemas y observaciones desde esa cátedra extraordinaria que era la Revista.⁶ (285)

Largely, it was Ortega's Continental education that contributed to his ample gaze and refined critical perspective. Having spent significant time in Leipzig and Marburg, Germany in his youth, he had the opportunity to become acquainted, in some cases personally, with the forward-thinkers of his day. López Campillo makes note of the direct, potential and likely contacts that he made during this time, between the years 1905 and 1907, on two separate visits.

Estudia con Hermann Cohen, neo-kantiano; con Paul Natorp (psicología general y pedagogía general). Los otros filósofos alemanes célebres que profesaban por los años 1906-1907 y cuya obra pudo ser conocida de Ortega entonces, eran: en Berlín, Dilthey, Simmel, Paulsen, Riehl, Dessoir (filosofía e historia de la cultura); Wölfflin (historia del arte); Harnack y Mueller (teología); E. Meyer (historia); Planck (mecánica teórica); por otro lado, en Leipzig, Ortega pudo tomar contacto con la obra de W. Wundt (psicología científica.) (33)

In the pages of the *Revista de Occidente*, the works of Georg Simmel figure prominently; essays by Simmel appear with relative frequency and are often revolutionary in the sense that each article is a contribution to the founding of the discipline of sociology.⁷ While Max Planck's articles were not translated for the *Revista*, his legacy certainly was: Planck's formulation of the quanta in 1900⁸ would facilitate future discoveries by Albert Einstein (the photoelectric effect, general and special relativity), Max Born and Niels Bohr (atomic structure), Louis de Broglie and Erwin Schrödinger (wave mechanics, probability functions and discontinuity), and Werner Heisenberg (matrix mechanics and the Uncertainty Principle), all of whose articles appear in translation in the *Revista de Occidente* in the late 1920s and early 1930s. The presence of these articles about physics among others on history, philosophy, and the aforementioned sociology confirm Ortega's mission of narrowing the gaps between disciplines, a strategy that reflects his philosophy regarding of the interrelatedness of human knowledge. Comments one critic, this project of viewing science within a larger epistemological field was related to his personal philosophizing about the ways in which we come to know the world:

⁶ Emphasis mine.

⁷ There exists such a wealth of sociological content in the *Revista de Occidente* that it could merit its own section in this chapter. Clearly, Ortega considered sociology to be its own discipline, and extremely pertinent to the exploration of *actuality*.

⁸ See Max Planck, "On the Theory of the Energy Distribution Law of the Normal Spectrum," *The Discoveries*, ed. Alan P. Lightman (New York: Pantheon Books, 2005) 16-21.

Ortega, como gran filósofo que era, estuvo muy abierto y muy atento a los descubrimientos científicos en general y a los de la Física en particular, de los que era gran entusiasta, para penetrar en su esqueleto ideológico y detectar sus impactos sobre la Filosofía... (Maravall Casesnoves 11)

Ortega's openness to the interpenetration of science and philosophy grew out of these early years of exposure to new developments in many different areas, and the *Revista de Occidente* reflects this particularly broad intellectual foundation.

Ortega's interest in the popularization and dissemination of scientific ideas was not confined solely to the *Revista de Occidente*, as a magazine; he also founded a publishing house under the same name, whose responsibility it would be to bring forth new titles by either Spanish authors (for example, the *Nova Novorum* series that would encourage authors such as Pedro Salinas, Antonio Espina and Benjamín Jarnés in their pursuit of new forms of literary fiction) or by (mostly) European authors in translation. Beyond this, Ortega went on to direct a series titled "*Biblioteca de Ideas del Siglo XX*", whose general introduction he wrote as well; it was included in addition to the specific prologues of each volume. The *Prólogo general* to the "*Biblioteca de Ideas del Siglo XX*" is significant in that it illustrates quite clearly Ortega's agenda in publishing works beyond the literary-cultural landscape, as well as his cosmopolitan and international goals. He writes:

En los últimos años se oye por dondequiera un monótono treno sobre la cultura fracasada y concluida. Filisteos de todas las lenguas y todas las observancias se inclinan ficticiamente compungidos sobre el cadáver de esa cultura, que ellos no han engendrado ni nutrido. La guerra mundial, que no ha sido tan mundial como se dice, parece ser el síntoma y, al par, la causa de la defunción.

La verdad es que no se comprende cómo una guerra puede destruir la cultura. Lo más a que puede aspirar el bélico suceso es a suprimir las personas que la crean o transmiten. Pero la cultura misma queda siempre intacta de la espada y el plomo. Ni se sospecha de qué otro modo pueda sucumbir una cultura que no sea por propia detención, dejando de producir nuevos pensamientos y nuevas normas. Mientras la idea de ayer sea corregida por la idea de hoy no podrá hablarse de fracaso cultural.

Y, en efecto, lejos de existir éste, acontece que, al menos la ciencia, experimenta en nuestros días un incomparable crecimiento de vitalidad. Desde 1900, coincidiendo peregrinamente con la fecha inicial del nuevo siglo, comienzan a elevarse sobre el horizonte intelectual pensamientos de nueva trayectoria. Esporádicamente, sin percibir su radical parentesco, aparecen en unas y otras ciencias teorías que se caracterizan por disentir de las dominantes en el siglo XIX y lograr su superación. Nadie, hasta ahora, se había fijado en que todas esas ideas que se hallan en su hora de oriente, a pesar de referirse a los asuntos más dispares, poseen una fisonomía común, una rara y sugestiva unidad de estilo. ("Prólogos a la *Biblioteca de Ideas del Siglo XX*, Prólogo general" 165-66)

Within the *Revista de Occidente* (magazine and publishing house), we find an echo of this particular idea: that the emergent ideas and discoveries challenge the (in Ortega's opinion) misinformed ideas of the past century.⁹ The expression of this type of rupture with the past can be found in the series *Nuevos hechos, nuevas ideas*, which is critical to understanding the scope of Ortega's desire for a new epistemology. This series brought together some of the greatest thinkers in a list of publications that is extremely varied, all with an eye for the latest in scholarship and the most recent developments of *ciencia*.¹⁰ Of these thirty-nine titles, several deal directly with the hard sciences. They are the following:

- Weyl, Hermann, *¿Qué es la materia?* (reviewed in the *Revista*, 2-V-1925)
- Kramers, H.A. and Holst, H., *El átomo y su estructura según la teoría de Niels Bohr* (reviewed in the *Revista*, 12-VIII-1925)
- Nolke, F., *La evolución del universo* (reviewed in the *Revista*, 5-X-1927)
- Eddington, A.S., *Estrellas y átomos* (reviewed in the *Revista*, 9-VII-1928)
- Reichenbach, Hans, *Átomo y cosmos* (reviewed in the *Revista*, 8-IX-1931)
- March, Arthur, *La física del átomo* (reviewed in the *Revista*, 3-IX-1934)
- Mark, H., *El agua pesada* (reviewed in the *Revista*, 12-XII-1935)

While the hard sciences clearly comprise a worthy portion of Ortega's concept of *nuevos hechos, nuevas ideas*, it is notable that these titles comprise only a fraction of a much more diverse whole. The series "*Nuevos hechos, nuevas ideas*" was more than just a list of titles; it actually demonstrates Ortega's growing concept of science as encompassing not only the physical sciences, which often demonstrated their kinship with philosophy and other humanistic enterprises, but also other fields that were doing the job of analyzing human consciousness, social constructions and interactions, and the nature of our collective societies. "Science," for Ortega, was clearly much more than physics.

The *Revista de Occidente* and Science: Exploring the Boundaries of a Discipline

"Science" is a pervasive concept in the *Revista de Occidente*. It unavoidably presents itself in essays dealing with a wealth of themes—from articles on electromagnetism to studies of Egyptology—and this presents the reader with the distinct problem of the word's complex usage and general ubiquity. If the word "science" could just as easily refer to the means by which ancient cultures were studied and documented as it could a description of the structure of the atom, what use did the word actually have, then, for the reader and/or investigator? Dale Pratt in

⁹ See, for example, Ortega's article "Nada 'moderno' y 'muy siglo XX'" for a succinct version of his problematic of the 19th century with regard to science. José Ortega y Gasset, "Nada 'moderno' y 'muy siglo XX,'" *Obras Completas*, 4th ed., vol. 2 (Madrid: Revista de Occidente, 1957).

¹⁰ For a complete list of the thirty-nine articles that make up the series, see López Campillo, whose cataloguing of the *Revista de Occidente* and its corollaries is truly exhaustive.

his book *Signs of Science* also notes this phenomenon. He writes that “[f]or Ortega, the sign *science* covers activities and knowledge ranging from the arcana of Einstein’s theory of relativity and the other ‘hard’ sciences through the social sciences and medicine to philosophy” (156).

The term “science” (because of its ambiguity or, better stated, flexibility) and its polyvalence remains extremely informative for the researcher. It gestures to a unique phenomenon of the time: the explosion of new themes worthy of investigation, and, more precisely, the vogue of developing processes of investigation in emerging fields that could approach the well-known rigor of the so-called “scientific method”. The scientific method traces its roots to Aristotle and the desire for empirical knowledge through observation of phenomena and the analysis of the results of said observation and experimentation. At its most basic level, the scientific method requires hypothesis, experiment, observation, and analysis. It also requires the confirmation of observation through extensive repetition of experiment. In addition, in order to substantiate with added certainty the results of the experimentation, there must exist a constant refining of the method by which conclusions are reached and the hypothesis confirmed. In other words, the scientific method, far from being a process of mere repetition and (often enough) redundancy, is quite dynamic in its constant shift towards even greater precision. While it is clear how this precision is desirable and achievable in the hard sciences, and why its process is necessary for the maintenance of what Thomas S. Kuhn labels “normal science” (i.e. the process of the day-to-day business of experimentation by which scientific phenomena are investigated, articulated and confirmed), the application of the scientific method to other areas of investigation remains muddled to a certain degree.¹¹

Leaving aside for a moment the notion of the application of scientific method to other disciplines, let us turn our attention to these “other disciplines” in their general form, and how they were able to appropriate and make use of scientific vocabulary in their pursuits. The disciplines to which I am referring are principally Psychology, Sociology and Economics. Ortega refers to these disciplines under the umbrella term *ciencia*: “[b]y ‘science,’ in the broad sense of *ciencia*, Ortega understood not only the natural or ‘hard’ sciences but the budding social sciences and history as well” (Gray 78). What these areas of study had in common was that they were still in their initial stages of development as *formalized* disciplines during the time the *Revista de Occidente* was being published. Formalization of a discipline requires the establishment of the criteria for its study, and the articles that are found within the pages of the *Revista de Occidente* contributed much toward the articulation of the standards of these disciplines through both their subject matter and their rigorous scholarship.

Of the social sciences, Sociology and Psychology are perhaps the most pertinent to this discussion. The *Revista de Occidente* includes a multiplicity of articles dedicated to these themes, and all are presented under the banner of *ciencia*. In the case of Sociology, it is interesting to note that the articles that we would consider sociological studies did not actually define themselves as such until the late 1920s, after the *Revista* had already published many articles by Georg Simmel, Max Scheler and other scholars.¹² Until the actual word “sociology”

¹¹ For a detailed discussion of “normal science,” see Thomas S. Kuhn, *The Structure of Scientific Revolutions*, (University of Chicago Press, 1996).

¹² López Campillo notes that there were fifty articles of a sociological bent published during the entire run of the magazine. López Campillo, *La «Revista de Occidente» y la formación de minorías (1923 - 1936)* 112.

appears, thereby collecting these articles under a disciplinary banner, the general tendency seems to be that the essays about topics such as gender differences (sexology plays a relatively large role here), the difference between humans and animals, or the place of human consciousness in the larger cosmos are legitimately scientific in their endeavor. With the human and its environment as subject, and as they also display a tinge of nineteenth-century predilections towards the biological explanation of societal phenomena, it is possible to see how the authors of these articles would view their work as being a part of the scientific experience.¹³ Observation, if not always experiment, was a key part of their work, and therefore was at least partially synchronized with the scientific method. As for Psychology, a similar case can be made, that the importance of observation, analysis, and (with the behaviorists) experiment legitimized for many the inclusion of psychology as a science. There are, of course, well-known arguments against the scientific nature of psychology, but the *Revista de Occidente* does not enter into this polemic, except in its possible critique of Freud, well-explained by both López Campillo and Rockwell Gray in their respective works.

From these critical observations, it is safe to conclude that the *Revista de Occidente* (and perhaps this is also true for other educational institutions of the time period) held that for science to be science, it must at the very least be compliant with scientific method and make the attempt to be *objective*. It is this emphasis on objectivity that I wish to highlight here as being one of the structuring principles of the magazine at large. Nevertheless, as stated in the opening article of the *Revista de Occidente*—its *Propósitos*—the magazine was generally meant to be a discussion of ideas and art. Were we to reduce such a statement to its elemental nature, we would see that really, the *Revista de Occidente* was an avenue for exploring the ultimate products of both the objective study of reality and the subjective reactions to that same reality, with the goal of achieving a meaningful knowledge of the world and a recognition of the means by which actuality is apprehended. The *Revista*, in its eclecticism, was holding up a dual lens by which the public could view the world around them: either as an object of analysis or an object of contemplation. At stake were the idea of subjectivity itself and the epistemological quandary of asking “how is it that we know our own world?” Apart from many others, this reason alone—the neo-Kantian project of understanding subjectivity—makes the publication’s engagement with the hard sciences, and the theory of relativity in particular, so significant. When seen as a part of this larger project, it is not at all surprising that an article on the structure of the universe should appear alongside an essay exploring the current state of the study of Phenomenology. Ortega’s grand project was to illuminate the currents and tides of the modern world, and he was fully aware that the modes of knowing proposed by science and art were essentially, by definition, at odds. And yet, the times being what they were, a certain marriage between art and science was to happen; this will be the object of our exploration in Chapters Four and Five.

¹³ A possible example would be a “biological” treatise about human vice by Gustavo Pittaluga, “Biología de los vicios,” *Revista de Occidente* 7.20 (1925).

The “Hard” Sciences in the *Revista de Occidente*: The Pulse of a Revolution.

Of the hundreds of essays that comprise the fifty-three total volumes of the *Revista de Occidente*, thirty of them deal directly with the hard sciences. To be even more specific, “physics” breaks down into articles on relativity, quantum mechanics and astronomy/cosmology; “chemistry” equates to discussions on the structure of the atom and the composition of matter. Some of the articles are somewhat fanciful in their focus—for example, an essay titled “¿Se puede volar por el espacio cósmico?”—others less formalized and more direct (the two articles featuring a debate—translated from the original English—among the preeminent astrophysicists of the day: J. H. Jeans, Abbé G. Le Maître, A.S. Eddington, W. de Sitter, E. A. Milne, and Robert Millikan), and still others come directly from the innovators themselves—articles by Einstein, Born, Heisenberg, Schrödinger, de Broglie, etc. These are just the major articles, that is, essays that devote more than a few pages to their topic and go into some depth about their object of investigation. Not included in this count are the multiple reviews of scientific treatises (as mentioned above), mainly released by the publishing house of the *Revista de Occidente*, and other articles on the biological sciences by authors such as Gregorio Marañón and Gustavo Pittaluga.¹⁴ In addition to these targeted articles, essays and reviews, there are hundreds of discrete references to science and scientific phenomena within articles on other subjects—psychology, art history, and literature. While these minor mentions of science in other venues are fascinating in their own right, and indeed have much to say about the nature of the magazine, it is the major essays that concern us at the present moment. Let us therefore bring our attention to the composition and qualities of the *Revista de Occidente*’s discussion of actual science, the revolutionary science of the first four decades of the 20th century.

Science beyond the Pyrenees: Non-Spanish Contributors to the *Revista de Occidente*

In the majority, the *Revista de Occidente*’s offerings in the hard sciences were translated reprints of articles originally published in other, mostly foreign, magazines. The reason for the

¹⁴ I have made the decision to eliminate the discussion of the biological sciences within the *Revista de Occidente*, as Dale J. Pratt’s coverage of the biological sciences in relation to literature and culture is quite thorough, and there is no need to restate his findings here. He does, however, offer a challenge in his last paragraph, that I find both relevant to the discussion at hand and therefore worth mentioning. He states: “Cultural dialogues and their systems of representation naturally spill into literature, and hence demand attention as objects of literary study. To analyze literary images of science in the Spanish cultural dialogue is therefore to take that dialogue at its word, to explore crucial nuances on the level of cultural discourse and in specific texts. The ensuing avenues of investigation in epistemology and reference, in systems of cultural signification and identity, and in aesthetics, all demand further criticism of literature and science in Spanish texts and contexts.” This is precisely the goal of this project at large. Dale J. Pratt, *Signs of Science: Literature, Science, and Spanish Modernity since 1868* (West Lafayette, IN: Purdue UP, 2001) 185.

reliance on foreign material was due in part to the underdevelopment of scientific study in Spain, as was noted in Chapter One of this study. Mostly, however, the *Revista de Occidente* was interested in publishing only the best articles that were representative of the field at the time, and this meant seeking collaborators abroad. Sir Arthur S. Eddington, Sir James H. Jeans, and the most celebrated physicist of the time, Albert Einstein, contributed at least two articles each to the *Revista*. The fact that these articles were not expressly written for publication in the *Revista de Occidente* is rendered unimportant when one considers the mission of the *Revista* itself: to be a repository for the finest contemporaneous scholarship emerging in the West. What is significant, given this goal, is that Spanish scientists could not provide this material, neither in quantity nor in quality. Considering the dearth of scholarship in the hard sciences in Spain in the early part of the 20th century, it stands to reason that Ortega would cultivate relationships with other European scientists and scholars who could provide significant contributions to his “Review of the West.”

The *Revista de Occidente* offered its reading public a selection of articles on physics that, when viewed as a whole, appears as an extraordinarily rich, nuanced and detailed portrait of the developments in the physical sciences between the years of 1924 (when the first article by Bertrand Russell, “Ícaro, o el porvenir de la ciencia,”¹⁵ was published) and 1936 (when James H. Jeans neatly summarizes the current state of the discipline of physical science which he compares to a house ruined by a series of earthquakes in his article “La nueva imagen física del mundo.”¹⁶) Impressively, the magazine published during its run of fourteen years thirty articles dealing directly with physics and numerous others on a variety of topics in the natural sciences and mathematics; this is not to say, however, that the *Revista de Occidente* was attempting to market itself as a major forum for scientific inquiry, debate and discovery in any way. In fact, a close examination of the contents of the magazine warrants the argument that the *Revista de Occidente* was interested in publishing only those articles that managed to explain the new physical *Weltanschauung* brought on by the theory of relativity and quantum mechanics in the 1920s, as well as relate those phenomena (observed, unobserved and theoretical) to its more central themes of philosophy, culture, and the human condition. The fact that the first article that addresses the world of physics is written by Bertrand Russell is significant. Russell’s grasp of both philosophy and physics, and their implicit but troubled relationship, was profound; his ability to communicate complex realities, truly outstanding. “Ícaro, o el porvenir de la ciencia” definitively sets the tone for the *Revista de Occidente*’s scientific aspect: one of a dual consideration for the *nature* of contemporary scientific advances and the significance of those advancements beyond the boundaries of so-called “pure science”—*la ciencia inútil*.

One needs only to look closely at the table of contents of the *Revista de Occidente* to perceive Ortega’s historical and interpretative project; with regard to science, this project hinged on the publication of articles that were not merely explanatory of the would-be cutting edge of physics. Rather, articles and authors were chosen that were communicatively highly efficient: popularizations varying from the fantastic (Hans Thirring’s conjectures about space flight) to elaborations of specific controversies of the moment (for example, the written collaboration of

¹⁵ See Bertrand Russell, “Ícaro o el porvenir de la ciencia,” *Revista de Occidente* 5.14 (1924).

¹⁶ See James H. Jeans, “La nueva imagen física del mundo,” *Revista de Occidente* 52.156 (1936).

Jeans, de Sitter, Lemaître and Eddington on the theory of an expanding universe.)¹⁷ The key concept here is, of course, that these articles were not technical treatises in any way; they were articles written by exceptional scientists for a popular audience who had some knowledge (or perhaps a more advanced awareness) of the key concepts in philosophy and physics that were open for discussion.

It is not the objective of this chapter to present a detailed description of the specific content of these articles; rather, the central aim is to submit to the reader an outline of the general concerns that these essays demonstrate when considered as a whole, and also as a continuum. In order to illustrate effectively the significance of this collection of articles, several aspects must be highlighted. First, it is necessary to know who was writing these essays and the authors' relationship to each other, some of which at times were brutally personal, as between Sir James Jeans and Sir Arthur Eddington. Second, the thematic importance of the articles must be examined, in order to attempt to answer the questions, "What does this particular article represent for the reader?" and "What significance would this article have within the context of a magazine of '*política cultural*'?" In other words, what is the relationship between the authors, their titles, and the overall project of the *Revista de Occidente*, as determined by its chief editor, José Ortega y Gasset? I will be giving a general overview of the contributors and their works, with a special focus on the case of Blas Cabrera, the only Spanish scientist to publish within the *Revista de Occidente*, arriving at a total of six major essays, more than any other physicist represented therein.

Geographically, the scientists form two major groups: the British astronomers Jeans, Eddington and E. A. Milne, with the philosopher of science, Bertrand Russell; the Continental Europeans, comprised mostly of German scientists (Max Born, Albert Einstein, Werner Heisenberg, Pascual Jordan, Erwin Schrödinger) and popularizers (Hans Reichenbach, Lothar von Strauss und Torney, Hans Thirring), the exceptions being the Frenchmen Louis de Broglie and L'Abbé Lemaître, Dutchman Willem de Sitter, and Spaniard Blas Cabrera (as well as the 18th century Spanish scientist Rogerio Cotes, whose introduction to Newton's *Principia Mathematica* is reprinted as a part of a special section honoring the third centenary of Newton's death). The third group, representing North America is comprised of Lewis Mumford, an historian with interests in science and technology and the physicist Robert Millikan, whose contribution consists of a written dialogue with Jeans, Eddington, Milne, de Sitter, and Lemaître about the origins and fate of the universe. Thematically, these scientists can be grouped around the following areas: relativity; quantum theory and atomic structure; cosmogony, cosmology and astrophysics; technology and its concerns; and finally, a direct discussion of the philosophy of science. With these major groupings in mind, let us now move on to a consideration of the physicists themselves, their lives and their work, and their significance as a part of the developing continuum of rapid scientific advancement that the *Revista de Occidente* aimed to capture.

¹⁷ See James H. Jeans, Abbé G. Lemaître, W. de Sitter and A.S. Eddington, "Un debate científico sobre la evolución del Universo (1a parte)," *Revista de Occidente* 41.123 (1933).

The Master: Albert Einstein in the «Revista de Occidente»

The most visible and easily recognized pioneer of the New Physics was Albert Einstein, whose 1905 paper on Special Relativity provided a decisive break with the aging conceptualizations of such substances as the purported ether (a space-filling substance of undetermined and ever-flexible qualities that had been in dispute for centuries) and whose work also provided an explanation for the shortcomings of Newtonian mechanics, whose limits were constantly being probed by developing technologies and geometries as Euclidean points and parallels gave way to the Riemannian curvatures of space itself.

In 1923, Albert Einstein was invited to come to Spain to complete a lecture circuit in Barcelona, Zaragoza and Madrid, with the hopes that the famous physicist would provide additional momentum in Spain's struggle to find a place in the scientific world. Spain's resistance to scientific progress and discovery, a phenomenon whose primary cause was the continuing conservatism of the government and the influence of the Church, had effectively kept her at least 50 years behind the times. When the Special Theory of Relativity made its appearance in 1905, it was recognized only by a tiny number of scientists; the General Theory of Relativity when it arrived in 1915 caused a much greater reaction as scientific conservatives began to build barricades to protect themselves from the perceived subversive nature of the theory. Catholic scientists like Josep Comas Solà stubbornly refused to accept the theory of relativity as anything except fanciful mathematics, incapable of being proven through experiment. What was most onerous to physicists like Comas Solà was that relativity annihilated the old Newtonian concepts of absolute space and time. Newtonian physics relied on these absolutes as a matter of course; and, not insignificantly, such absolutism had lingering religious overtones that conservative scientists could not ignore. Doing away with the ether in favor of empty space was one of the more scandalous by-products of the advent of relativity theory. The debate over the existence of the ether—the substance that would allow for the propagation of light waves, and that would also provide an absolute spatial and temporal frame of reference—had been definitively rejected by the scientific elite long before Einstein's Spanish sojourn. The failure of the Michelson-Morley ether-drift experiment in 1900 sounded the death knell of the theory, and the emergence of relativity effectively marked the ether as pure fantasy, a non-existent entity that served only to preserve Newtonian mechanics on a cosmic level. It was clear that Einstein's theory when it appeared was going to upend the mechanical universe and replace it with a much stranger cosmos whose rules were just beginning to be discovered. The theory of relativity did violence to the establishment in this way, dismantling as it did hundreds of years of theoretical physics that had come to be near dogma, as Newton's universe ultimately maintained the existence of God, upheld prevailing notions of causality and determinism, and did nothing to dismantle the idea of God's omniscience or omnipotence.¹⁸ It serves to reason, then, that in

¹⁸ Admittedly, Einstein's theory of relativity did little to disturb prevailing theories of causality and determinism: that particular task would be reserved for the advent of quantum physics. However, the mere fact that relativity challenged the Newtonian view of the universe was enough to perturb Catholic doctrine. Einstein was confounded by this reaction, and was reported as saying that relativity had little or nothing to do with religious doctrine. Discussed in Gerald James Holton, "The Shaping of Our Imagination," *Albert Einstein: Historical and Cultural Perspectives*, eds. Gerald James Holton and Yehuda Elkana (Princeton, NJ: Princeton UP, 1982) xiii.

Spain a large part of the scientific community would prove resistant to Einstein's theory. For Catholic scientists, accepting relativity as true would have implications for this hierarchy of identity, not necessarily because relativity undermined Catholic doctrine itself, but rather because it brought down the structures of classical mechanics, which did indeed largely conform to Catholic theology, in its own manner.

Bearing in mind this tension between the entrenched conservatism of Spanish science and the proponents of relativity (for example, Blas Cabrera and Ortega y Gasset, within their respective spheres of influence), it is notable that Einstein's first contribution to the *Revista de Occidente* came in the form of a reprint of his article "Newtons Mechanik und ihr Einfluß auf die Gestaltung der theoretischen Physik," originally printed in the German-language magazine *Naturwissenschaften* in 1927.¹⁹ The Spanish translation of the article appeared in the *Revista de Occidente* in April of that year, as a part of its bicentennial celebration of the life and work of Isaac Newton. The article preceding Einstein's in this issue is also a reprint, but from much earlier: it is the preface from a Spanish edition of Newton's *Philosophiae Naturalis Principia Mathematica* from 1713, written by Rogelio Cotes.²⁰ There are several possible reasons for the inclusion of Cotes' preface. Primarily, it stands as an indication that Spain had a history of scientific activity, if not achievement, in centuries past, and that it had been enlightened enough to accept the ideas of Newton. However, the juxtaposition of Cotes' preface with Einstein's treatise on Newtonian mechanics provides quite a different view. One possible interpretation of the inclusion of a German rather than a Spanish author to offer commentary on Newton's bicentennial, is that it gestures rather markedly to the lack of activity in the sciences in Spain at the time. It could also be interpreted as a subtle nod to that same scientific community's desire to *retain* a Newtonian universe at all costs, in which case the inclusion of Einstein's article as a counterpart to Cotes' work could be seen as an outright challenge to the old system so rigidly in place, and in such entrenched denial of Einstein's theories. Therefore, bringing in Einstein—even within the context of discussing Newton—would have been an explicit challenge to the establishment, an undoubted show of support for Einstein's theories of relativity, and consequently the New Physics in general.

The inclusion of Einstein's second article, "La nueva teoría del campo",²¹ published in the *Revista de Occidente* in February of 1929, could also be interpreted as a challenge to another establishment, extremely new and powerful, that is, the school of quantum mechanics. As Maravall Casesnoves notes: "Aunque en la *Revista de Occidente* publicó trabajos de los grandes físicos cuánticos, fue sin duda alguna Einstein como físico, y la teoría de la relatividad como teoría física, lo que más influyó e interesó a Ortega de toda la Física" (11). While scientists such as Heisenberg and Schrödinger were touting the predominance of probabilistic laws, statistical uncertainty and *discontinuity* in the physical sciences, Albert Einstein busied himself with finding the forces of unity behind gravitation and electromagnetism—the Unified Field Theory. Einstein was to become increasingly preoccupied with the nature of unification, and during this

¹⁹ See Albert Einstein, "Newtons Mechanik und ihr Einfluß auf die Gestaltung der theoretischen Physik," *Naturwissenschaften* 15.12 (1927): 273-76.

²⁰ See Rogelio Cotes, "Prefacio a la segunda edición de 'Principios matemáticos de Filosofía Natural' de Isaac Newton (1713)," *Revista de Occidente* 16.46 (1927): 44-56.

²¹ See Albert Einstein, "La nueva teoría del campo," *Revista de Occidente* 23.68 (1929): 129-44.

time was also positioning himself against the advances in quantum mechanics, which he felt were too emphatic in their espousal of probability in physics and their rejection of more traditional concepts allowing for determinism, as well as causality.²² Einstein's opposition to quantum theory was well known, and his pursuit of the Unified Field Theory was often seen as a pursuit of a Holy Grail—fictitious and/or unattainable. However, Einstein was in 1929 still the most famous of the world's scientists, even though in Spain the years of infatuation had long since ended. Albert Einstein, resistant to what was shaping up to be the most important branch of physics since the development of his theory of relativity, was losing some of his clout within the world of the scientists; but on the street, in the average home, the man had become equated with genius, and the relativistic *Weltanschauung* was becoming a part of daily life. Einstein, the commodity, was still significant in the eyes of the world, and his squabbles with the arcane complexities of quantum mechanics were largely ignored by the general populace, as well as by Ortega y Gasset, who continued to embrace him as the figurehead of scientific progress in the 20th century, a person who had radically reshaped reality—a scientific expression of the complexities of their modern life.

Ortega y Gasset traces his support of Einsteinian physics to a speech given in 1916 in Buenos Aires.

En 1916 pronuncié algunas conferencias en la Facultad de Letras de Buenos Aires. Me había propuesto en ellas dibujar someramente la fisonomía de un nuevo espíritu que sobre Europa alborea. Ante todo me interesaba fijar los caracteres de la nueva manera de pensar que desde el friso secular actúa en las ciencias y las va renovando radicalmente. Con alguna reiteración aludí a la teoría de la relatividad de Einstein, ejemplo admirable del nuevo sesgo intelectual. Era entonces muy poco conocida, en rigor se hallaba todavía en período de desarrollo. Aquel mismo año 1916 publicó Einstein la exposición de su sistema generalizado. Al concluir mis conferencias decía yo al auditorio: “No tengo prisa alguna en que me deis la razón. Sólo pido que cuando en tiempo nada lejano algunas de las cosas que habéis oído por vez primera en estas conferencias resuenen por todo el mundo y celebren su consagración pública, recordéis que en esta aula y en esta fecha oísteis ya hablar de ellas.” (“El sentido histórico de la teoría de Einstein” 188)

Of note is that the main point of Ortega's speech is not to bring into sharp relief the characteristics of the theory of relativity that made it so arguably revolutionary. Rather than focusing on relativity itself, Ortega uses Einstein's theory to make a larger point: that of the renovation of intellectual life on the Continent that began before 1914 and at that point (1916) was struggling for survival amid the chaos of the First World War.

It is uncertain what the nature of the relationship between Einstein and Ortega actually was, but it can be assumed from both Einstein's appearance at the *Residencia de Estudiantes* and Ortega's (factually questionable and impressionistic) essay “Con Einstein en Toledo”, along with Ortega's familiarity with German language and culture, that there was a reasonable level of

²²For an excellent discussion of the conflict between Einstein and Niels Bohr (as well as other quantum physicists), see Edmund Blair Bolles, *Einstein Defiant: Genius versus Genius in the Quantum Revolution*, (Joseph Henry Press, 2004).

communication between the two thinkers, at least in German.²³ What is most important to note with regard to the personal relationship between Einstein and Ortega is that Ortega felt himself worthy to be one of Einstein's "messengers"; that is, he felt that his understanding of Einstein's ideas was sufficient enough for him to translate them into his own language of cultural philosophy and politics, to make Einstein's work more than just another fad²⁴ for the masses—rather, he would make them culturally and historically significant for his beloved intelligentsia who would then profit from the ideas in as-yet-unforeseen ways.

Ortega's writings regarding Einstein and his theories are not "popularizations". They are decidedly interpretative, and not infrequently manipulative. Ortega uses Einstein strategically, indicating his early awareness of the theories (see above) themselves, but mostly employing the theory of relativity as a non-causal confirmation of his own historical perspective. Manuel García Morente, in his review of *El tema de nuestro tiempo* in 1923 points out that, regarding the philosophical implications of the theory of relativity, "es bien extraordinario que nadie lo haya visto con claridad antes de Ortega. Lo único real es la realidad de cada perspectiva" (211). But it is not the implication and development of a more detailed doctrine of perspectivism (not relativism) coming as a result of Einstein's theories that holds the most interest for Ortega, rather his belief that Einstein's theories are in themselves a product of history, of Ortega's concept of the generation—the collective—the spirit of which engenders the possibility of scientific revolutions such as that of the theory of relativity. He writes:

...[C]omo un edificio científico de esta importancia no es obra de un solo hombre, sino resultado de la colaboración indeliberada de muchos, precisamente de los mejores, la orientación que revelan estas tendencias marcará el rumbo de la historia occidental. No quiero decir con eso que el triunfo de esta teoría influirá sobre los espíritus, imponiéndoles determinada ruta. Esto es evidente y trivial. Lo interesante es lo inverso: porque los espíritus han tomado espontáneamente determinada ruta, ha podido nacer y triunfar la teoría de la relatividad. Las ideas, cuanto más útiles y técnicas, cuanto más remotas parezcan de los afectos humanos, son síntomas más auténticos de las variaciones profundas que se producen en el alma histórica. ("El sentido histórico de la teoría de Einstein" 188-89)

By publishing works by scientists such as Einstein within the context of a cultural magazine, Ortega y Gasset was creating an explicit outline of this *alma histórica*, implying to the reader through mere selection of content that these disciplines that seem so disparate are connected in ways that are only apparent when placed in close proximity and allowed to engage in dialogue with each other. Many of these connections are explicitly historical, others thematic. But all

²³ When introducing Einstein to the audience at the Residencia de Estudiantes, Ortega called him "una de las más gloriosas fisonomías de la historia humana"; he then justified this glorification of the man standing next to him by saying, in effect, that he was taking plain advantage of the fact that Mr. Einstein "no entiende plenamente nuestro idioma" [that he does not completely understand our language]. José Ortega y Gasset, "Anejos I: Mesura a Einstein," *El tema de nuestro tiempo*, 1 ed., Obras de José Ortega y Gasset (Madrid: Alianza Editorial, 1981) 199.

²⁴ See Thomas F. Glick's *Einstein in Spain* for a discussion of the "Einstein fever" that gripped Spain during the physicist's visit in 1923.

together, they are an effective portrait of a time that was witnessing widespread intellectual and social revolutions across the board.

British Astrophysics in the «Revista de Occidente»

One of these so-called “historical” connections between scientific authors published in the *Revista de Occidente* is the relationship between Einstein and Sir Arthur Stanley Eddington, whose contribution consists of three articles between 1929 and 1932. Sir Arthur Eddington was a British astrophysicist who had spent time as the head of the Royal Astronomical Society, but who was most famous for leading the team that went to Principe, an island off the African coast, in 1919 to observe the total solar eclipse visible from that location. Eddington’s importance in the dissemination of the theory of relativity in England was pivotal:

Eddington's study of the general theory of relativity began when Willem de Sitter, the Dutch astronomer, forwarded a copy of Einstein's theory to Eddington, who was then secretary of the Royal Astronomical Society. For several years, it remained the only copy of the theory in England. Eddington immediately recognized its importance and began to teach himself the intricacies of its mathematical details. At the request of the Physical Society of London, Eddington prepared his *Report on the Relativity Theory of Gravitation*, which was published in 1918 and “is a masterpiece of concise and elegant exposition.” Eddington's report was the first complete account of general relativity written in English. He revised the report in 1920 to include the results of his own 1919 eclipse expedition to the Isle of Principe in the Gulf of Guinea, which had confirmed a central prediction of Einstein's general theory: the bending of light by the gravitational field of matter. (Eddington himself was so busy changing photographic plates during the eclipse that he did not actually see it.) (Weaver, Motz and McAdoo 235-36)

These results made both Eddington and Einstein celebrities in their own right and brought the concepts of the theory of relativity into the common parlance, albeit in a simplified, often distorted form.²⁵

While Eddington’s international fame may have begun in 1919, in Britain he was already quite well known for his work in astrophysics. His specialization was the internal structure and constitution of stars; he believed that stars were gaseous objects, and it was the state of equilibrium beneath their surface that interested him most. It was not this work in stellar physics, however, that made his name renowned even outside of the insular world of science—rather it

²⁵ Thomas F. Glick discusses some of the distortions of the theory of relativity by common consensus in his book *Einstein in Spain*. The most frequent were the belief that light has weight (an idea that stems more from Einstein’s interpretation of the photoelectric effect, in which he puts forth the idea of light quanta) and the maxim that, of course, “everything is relative”. See Chapter 8 “The Flow and Transformation of Ideas” for a detailed discussion of this phenomenon. Thomas F. Glick, *Einstein in Spain: Relativity and the Recovery of Science* (Princeton, N.J.: Princeton University Press, 1988) 277-300.

was his written popularizations of the advances in modern physics that furthered the recognition of his name as an eminent scholar in the field. These popularizations (*Space, Time and Gravitation* [1920]; *Stars and Atoms* [1926]; and *The Nature of the Physical World* [1928]) were all well-received, and were translated into a variety of languages—including Spanish: *Stars and Atoms* was released by the *Revista de Occidente*'s publishing house in 1928 under the title *Estrellas y átomos*. Eddington's biographer A.V. Douglas discusses his special narrative ability as shown in his first popular work, *Space, Time and Gravitation*:

For three years before [1920] Eddington had been called upon frequently to present the new ideas and explain their significance to learned and to very mixed audiences. His humour and felicity in selecting a striking metaphor, simile or quotation to illuminate a scientific idea enriched these addresses and gave him a new interest and satisfaction which led him to carry over this scintillating style into his semi-popular books. In *Space, Time and Gravitation* we find this gift for picturesque and vivid exposition of scientific ideas making its first appearance in his writings. In this book, as also in some of his later books, he gave much pleasure to his readers by the inclusion of an apt quotation under every chapter heading. The range of the sources of Eddington's quotations throws light on his wide reading and sometimes underlines the puckish whimsicality of his humour. (46)

Eddington, however, was not the only respected physicist who profited from the need for popularizations of the New Physics among the reading public. Sir James H. Jeans, fellow member and also sometime president of the Royal Astronomical Society (Eddington served as president between 1921 and 1923, Jeans during the years 1925 to 1927), was an astrophysicist and mathematician who also took up his pen in an effort to explain the changing vision of the cosmos to an eager public. Sir James H. Jeans' enthusiastic biographer, E. A. Milne, also a British physicist, characterizes ten books out of the many that Jeans wrote during the course of his life as popularizations. The most widely read were *The Universe Around Us* (1929) and *The Mysterious Universe* (1930). Of the former, Milne writes that in terms of content, Jeans

...gave special attention to the problems of cosmogony and evolution and to the general structure of the universe. His initial chapter headings, "Exploring the Sky", "Exploring the Atom", "Exploring in Time", describe respectively the astronomical, physical and cosmological interests dealt with, and the concluding chapter, "Beginnings and Endings" dwelt on the results Jeans himself obtained in his wide researches on the evolution of celestial bodies and astronomical eschatology. Like his technical treatises, this book sustains the reader's excited interest from cover to cover. (61)

Jeans' bestselling title *The Mysterious Universe*, while published in many languages other than its native English, was *not* translated into Spanish. However, the *Revista de Occidente* did publish a total of three of Jeans' popularizing articles, as well as the written debate mentioned above regarding the origins of the universe (with Eddington, de Sitter, Lemaître, Millikan, and Milne).

The presence of both Jeans' and Eddington's work within the *Revista de Occidente* is demonstrates a recognition of the importance of the most eminent British scholars (as well as an understanding of their skill as popularizers). In addition, it implicitly gestures to an awareness of a certain controversy undergirding their selection: that the two astrophysicists, Jeans and Eddington, were, at the time of the publication of their articles in the *Revista de Occidente*, engaged in the second phase of a bitter feud begun in 1917 regarding stellar structure. According to Milne, the mathematician Jeans found Eddington's conclusions about the internal constitution of the stars to be lacking in mathematical rigor and therefore dubitable, while Eddington found Jeans' proposals of both crystal stars and liquid stars to be, at best, imaginative. It was a spat that played out quite publicly through the publications and banquets of the Royal Astronomical Society and indeed other venues; E. A. Milne comments that their battle was ongoing and never resolved:

...[D]uring their lifetimes neither Jeans nor Eddington ever budged from the positions they had taken up *vis à vis* their respective papers on stellar structure. But this opposition did not extend to papers on other, even if closely allied, subjects. They tacitly agreed, evidently, not to refer to the thorny subject on which they disagreed. (31)

But even such a gentleman's agreement could not entirely dissuade the presence of continuing personal attacks, especially as the two scientists aged and both began to produce questionable scholarship.

The work of Jeans and Eddington that we see published in the *Revista de Occidente* is that of two popularizers in their best moment. In the introduction to Eddington's 1929 article "El lugar del hombre en el universo", (an excerpt from his book *The Nature of the Physical World*) the editor gives the following introduction:

A.S. Eddington es profesor de la Universidad y director del Observatorio de Cambridge. Es, con Jeans—del cual hemos publicado varios trabajos—, la figura más alta de la astronomía contemporánea. Como dice Maeterlinck "está en las avanzadas de los puestos más peligrosos de la ciencia". Une a su tecnicismo, claridad, ingenio y profundidad. ("El lugar del hombre en el universo" 267)

Jeans displays an equal ingenuity. In fact, the two authors' works manage to effectively and elegantly communicate complex cosmic phenomena in laymen's terms, often through the use of analogy. The only drawback to such a strategy is that, for all of its communicative efficacy, analogy often lacks precision. For example, Jeans' 1928 article "Nuevos aspectos de la cosmogonía"²⁶ compares the age of the universe to that of the average human life span, in which case, human existence is in the earliest hours of its infancy.²⁷ The metaphor is extended over the

²⁶ Originally published in the United States as J. H. Jeans, "The Wider aspects of Cosmogony," *The Scientific Monthly* 26.5 (1928). This was a reprint of the same article as it appeared in the British magazine *Nature*, the same year.

²⁷ He also compares the structure of the atom to a planetary system—a very common analogy employed by numerous scientists and popularizers, especially before the advent of quantum mechanics around 1927. Jeans shows

course of the entire article, allowing Jeans to promote the idea that only in humanity's "adulthood" (e.g. in the very distant future) will the possibility of finding other forms of life in the universe be even imaginable, due to the improbability of finding similar environmental circumstances that would allow for the creation of life and the sheer distance between galactic systems that could contain these other worlds.²⁸ He concludes the article with the image of the child growing older, finding his place within his surrounding universe:

Pero es todavía muy joven; puede recorrer la mitad del mundo antes de encontrar otro niño tan tierno e inexperto como él. Aún le queda bastante tiempo disponible para conseguir comprenderlo todo. Más pronto o más tarde, las piezas del rompecabezas principiarán a ocupar su sitio, aunque se puede dudar, razonablemente, de que todo el cuadro llegue a ser comprendido por una pequeña, y en apariencia completamente insignificante, parte del mismo. Además, siempre le obsesionará el antiguo problema de si el niño posee medios para saber que no todo es sueño. A veces, el cuadro le parece ser mera creación de su propia mente, en el que nada existe realmente, salvo él mismo; el universo que estudiamos con tanto cuidado, puede ser un sueño, y nosotros células cerebrales en la imaginación del soñador. ("Nuevos aspectos de la cosmogonía" 266)

Jeans resorts to the trope of the sleeping Creator who has dreamed his creation, but with a biological twist—that of human beings as "brain cells" in this dreamer's mind.

This recurrence to the metaphysical aspect of physics itself is a trait shared by Jeans and Eddington, each with his own flavor. Jeans' articles refer obliquely to metaphysical and religious

his awareness of the quantum revolution, underscoring the new dominance of the idea of discontinuity in physical phenomena, going so far as to say that even a star expends itself in a discontinuous manner. He writes, describing this supposed parallel between the quantum scale and the cosmic scale that

los tamaños observados de las estrellas proclaman el secreto de la estructura del átomo. Los tamaños de las estrellas son discontinuos, porque los tamaños de los átomos deshechos en diferentes grados son discontinuos. Estas discontinuidades pueden compararse a las que forman el rasgo central del nuevo *quantum* dinámico. Así la característica de las leyes que rigen los procesos más ínfimos de la naturaleza, se transmite directamente a la escala superior de los fenómenos astronómicos y dirige la distribución de las enormes masas estelares. Lo infinitamente grande no está en la ciencia muy lejos de lo infinitamente pequeño, pero costará trabajo encontrar un ejemplo más sensacional de la unidad de la ciencia que el que acabo de poner.

It is this type of unity of the infinitesimal and the infinite that became Einstein's main pursuit in the (unsuccessful) Unified Field Theory, and which still remains elusive to physicists. Jeans' understanding of this unity seems to be more metaphorical than practical, and much more suggestive of metaphysics rather than physics, a trait not uncommon (but still frugally employed) in both Jeans and Eddington's popularizations. J. H. Jeans, "Nuevos aspectos de la cosmogonía," *Revista de Occidente* 20.59 (1928): 249.

²⁸ The idea of "habitable worlds" becomes a running theme throughout the articles that deal with the cosmos and astrophysics in general. Eddington, Jeans, Cabrera and Thirring all explore the idea at some length, all arriving at similar conclusions: that the universe is too vast for us to ever find a similar environment that would support life, if it exists at all. For Eddington, this prompts the question if, considering the age and extension of the Universe, "¿Culmina en el Hombre esta prodigalidad de la materia, del espacio, del tiempo?" A.S. Eddington, "El lugar del hombre en el universo," *Revista de Occidente* 25.75 (1929): 276.

concepts, usually through the metaphor of the creator-god as mathematician. In “La nueva imagen física del mundo”, he insists that our comprehension of the world, our ability to measure it, makes it inherently mathematical in nature, not imagistic, as the comparisons and parables used to describe/interpret science would suggest. Mathematics in physics is unmistakably “Dios” (304).²⁹ Not so for Eddington. The two articles published in the *Revista de Occidente* by A.S. Eddington deal explicitly with metaphysical and religious questions raised by the New Physics itself. “La ciencia y el mundo invisible” was actually a lecture presented to the Quaker Society of Friends at Swarthmore College in 1929 and republished by the magazine. The discussion attempts to address in part the relationship between religion, philosophy and physics, as does his article “La decadencia del determinismo”, which deals with the metaphysical trappings of indeterminacy, especially with regard to free will.³⁰ His conclusions retain a respect for the integrity of spiritual knowledge, but he also stands firm in his belief in continuous investigation of scientific phenomena, demonstrating the ongoing need for observation (even in the world of quantum mechanics, where observation always causes a disruption in the system, as will be discussed in Chapters Four and Five.)

As if to complement these articles by Jeans and Eddington and round out their distinct perspectives, the *Revista de Occidente* also published a translation of an article by Bertrand Russell titled “Ciencia y religión.”³¹ In the article, Russell addresses the polemics raised by both Jeans and Eddington about the conflicts between science and religion. His most pithy comment is that “Sir Arthur Eddington deduces religion from the fact that atoms do not obey the laws of mathematics, Sir James Jeans deduces it from the fact that they do” (Cited in Douglas 140).³² Jeans’ God is a mathematician, while Eddington’s is not. Douglas writes on the difference of opinion between the two men that “Eddington’s selective subjectivism prevented him from concurring with Jeans’s reasoning. His approach was a different one, requiring an intuitive apprehension of spiritual truth which transcended mathematical symbolism and could not be deduced from it” (140).

In any event, the contributions of A.S. Eddington, and J. H. Jeans (as well as Bertrand Russell) to the *Revista de Occidente* are an ideal representation of the general attitude of the publication towards scientific exploration. The authors are eminent researchers, greatly respected within their field; they are also well-received authors whose publications have reached a wide audience. But more than that, both scientists show a preoccupation with more than the empirical, objective universe of scientific exploration: both Jeans and Eddington in their writings look beyond their ostensible focus, be it stellar structure or the age of the universe, to the place that humanity takes within the spectrum of creation. They do not limit themselves to a mere recounting of empirical data, the facts on which their theories are built, but rather connect the aims of science to the web of humanistic exploration, be it through the invocation of a religious aspect (such as Jeans’ Mathematician-God) or metaphysical questioning (Eddington’s

²⁹ It is ironic that Jeans makes this assertion considering that this same article is itself a masterpiece of imagery and analogy used to vivify often sterile scientific models.

³⁰ See A.S. Eddington, “La decadencia del determinismo,” *Revista de Occidente* 37.111 (1932).

³¹ See Bertrand Russell, “Ciencia y religión,” *Revista de Occidente* 33.99 (1931).

³² Also cited in *Ibid.*: 304. Translation given as “Sir Arthur Eddington deduce la religión del hecho de no obedecer los átomos a las leyes de las matemáticas. Sir James Jeans las deduce del hecho de hacerlo.”

exploration of determinism and its implications for the human subject). By exploring in some detail their publications within the *Revista de Occidente*, I hope to have illustrated by example the criteria of the publication for the selection of its content with regard to essays on science, in particular, that these articles explore in some way the relationship between pure science and the world that surrounds it—that is, science as it exists within cultural constructs. In the coming pages, I hope to show that these same criteria apply when we examine the rest of the scientific articles published in the *Revista de Occidente*.

Physics on the Continent: The Quantum Mechanical Players

The *Revista de Occidente* did a remarkable job in portraying the state of British astrophysics through a select publication of various articles by the leaders in the field. The editors of the magazine did an equally remarkable job with the trends in physics on the European continent, with especial attention to that of the developing field of quantum mechanics. If the *Revista de Occidente* did not effectively capture the stunning shift in worldview that came with the advent of the theory of relativity—it published its first issue in 1923, the year that Einstein visited Spain, by which time the basic concepts of relativity had ceased to be “revolutionary”—the magazine indubitably serves as a very basic topographical map of the development of quantum physics in the 1920s and '30s, and more than adequately registers the philosophical earthquake that developed alongside the elaboration of Heisenberg’s Uncertainty Principle in the years following its debut in 1927. The articles chosen for publication are highly representative not only of the major philosophical questions raised by the principles of quantum mechanics, but also of the alliances between scientists that existed at the time.

The major continental physicists published in the *Revista de Occidente*—Max Born, Luis de Broglie, Werner Heisenberg, Pascual Jordan, and Erwin Schrödinger—were *the* major players in the early debates over indeterminacy in the mid 1920s. Born, Heisenberg, and Jordan comprised what is known as the *Dreimännerarbeit*—a group publication about matrix mechanics (a structuring principle of quantum mechanics) that “immediately expanded it into a complete and logically impeccable theoretical structure,” the existence of the particle, or *corpuscle*, serving as its point of departure (Beller 469). Opposing the principles of the *Dreimännerarbeit* and matrix mechanics in general were Louis de Broglie and Erwin Schrödinger, whose alternative theory of wave mechanics (which denied the observable existence of the individual particle, preferring to view the orbit of electrons as “elastic waves,” (328) to use de Broglie’s words) “was enthusiastically welcomed by the conservative wing of the physical community, which distrusted the revolutionary physical ideas of matrix mechanics and the complicated mathematics involved” (Beller 469). It is entirely remarkable that these five physicists should appear with equal voice in a magazine whose focus is decidedly cultural, not scientific. This conglomeration of names and ideas is far from random—it is clear that the editorial board of the *Revista de Occidente* had a lucid portrait of the dynamics of the development of the physical sciences beyond the Spanish border.

Again, it must be noted that these articles by Born, de Broglie, Heisenberg, Jordan and Schrödinger are not, as in the articles by Jeans and Eddington, highly specific professional treatments of topics in quantum mechanics; they are not articles written for other physicists. They are, some more than others perhaps, also popularizations of very complex ideas aimed at describing not the mathematical or scientific complexities of quantum mechanics, but rather some of the practical and philosophical implications of the theory itself. In other words, while the players of the debate over matrix vs. wave mechanics, for example, are present, we do not see the actual duel between the two camps, only its shadow.

Max Born is the first of the continental physicists to find publication in the *Revista de Occidente*, and his article, “Ley y materia” (1926), immediately sets the tone for the articles on quantum physics that will follow his. Born takes up the essential issue of discontinuity in physics, a problem that appeared with the discovery of Max Planck’s energy *quanta* in 1900, and came to a crescendo as physicists began to clarify the quantum behavior and structure of the atom a few decades later. Born addresses the physics of discontinuity (summarizing Planck’s theory, Einstein’s photoelectric effect, and Niels Bohr’s theory of atomic structure), but he also concedes that the problem of discontinuity is essentially philosophical in nature, “en el mejor sentido de la palabra” (327).

This deference to the philosophical side of physical phenomena is maintained throughout the series of articles written by the quantum physicists between 1926 and 1932. De Broglie takes up discontinuity in his article, “Continuidad e individualidad en la física moderna” (1930), where he also addresses the larger issue of quantum mechanics as presenting the world of physics and philosophy with a full-on crisis in the way we apprehend reality and the way science must proceed in gathering new knowledge: quantum physics is, in sum,

[una] crisis profunda que ha conmovido todo el viejo edificio de nuestros conocimientos científicos, lanzando uno contra otro, en todos los dominios, los conceptos antitéticos del continuo y del discontinuo, resucitando uno de ellos donde el otro parecía triunfar. Crisis que señala una de esas etapas en que el espíritu humano comprueba amargamente que la complejidad de lo real se resiste a dejarse verter en moldes demasiado sencillos, y que es preciso un nuevo y doloroso esfuerzo para intentar una vez más definir lo que acaso es indefinible. (322)

Schrödinger, whose wave mechanics were a further elaboration of ideas originally posed by de Broglie in 1923, in the *Revista de Occidente*, does not write in the same vein as his colleague (Beller 469). Schrödinger instead decides to tackle the philosophical problem of subjectivity as a major determinant in scientific progress. The title of his article comes in the form of a question: “¿Está la ciencia natural condicionada por el medio?” Schrödinger’s approach synthesizes science and the culture that produces it, seeing the two forces as mutually influencing each others’ development. He questions the supposed objectivity of the sciences as well as the view that scientific progress follows an almost inevitable path of development where one experiment must lead to one and only one possible result, and from that, the concurrent discovery that pushes science forward. Schrödinger counters that the individual will and creativity of the discoverer must have some weight in determining what science actually

achieves and its general trajectory. He speaks of how “la *disposición momentánea de nuestro interés y ... su influjo determinante en la dirección del trabajo posterior ... abre una ancha puerta de acceso--en principio incerrable—a la subjetividad*” (Schrödinger 127-28). The article goes on to entertain other ideas about invariance and statistical analysis, but it is really Schrödinger’s openness to the idea that a humanistic environment can have a determining effect on the sciences via the interpolation of the Subject that makes this article resonate as a commentary on culture as well as science.

Similarly, Pascual Jordan begins his cross-disciplinary article with a discussion of Hume and the doctrine of causality. His analysis of causality hinges on the possibility of observable phenomena—a true quandary for the quantum physicists whose theories would be impossible to prove through empirical methods, as their very scale borders on the infinitesimally small: the technology of the time did not permit physicists to actually confirm through sensory perception the existence of electrons or their orbitals, or even in effect the atom itself. Jordan notes that the impossibility of empirical observation must give rise to the dominance of statistical analysis in imagining atomic and subatomic activity. Of course, when probability is granted primacy, determinism must by default fall away. Jordan sees in the interstices of the debate between probability and determinism the outlines of the ancient polemic of free will. In sum, Jordan views quantum mechanics as a gateway to extended discourse on topics outside of physics itself, concluding that

El más bello triunfo de una teoría científica es que sus sugerencias y su fecundidad puedan rebasar los límites de su órbita originaria. El *carácter revolucionario* de la teoría de los cuantos se manifiesta allende de la física, en los puntos de vista completamente nuevos con los cuales contribuye a la discusión de los más hondos problemas de la filosofía, el libre albedrío y la relación del sujeto y objeto, y las vastas sugerencias que ha de ofrecer a la biología y la psicología. (Jordan 246-47)

A capstone for these articles is set in 1933 with an essay by the German philosopher of science Hans Reichenbach titled “La filosofía científica: nuevas perspectivas sobre sus fines y sus métodos.”³³ The article discusses science in relation to the fields of philosophy, biopsychology, physics, mathematics, and the discourse on free will. It is an article in two parts that effectively covers the scope of the physics/metaphysics debate, written in dense language, raising more questions than it answers.

The trend of questioning the frontiers of science is continued with an essay by Heisenberg. In “La transformación de los principios de la ciencia natural exacta,”³⁴ Heisenberg brings to a head the doubts and quandaries to which the New Physics has given rise, especially in the years since 1927 and the advent of indeterminacy (the Uncertainty Principle). The author discusses the problems inherent in the refutation of absolute space and time not only for

³³ See Hans Reichenbach, “La filosofía científica: Nuevas perspectivas sobre sus fines y sus métodos,” *Revista de Occidente* 42.125 (1933). And Hans Reichenbach, “La filosofía científica: Nuevas perspectivas sobre sus fines y sus métodos (Conclusión),” *Revista de Occidente* 42.126 (1933).

³⁴ See Werner Heisenberg, “La transformación de los principios de la ciencia natural exacta,” *Revista de Occidente* 46.138 (1934).

scientists, but also for the world of the arts and the “life of the spirit”. He laments that these camps of thought have erected walls to enforce their separation, and yet he sees hope for new modes of knowledge where the spiritual world and the physical world come into contact, perhaps through the questions raised by the New Physics itself.

In general, as we can see, the Continental physicists tended to see their discipline as being in frank association with the systems of philosophy, and explored at length the implications of this juxtaposition. The *Revista de Occidente*'s selection of articles testifies to the view of the physical sciences as having permeable epistemological boundaries, and gives an ample history of the development of the discipline via the exhortations of formal reasoning and scientific method. As a group, the articles by Born, de Broglie, Heisenberg, Jordan, Reichenbach and Schrödinger demonstrate the internal motion of the New Physics toward discovery, revelation and (as a direct consequence), mystification. The sense of wonder that these physicists had toward their subject echoes clearly throughout their essays—a sort of verbal Uncertainty that required a voice that would offer a clarification of the vocabulary of science, now muddled by the New, and translated with some difficulty into the Spanish idiom. That need would indeed be addressed directly by celebrated physicist and writer, Blas Cabrera, the seemingly lone Spaniard giving voice to the New Physics in his own country.

The Special Case of Blas Cabrera

Of the fair-sized collection of authors whose articles deal with the hard sciences in the *Revista de Occidente*, there is only one among them that hails from Spain, and that author is Blas Cabrera. This is not to say that there weren't other scientists writing articles about physics during the 1920s and 30s. The problem is that many of the other scientists were writing *against* the findings of the New Physics and doing their best (as in the case of Josep Comas Solà) to refute Einstein's findings, mostly by staunchly affirming the existence of the ether, a concept long retired by the majority of progressive scientists after the 1919 eclipse experiment.

Blas Cabrera stands out as one of the few scientists who were willing to support Einstein, as well as the findings of the quantum physicists. He was not the first to embrace relativity, but, according to Thomas F. Glick, by 1912, he gave his full support to the theory (38). He served for a time as director of the *Laboratorio de Investigaciones Físicas*, beginning in 1910 (sponsored by the *Junta para Ampliación de Estudios*, in which organization Blas Cabrera would remain active for many years) when the state of the physical sciences in Spain was still lamentable.³⁵ With the arrival of Blas Cabrera and his contemporaries and apprentices (Esteve Terradas, Josep María Plans, Miguel Catalán, Julio Palacios), the situation began to improve significantly. By the

³⁵ Sánchez Ron offers a description in these pages of the state of the *Laboratorios y cátedra de Física* sponsored by the JAE, illustrating the subpar furnishings of the laboratories themselves, the lack of equipment, funding, interest and even students. He explains that the general trend in Spain in the early 20th century was toward the development of applied sciences and technology, rather than pure research: “La cultura que subyacía detrás de toda aquella infraestructura de laboratorios y gabinetes, era una cultura lejana a los intereses de la ciencia tal y como se practicaba en por entonces tantos y tantos centros de naciones como Alemania, Gran Bretaña y Francia; era la cultura de las escuelas de ingenieros, de departamentos de ensayos del Ejército, de la construcción, de la electrotecnia.” Sánchez Ron, *Miguel Catalán: su obra y su mundo* 66.

time Albert Einstein visited Spain in 1923—with Blas Cabrera as his official guide for the length of the trip—the facilities in centers of research such as Madrid, Barcelona and Zaragoza (all of which Einstein visited) had seen a marked increase in all that was lacking: funding, facilities, and interest.

Blas Cabrera, as a scientist, had as his focus the study of electromagnetism, and wrote several professional treatises on this subject. For this, he was duly recognized in scientific circles abroad, not only in Spain. But it was his role as a popularizer of relativity that succeeded in achieving his *consagración nacional e internacional*.³⁶ In Luis Navarro Veguillas' book, *El siglo de la física*, the author mentions the name of Blas Cabrera along with others such as Eddington, Jeans, Russell, Born, Reichenbach and Einstein himself as one of the major authors in disseminating the ideas of relativity, and the wealth of popularizations, suggest Navarro Veguillas and Silvio Bergia, became nearly a genre in its own right (Navarro Veguillas and Bergia 64).

Blas Cabrera also had a special relationship with José Ortega y Gasset, being a member of his *tertulia*, as well as a supporter of the *Residencia de Estudiantes* (he gave a lecture there titled “¿Qué es la electricidad?” which was also published in book format.)³⁷ It is this relationship with Ortega that is of primary importance to this study, along with his established role as popularizer and disseminator of scientific knowledge within Spain: Blas Cabrera contributed more articles on physics to the *Revista de Occidente* than any other author—six major essays and four book reviews between the years of 1925 and 1933. The six articles, in order of publication, are the following:

- “Nuevos hechos, nuevas ideas: El éter, la relatividad, y los resultados experimentales de Miller” (February 1926)
- “Cosmogonía” (August 1926)
- “Proceso de extension del conocimiento” (June 1927)
- “Los mundos habitables” (December 1929)
- “La imagen actual del universo, según la relatividad” (July 1931)
- “Cómo ve el mundo la física actual” (March 1933)

Unlike the Eddington and Jeans who occasionally used their discussions of astrophysics as a platform for the suggestion of the spiritual implications of the physics of their time; and also unlike the physicists from the Continent who infused their treatises on atomic structure or cosmogony with philosophical debates that had spanned centuries, Blas Cabrera tended to present the physics of his day—*la física actual*, as he phrases it—in unambiguous, precise language that clearly recognizes the limits of expression and the limits of his audience, rarely

³⁶ Terminology used by the Centro Científico Cultural Blas Cabrera.
<http://www.lanzarote.com/blascabrera/index.html>

³⁷ See Blas Cabrera, *¿Qué es la electricidad? : conferencias dadas en la Residencia de Estudiantes los días 16, 19, 23, 26 y 30 de enero de 1917*, Publicaciones de la Residencia de Estudiantes, Serie I, Cuadernos de trabajo (Madrid: Residencia de Estudiantes, 1917). A second version was also published: Blas Cabrera, *¿Qué es la electricidad? : conferencias*, Publicación de la residencia de estudiantes; (Madrid: Impr. de Fortanet, 1917).

evoking the names of philosophical concepts unless they serve his purpose directly.³⁸ In several of his articles, he seems to conjure the presence of the audience so vividly that it is possible to imagine the very outlines of the typical reader of such an article; he does this by showing where the discussion of the phenomenon in question must of necessity end, be it due to the need for (and lack of) a new vocabulary to describe what has been heretofore unobserved, or due to the simple need for an economy of words in what must remain a brief sketch of the subject being discussed. He perhaps states it best in his article “Cosmogonía,” as he discovers the inherent problem in communicating his fascination with the physical world when a word count or page limit must be obeyed, or when one must simply choose a topic from among so many fruitful areas of exploration:

No es éste el único problema cosmogónico que debo pasar por alto en este artículo, siempre con el esfuerzo que exige separar la atención de los más sublimes aspectos de la naturaleza. Pero ocurre con estos problemas que es muy difícil ordenarlos en consideración a su belleza, pues cuando el pensamiento pasa de uno a otro es el último el que casi siempre merece la preferencia. (“Cosmogonía” 235-36)

The articles of Blas Cabrera show certain traits and preoccupations that are common throughout, and merit a brief analysis. First of all, it is the discussion of relativity that is preeminent in each of the articles, even in those written in the years following the advent of quantum mechanics in the late 1920s. This is not surprising considering that it was as a proponent of the theory of relativity that Cabrera gained his reputation as a skilled writer of scientific popularizations. Even when the discussion ventures into distant territory, such as the nearly inexplicable behaviors of the quantum world, Cabrera always manages to highlight the fundamental importance of the theory of relativity in the development of the New Physics in general. The majority of his articles focus primarily on cosmic phenomena, the kind described and/or best understood through an application of the theory of relativity. Thomas Glick writes about Blas Cabrera that “[w]ith regard to his ‘popular’ presentations, he was the only leading Spanish relativist who was interested in the philosophical ramifications of the theory” (40). Perhaps this is so, but the articles in the *Revista de Occidente* seem to affirm, if not the contrary, then at least that this interest was subordinated to the needs of his audience—the measure of the effectiveness of a great popularizer, which indeed he was.

Blas Cabrera had a gift of the visual metaphor when describing scientific realities beyond our powers of observation. He was able to effectively communicate the immensities of scale that were so often a limiting factor in the world of physics, which had once prided itself on being a discipline of observable phenomena. The New Physics dealt with the nearly infinite scale of the cosmos (the shape of which Cabrera debated along with Einstein and de Sitter in the pages of his articles) and studies that were now approaching the infinitesimal scale of the Planck length (1.6×10^{-35} meters), in effect invisible, making even the theoretical size of the proton (1.5×10^{-15} m), seem gigantic in comparison). Perhaps the best example of this ability to capture these extremes

³⁸ He does mention Democritus in his discussion of atomicity in his article “Proceso de extension del conocimiento” (p. 304) and makes a passing reference to Kant’s view of the universe in “Cosmogonía” (p. 225).

of size in the physical universe can be found in his article from July of 1931 “La imagen actual del universo, según la relatividad.”

Con esto doy por segura la medida de longitudes que alcanzan a ciento cincuenta mil años luz; pero como hoy se atribuye al radio del espacio mil cuatrocientos millones de estas unidades, el llegar a este número mediante observaciones localizadas dentro de tal sistema estelar es comparable a la investigación del radio de la Tierra estudiando una parte de su superficie algo menor que el área cubierta por el Madrid viejo. (40)

Seven pages later, a recurrence to the same analogy appears, this time with reference to the manner in which physicists were attempting to determine the shape of the universe.

Volvamos a recordar que estos atisbos de la configuración del Universo son comparables a deducciones que hiciéramos respecto de la forma de nuestro planeta sin más datos de observación que los obtenidos en una porción de su superficie no mayor que el área del Madrid viejo. (47)

While it could be argued that his continued use of the atom-as-miniature-solar-system (an analogy that appears in the majority of his articles) was out of date and derivative, this use of “Madrid viejo” as a point of comparison is wholly ingenious and achieves something that the other articles on physics written by foreigners could not: it brings the universe directly into a particularly Spanish frame of reference. It provides an identity, a point of connection for the readership that is not entirely abstract or unfamiliar, a move which would be emotionally satisfying for the reader, even as it confirms how impossibly small we are within the scope of the universe as a whole.

Blas Cabrera’s masterpiece within the *Revista de Occidente* is without a doubt his article from June of 1927, “Proceso de extensión del conocimiento”. The article is a discussion of scientific progress, including the theories of relativity and the (at the moment) brand new field of quantum mechanics, and how it is that scientists know what they know. Acknowledging the limits of perception, Cabrera enters into a polemic about the role of empirical observational data in a scientific world that has seemed to have transcended this very basic principle of the scientific method. He gives a summary on atomicity, starting with Democritus and ending with the still-unobserved, yet indirectly confirmed, existence of the proton and the electron, adding the caveat

pero bueno es advertir que nunca ha sido abandonado el sugestivo problema de interpretar los protones y electrones como irregularidades de un todo continuo, cuya misma definición formal no aparece clara. Sin embargo, todo anuncia en los días que corren, la posibilidad de una solución satisfactoria para este problema. Es muy interesante seguir la trayectoria del pensamiento filosófico a través de la evolución de la ciencia, pero solo nos interesa ahora el atomismo físico, según advertía. (304-05)

Once again, Blas Cabrera conforms to the needs of his reading public. Skillfully, he manipulates the discussion of atomicity into a forum for the new quantum mechanics, the advent of which he is the first to announce within the pages of the *Revista de Occidente*. He analyzes the two competing schools of thought: matrix mechanics (the aforementioned *Dreimännerarbeit* of Born, Heisenberg and Jordan) and wave mechanics (de Broglie and Schrödinger). He is very politic with his conclusions about which theory is the correct interpretation of quantum phenomena, but seems to come down lightly on the side of Heisenberg et al.:

Si he calificado de intentos de solución del problema fundamental de la ciencia de nuestros días a la mecánica cuantista y a la ondulatoria, dicho se está que he de conceder menos valor al modo como se ha empezado a buscar interpretación física a la función que define analíticamente las ondas de de-Broglie y Schrödinger. Quede apuntada aquí la noticia de su existencia y reservado su estudio para después. (“Proceso de extensión del conocimiento” 323)

Cabrera announces to the Spanish world that a whole new branch of physics is being illuminated, that there is a struggle for the correct interpretation of that event, but quietly leaves the matter open for debate, refusing to display any amount of dogmatism that would unduly influence the reading populace. It is this equanimity of presentation that truly sets Blas Cabrera apart as a popularizer.

One curiosity that stands out in Blas Cabrera’s work is worth mentioning. In the article “Los mundos habitables,” from December of 1929, Cabrera lays out in typical fashion his reasoning as to why the idea of finding other inhabitable planets is a near impossibility. Like Jeans, he uses the metaphor of the human life span to illustrate our youth and naiveté, newborns in not just the solar system, but cosmic infants, unparalleled in our lack of understanding and technology, completely incapable of reaching out beyond our own borders. Like Eddington, he considers the unique nature of humanity and the miracle of life and wonders at its presence in the universe. His tone is markedly different from that of the German popularizer Hans Thirring, whose extensive reasoning as to why we cannot reach other worlds ventures on the glib.³⁹ What is uncharacteristic, and for that reason especially poignant, is Blas Cabrera’s brief gesture to the indescribability of the human spirit, and its essentially mysterious nature. In four sentences he manages to summarize the enigmas of our existence, bringing physics and technology into contact with the ineffable soul of humankind:

Conocimiento del espíritu. He aquí un capítulo que juzgo en situación completamente distinta. Sabemos hoy de él poco más o menos lo que el niño de un par de días respecto de la telegrafía, la telefonía, la aviación, la estructura del átomo o la Mecánica ondulatoria. Acaso se trate de un problema verdaderamente insoluble, pero nuestros

³⁹ An example: after describing the problems of building a rocket ship that could transcend Earth’s gravity and actually make it into orbit, Thirring adds the following: “Y aparte de las dificultades técnicas citadas, ¿qué persona razonable podría soñar con instalarse en un montón de 2000 vagones de explosivo, para pegar fuego y abandonarse a la esperanza de volver con la piel sana?” Hans Thirring, “¿Se puede volar por el espacio cósmico?,” *Revista de Occidente* 49.146 (1935): 219.

juicios respecto a él tiene el mismo valor que los del niño con relación a la Física. (“Los mundos habitables” 414)⁴⁰

Blas Cabrera—subtle, precise and extremely effective in his prose—conveys a distinct appreciation of the importance of physics in the realm of human understanding. In addition, his elegance of style and succinct analyses glow with a certain optimism about Spain’s maturation in this particular field. His articles in the *Revista de Occidente* are a manifestation of a scientific culture in ascendance; however, many more scientists of similar stature as Blas Cabrera would be needed for Spain to truly be on par with the rest of Europe, and this project of intellectual integration would be curtailed by the Spanish Civil War.

Conclusion: Science, Language, Knowledge

It goes without saying that in 1936 this flowering in the sciences was abruptly cauterized, with the war effectively halting most investigation and discovery in the hard sciences. But it is undeniable that prior to the Spanish Civil War, Spain had experienced a significant renaissance in this area, and that people such as José Ortega y Gasset and Blas Cabrera were at the forefront of the movement towards the ideal of a modernized, European Spain. The *Revista de Occidente* provided a forum in which this ideal was given flesh and form through its diverse offerings of the most current scholarship in a variety of fields, including the physical sciences. Most importantly, the platform of the *Revista de Occidente* served as a space in which these disciplines could interact and enter into dialogue through their juxtaposition within the pages of the magazine itself. Readers who would perhaps not perceive the connection between physics and art or literature could find in its pages treatises on, for example, cubism’s connection with the theory of relativity, or stories such as Gómez de la Serna’s “El dueño del átomo”—a piece of short fiction that will appear in the last chapter of this study.

The very foundation of this interface, however, comes not in the form of thematic exploration, but rather within the realm of language itself. In a talk given in 1936, just before the initiation of the Spanish Civil War, Blas Cabrera discussed the imperative of finding language expressive of the new realities of science: new realities that had distinct consequences for the quotidian realities of human existence. Allow me to cite at length:

Es la lengua producto de la cultura toda de los pueblos que la hablaron, pues en ella va quedando el sedimento de la vida intelectual de las generaciones pasadas. Los diversos órdenes de ideas influyen en la medida de su intervención en la vida ordinaria...[S]ería error fundamental desconocer la contribución de las ciencias en la formación del arsenal de medios de expresión, para los sentimientos e ideas elaborados por la inteligencia. Téngase presente que en cuanto el hombre se sintió espectador de la naturaleza aspiró a interpretarla y comprenderla, utilizando las ventajas que de este conocimiento pudo deducir para mejorar su condición vital. De este modo nacen los diversos capítulos de la ciencia cuyas aportaciones al patrimonio cultural contenido en el lenguaje son

⁴⁰ Blas Cabrera, “Los mundos habitables,” *Revista de Occidente* 26.78 (1929). 414.

proporcionadas a la participación en que sus problemas afectan a los intereses y gustos de la humanidad, pues el lenguaje constituye a impulsos de la necesidad de comunicar las ideas que reflejan las preocupaciones individuales. (Cabrera and Bolívar y Urrutia 19-20)

....

Las nuevas ideas que brotan en un cerebro no quedan incorporadas a la ciencia hasta que han encontrado una descripción adecuada para ser comunicadas y reconocidas si vuelven a surgir. Se requiere para ello un lenguaje apropiado que frecuentemente necesita una elaboración difícil. La importancia de esta labor adjetiva pero esencial aparece con claridad meridiana si se compara la rápida evolución de la teoría relativista con la lentitud del progreso de la cuantista. Aquélla halló ya construído un lenguaje adecuado en el cálculo diferencial absoluto, mientras la última necesitó elaborar poco a poco su algoritmo propio que parece haber encontrado en el cálculo simbólico de la Mecánica ondulatoria. Acaso la inercia mental sea pura manifestación de este esfuerzo para hallar los modos adecuados para transmitir las nuevas ideas. Naturalmente, sus efectos alcanzan hasta el mismo lenguaje vulgar que, poco a poco, va precisando la significación de las palabras de uso corriente. (Cabrera and Bolívar y Urrutia 33-34)

The problem of language and the expression of new physical realities would later be taken up by Werner Heisenberg in his treatise on physics and philosophy, which we will discuss in Chapter Four. The preoccupation with language as it relates to science was a primary concern for the New Physicists that were revolutionizing the world, yet still struggling to express their daily findings in a way that wasn't either a distortion of the old language or rife with neologism. The effort to find new means of expression for the revelations of the New Physics was of great interest to all physicists, and we have seen this reflected in the content of the *Revista de Occidente* as it carefully juxtaposed content in a manner that proceeded to highlight the innovations in disparate fields and their shadowy analogousness.

Blas Cabrera's astute recognition of the inability of the common parlance to reflect the new realities being discovered in the sciences echoes the dissatisfaction with literary convention that called for new artistic idioms to explore the strange actuality of the twentieth century—thus the formal and linguistic experimentations of the Spanish *vanguardia*. This will be the topic of the coming chapters: how the newness of language and unfamiliar, wholly innovatory concepts in the hard sciences contributed to the renovation of form, content and expression in the realm of its conceptually polar opposite, literature. Language both follows and informs the times in which we live. In the case of Spain in the first third of the twentieth century, literary language became elastic, stretching to encompass a rapidly evolving culture of perpetual innovation in the world of *ideas*—scientific, philosophical, and artistic—a moment that was documented thoroughly in the diverse and eclectic run of the *Revista de Occidente*.

Chapter Three: Zones of Contact—Science as Culture in *La Gaceta Literaria*

Introduction: *La Gaceta Literaria* and the Spanish *vanguardia*

The emergence, dominance and eventual collapse of the Spanish *vanguardia* was a complex, polyphonic event, voiced through numerous periodicals whose proliferation came to signify the dynamism of the movement itself. Many of these magazines were extremely short-lived, but still influential in their promotion of the new poetics that gripped Spain in the 1920s. Most were dedicated nearly exclusively to literary topics, often being founded by the most eminent poets of the day—Gerardo Diego (*Carmen* and *Lola*), Federico García Lorca (*Gallo*), and Manuel Altolaguirre (*Héroe*, con Concha Méndez; *Litoral*, con Emilio Prados; and *Poesía*)—all issued magazines, albeit frequently regional in nature, and limited in scope to poetry and its concerns.¹

La Gaceta Literaria was not one of these small-press magazines. It was, comparatively speaking, a grand shout amid murmurs of the aesthetic revolution, which was well underway by the time of its first issue on the first of January, 1927. The *Gaceta* was uniquely suited to be the chronicler of the *vanguardia*: it had in its favor an amenable folio format, a bimonthly frequency of publication, and an avid readership already tuned into cultural issues, ready-made for its appearance and eagerly awaiting its arrival in all the major cities in Spain. Unlike the smaller magazines mentioned above, *La Gaceta Literaria* had no intention of limiting its scope to poetic events. And unlike the *Revista de Occidente*, it did not necessarily cater to a particular, well-educated elite. It was, to use a phrase in Spanish, “*al alcance de todos*”. And its scope, being wide enough to include within its pages a range of topics—literature, cinema, art, philosophy, psychology, sociology, and science—allowed for the creative interaction of fields traditionally kept at a distance from each other. One of the most notable interactions that occurs in *La Gaceta Literaria* is that of science and culture. In fact, it is safe to say that *La Gaceta Literaria* distinguished between these two categories only with regard to the sub-sections and titles that structured the magazine. For the *Gaceta*, science was a cultural event, part of a cohesive conception of human knowledge and creativity that undergirded the *vanguardia*.

In this chapter, I will examine in detail the way that *La Gaceta Literaria* expresses this vision of the interconnectedness of science and culture. I plan to explore what it is that makes *La Gaceta Literaria* unique, how it differs from the *Revista de Occidente* in terms of its exploration of science, and by what avenues it manages to arrive at its own definition of *ciencia*. By investigating not only the major themes of the magazine, but also the voices behind them, I hope to outline the ways in which science played an increasingly important role in cultural issues and production. I will show how this particular discourse gained political charge during the course of the *Gaceta*'s run, eventually coming to represent in itself the larger polemic of Spain's struggle to define its brand of modernity within the international context of, in particular, Europe, but also

¹ For a thorough list of the publications of the Spanish *vanguardia*, see Hildegard Hille Jeddloh Collins, *Indice analítico de La Gaceta literaria* (Austin: University of Texas at Austin, 1975) ix-xiii.

the Americas. *La Gaceta Literaria*, I contend, is unusually and uniquely representative of the cultural, epistemological, social, and political forces that were shaping a Spain that, at that moment, was in a state of ideological flux. Its influence exceeded the bounds of the merely aesthetic; *La Gaceta Literaria*, when taken as a whole, captures a large portion of this dynamic moment in Spain's history, when tradition clashed with innovation, and large ideological battles emerged that had been aching to be fought for decades.

La Gaceta Literaria: Form and Substance

La Gaceta Literaria appeared in 1927, at the moment when the formal experimentations of the Spanish *vanguardia* were reaching their peak. Born out of a spirit of collaboration and the need for a common forum dedicated exclusively (at least in theory) to literary interests, *La Gaceta Literaria* was immediately and warmly welcomed by the public both in Spain and abroad. The publication's second issue demonstrates its gratitude for the "acogida entusiasta del público" adding that its enthusiastic reception "agotó el 1^{to} de Enero su primera edición" ("*La Gaceta Literaria* agradece" 1). In spite of its auspicious beginning, its devoted readership, and its decided originality within the realm of Spanish letters, its critics would say that it was imitative of other European literary reviews such as Germany's *Der literarische Welt* or France's *Les nouvelles littéraires*, and surely it drew on such publications for inspiration;² still, what *La Gaceta Literaria* presented to its readers was a distinctly Spanish (if not to say Iberian) vision of the world of letters as it existed in that particular moment. And if the international literary presses were critical of *La Gaceta Literaria* for its supposedly derivative format, the editors of the *Gaceta* had enough grace to extend their appreciation to these foreign magazines for their role in publicizing the advent of their new (and soon to be quite influential) publication.³

La Gaceta Literaria had an approximately six-year run—not even half the length of the publication of the *Revista de Occidente*. The brevity of its existence cannot be attributed to any of the usual culprits for the cessation of publication—a decline in funding, a paucity of substance—but rather to its peculiar historical circumstance. *La Gaceta Literaria* came into existence at a moment in history when great shifts were about to occur; within its six year lifespan, the publication witnessed the toppling of the Primo de Rivera dictatorship, the complete overthrow of the monarchy, and the installation of the Second Republic in Spain. Such political upheaval does not come to pass without the presence of internal unrest and disquiet, even within the self-proclaimed apolitical⁴ space that belonged to the *vanguardia* in the late 1920s.⁵ As it

² For a discussion of the purported imitative quality of *La Gaceta Literaria*, see Miguel Angel Hernando, *La Gaceta literaria, (1927-1932): biografía y valoración*, Colección Castilla (Valladolid: Universidad de Valladolid, Departamento de Lengua y Literatura Españolas, 1974) 11-13.

³The editors mention explicitly (among those publications issued outside of Spain) "*O mundo y Diario das Noticias*, de Lisboa. *La Nación*, *Carátula* y otras letras argentinas. *Suplemento del TIMES*, *Comoedia*, *L'intransigent*, *La Fiera Letteraria*, *Corriere della Sera*, *Le Opere e I giorni*, *Pensiero*, *Litterarische Welt*, *Berliner Tageblatt*, y otras publicaciones, que rogamos excúsenos su mención por falta de espacio, pero no de conmovido recuerdo." Anonymous, "*La Gaceta Literaria* agradece," *La Gaceta Literaria*.2 (1927): 1.

⁴ This "apolitical space" was not universal to the *vanguardia*; José Díaz Fernández is a notable exception, along with the magazine *Post-Guerra* (1927).

happens, between the years of 1927 and 1932, Spain would find itself increasingly polarized between Left (the anarchists, socialists, communists, and the umbrella category of “Republican”) and the Right (the traditional monarchists, the CEDA [*Confederación de Derechas Autónomas*], as well as most of the military), and the embryonic fascist party stirring the pot with the hopes of creating a situation that would allow for the rise of a singular figure in the style of Mussolini, one who would create a Nationalist form of government, unified under one leader. It is this dynamic that we see reflected within the pages of the *Gaceta Literaria*, as it moved from being the voice of an aesthetic movement, to espousing the single view-point of its founder, Ernesto Giménez Caballero, a supporter of the fascist movement in Spain, who would become a card-carrying member of the Falange.⁶ When taken as a whole, the trajectory of *La Gaceta Literaria* serves as an eerily accurate portrait of the Spain of its day, not just in its coverage of artistic trends, movements and ideals, but also with regard to the churning and shifting political environment in which it functioned.

Ernesto Giménez Caballero is the figure to whom we must turn in order to understand how it is that the *Gaceta Literaria* reflected so clearly the turbulence of the years 1927-1932. Giménez Caballero is at best a contradictory figure, at once participating fully in the complex aesthetic of the *vanguardia* (for example, with his surrealist-inspired work, *Yo, inspector de alcantarillas* [1928]) and consistently proclaiming the political neutrality of *La Gaceta Literaria*—even after that purported stance had become a mere fiction—while at the same time, clearly espousing a program of cultural nationalism and earning the reputation, not unwarranted, for being at the very least an admirer of Italian fascism under Mussolini, if not an overt fascist entirely (the magazine being published in the years before the official founding of the Falange in 1933). Enrique Selva, in his book *Entre la vanguardia y el fascismo* states the following regarding the possibility of neatly summarizing Ernesto Giménez Caballero’s political disposition: it was “saturado de tropiezos, piruetas y saltos mortales, y, en relación con esa circunstancia, parece fútil aprehender en una síntesis coherente un pensamiento político muchas veces contradictorio y escasamente sistemático en su exposición” (17). And in his editorial introducing a special issue of the magazine *Anthropos* dedicated to Ernesto Giménez Caballero,

⁵ *La Gaceta Literaria* proved itself to be quite aware of the dissociation between the *vanguardia* and the political world, as its volatile survey “Política y literatura”, published late in 1927, attests. The most ardent response to the question “¿Debe intervenir la política en la literatura?” in this survey by *La Gaceta Literaria* was written by César M. Arconada, who stated as a response: “No. No. No. Rotundamente. La literatura es ocio, fantasía, inutilidad. Es decir, lo contrario de la política, que es utilidad y realidad.” Considering that Arconada would later become a voice for the politicization (rehumanization) of literature on the side of the left, his comment here is quite significant and gestures towards the fragility of the *vanguardia* as a movement of any duration. Thus the *Gaceta* showed even in its early years an undeniably political disposition towards its literary subject matter. “Política y literatura: Una encuesta a la juventud española,” *La Gaceta Literaria*.25 (1928): 3.

⁶ The “card-carrying” epithet is not meant as a cliché in this case; Ernesto Giménez Caballero was indeed the possessor of a membership card of the Falange, whose number was five, signaling his extremely early commitment to the Falangist movement. Douglas W. Foard in his book *The Revolt of the Aesthetes* questions the veracity of this claim by Giménez Caballero, saying that due to his appointment to Franco’s Grand Council as Vice-Secretary of National Education, “[it] is likely... that the Falange ‘membership card number five,’ which he so proudly held, was not issued in 1933 at the time the Falange was founded, but in 1937, when it was re-organized by General Franco. Douglas W. Foard, *The Revolt of the Aesthetes: Ernesto Giménez Caballero and the Origins of Spanish Fascism* (New York: P. Lang, 1989) 216.

Ángel Nogueira Dobarro asks a simple question: Who was Ernesto Giménez Caballero?, and finds no simple answer: “Un fascista, un personaje curioso, un vanguardista, según el talante de cada crítico. Pero en realidad se trata de mucho más que todo eso: es un creador cultural, todo un hombre de pensamiento y agallas juveniles, capaz de encender el fuego en España” (7). This “fire in Spain” was ignited not only by Giménez Caballero’s controversial works such as *Genio de España* or *Circuito imperial*, both nationalist to the extreme; rather Giménez Caballero’s most incendiary moments are found in what would become his own personal megaphone for his political stance and agenda, *La Gaceta Literaria*.

That being said, it must be noted that if *La Gaceta Literaria* echoes the reality of its time, this is principally due to the fact that the path tread by Giménez Caballero was paradigmatic in its own way of the polarization that characterized Spain after the fall of the short-lived “*dictablanda*” of Primo de Rivera’s successor, General Berenguer, and the advent of the Second Republic. Giménez Caballero began his magazine out of joy in the aesthetic, finding a welcoming group of collaborators who would gladly participate in the celebration of this exemplary moment in Spanish art.⁷ He ended the magazine as *El Robinsón Literario*, abandoned by the overwhelming majority of his contemporaries and former colleagues due to his conversion of *La Gaceta Literaria* into an increasingly political publication, given to celebrating the fascist ideology. While most of the *vanguardia* moved to the Left, to side with the newly formed Republic, Giménez Caballero chose to split with his former colleagues, instead advocating a strange mix of Marinettian aesthetics and Nationalist principles of country, Catholicism and tradition, preferably beneath a strong, centralized government led by a Mussolini-like figure, who had yet to appear, and was not to be found among the current leading figures of the Spanish intelligentsia, such as Ortega y Gasset.⁸ Giménez Caballero would stand virtually alone—with a few notable exceptions, such as his continued relationship with Eugenio d’Ors and Ramiro Ledesma Ramos. The critic Miguel Ángel Hernando notes that the polarization that showed itself so dramatically in *La Gaceta Literaria*, in particular in the issues titled *El Robinsón Literario de España*, was a symptom of a larger disease that was weakening the newly formed Republic and dividing the intelligentsia:

Cuanto más nos acercamos a 1936, la polarización hacia ideologías revolucionarias se hace cada día más evidente, hasta llegar a una contienda en la que los del 98, excepto [Ramiro de] Maeztu, tomaron partido por la República, consecuentes con su tradición liberal. Los de la generación de Ortega se sitúan al margen, únicamente Eugenio d’Ors es activo falangista y se pronuncia por ‘La Marsellesa de la autoridad’. Y serán los jóvenes

⁷ Included in the list of collaborators was the iconic (Vanguardist/Avant-garde) literary critic Guillermo de Torre, who was the original secretary of *La Gaceta Literaria*, and whose writings about the European *vanguardia* were essential to the continuance of the movement in Spain. See Guillermo de Torre, *Literaturas europeas de vanguardia* (Madrid: Caro Raggio, 1925).

⁸ In Giménez Caballero’s own words, in the first *Robinsón Literario de España*: “Yo no creo que Ortega sea nuestro Mussolini. Ni que la situación actual tenga la apariencia de un fascismo. Pero, indudablemente, pudiera ser ésta la hora mediterránea de España, y Ortega su profeta. (Si no se hunde todo en el caos o en la cursilería: en una España balcánica.)” Ernesto Giménez Caballero, “El discurso de Ortega,” *La Gaceta Literaria*.112 (1931): 6.

quienes participan directamente, la mayoría desde el lado liberal, antes de expatriarse. (*Prosa vanguardista en la generación del 27* 51)

Thus, in Giménez Caballero, we have a figure of principal importance to two highly contradictory movements: the perfection of the dehumanization of art that reached its pinnacle in the celebration of Góngora in 1927, the celebration itself receiving plenty of space in the pages of the paper's eleventh issue; and also the "rehumanization" of art that took place when art became compromised politically as the desire for a new Republican form of government gained momentum in Spain. This eventually resulted in the fall of the Primo de Rivera dictatorship, approximately three years following the initial issue of *La Gaceta Literaria*, the magazine that captured so vividly the internal fractures of the intelligentsia that would set a course toward the national tragedy, the Spanish Civil War.

La Gaceta Literaria: Début

In bold letters and with bold words, *La Gaceta Literaria* announced its appearance on the artistic horizon on the first of January, 1927.

La Gaceta Literaria
ibérica: americana: internacional
LETRAS—ARTE—CIENCIA
Periódico quincenal (1 y 15 de cada mes)
DIRECTOR-FUNDADOR: E. Giménez Caballero
SECRETARIO: Guillermo de Torre

An analysis of the first page of the *Gaceta* is essential to understanding its initial formulation as, in the words of the "Salutación" and repeated in the accompanying introductory article by José Ortega y Gasset, "*un periódico de las letras*" ("Salutación" 1). The "Salutación", located at the very center of the page, does not list an author (presumably Guillermo de Torre, Giménez Caballero, or a collaborative effort of the two), but proudly declares the mission of *La Gaceta Literaria*:

La Gaceta Literaria se presenta a la vida dispuesta a tres afirmaciones: una, hacia el pasado. Otra, hacia el presente. Y hacia el porvenir, la otra.

La afirmación hacia el pretérito es de color sentimental, español y respetuoso. Quiere recoger el esfuerzo, bello y magno, que una generación paternal tendió al aire de la Península en 1915, al fundar la inolvidable revista *España*. Aquella generación, timoneada por D. José Ortega y Gasset, que recogía, a su vez, el esfuerzo de la otra, cíclopea, del 98. Frente a aquel *Fígaro* romántico, en cuyo programa se presentaba España—un campanario en el yermo—llena de enojo y esperanza, quiere oponer *La Gaceta Literaria* su fe y su gozo en una geografía ideal cruzada por un ideal viaje. Una geografía donde no se tema al Diccionario, y, donde los límites, alcancen de América al

Pirineo, pasando hasta por ese rincón histórico de los sefardíes. La afirmación de *La Gaceta Literaria*—1927—hacia el pasado es la de enlazar 1898 y 1915. Y bogar adelante.

Su afirmación en el presente es de carácter editorial. Existía en el mundo (Europa), desde hace unos pocos años, el tipo del “periódico de las letras”, nuevo organismo intelectual creado por la post guerra, en su afán multitudinario de popularizar la alta cultura de la “*Revista*”, y de acercar eficazmente a autores, editores y lectores. Francia, Italia, Inglaterra, Alemania poseíanlo ya. Faltaba nuestra área hispánica. *La Gaceta Literaria* intenta hoy cuajar ese hueco ibérico e incorporarse a la tipicidad mundial, europea.

Por último: la afirmación tercera de *La Gaceta Literaria*, tendiendo hacia un futuro—de ignota cercanía—es de calidad ideal. ¿Qué contenido habrá de tener tal futuro? España—creemos—ya no deberá pegarse en los carteles con el campanario de *Fíguro* a la espalda. Ortega y Gasset, en su botella de champán sobre nuestra nave, lo ha exclamado: ¡Fuera provincianismo! En efecto: la tercera afirmación de *La Gaceta Literaria* es la de querer ser ibérica, americana e internacional. (“Salutación” 1)

Several trends announce themselves here that are extremely significant—the first being that the editors of *La Gaceta Literaria* did not declare an open and/or violent rupture with the recent past, as would be, perhaps, typical of an avant-garde publication, although it did invoke the specter of the Romantic figure *par excellence*, Mariano José de Larra’s disquieted alter ego, *Fíguro*.⁹ *La Gaceta Literaria* “opposes” this desolate and isolated figure, choosing instead to adopt as its foundation the literature and ideas of the Generations of 1898 and 1915, which, while still possessing quite a bit of both the themes of desolation and isolation (especially the Generation of ’98), are decidedly post-Romantic and imbued with a particularly original awareness of the “problem of Spain.”¹⁰ *La Gaceta Literaria* situates itself historically, as participating in a

⁹ This positioning that pits the Avant-garde against Romanticism is not atypical. For a discussion of the attitude of the Avant-garde towards past or passing generations of trends in art, especially with regard to the Avant-garde’s assessment of Romanticism, see Chapter 3: “Romanticism and the Avant-garde” in Renato Poggioli, *The Theory of the Avant-Garde*, trans. Gerald Fitzgerald (Cambridge, MA: Belknap Press of Harvard University Press, 1968) 42-59. In addition, in Ortega y Gasset’s classic work *La deshumanización del arte* (1925), Ortega positions the “new art” as being in direct contradiction to the Romantic aesthetic; it is in the spirit of the formulation of this opposition that the editors of *La Gaceta Literaria* declare their existence. Ortega states that “El ejemplo de la irrupción romántica que suele aducirse fue, como fenómeno sociológico, perfectamente inverso del que ahora ofrece el arte... El romanticismo ha sido por excelencia el estilo popular... En cambio, el arte Nuevo tiene a la masa en contra suya y la tendrá siempre. Es impopular por esencia; más aún, es antipopular.” José Ortega y Gasset, *La deshumanización del arte y otros ensayos de estética*, 6th ed. (Madrid: Austral, 1999) 48-49.

¹⁰ This highlighting by the editors of *La Gaceta Literaria* of the importance of the generation as a fundamental concept of literary history (and history in general) can be directly attributed to the work of José Ortega y Gasset. In Ortega’s book *El tema de nuestro tiempo*, he designates the Generation as being the most pivotal and important organizational concept of our time. Ortega defines the generation in the following manner: “...cada generación representa una cierta actitud vital, desde la cual se siente la existencia de una manera determinada. Si tomamos en su conjunto la elevación de un pueblo, cada una de sus generaciones se nos presenta como un momento de su vitalidad, como una pulsación de su potencia histórica. Y cada pulsación tiene su fisonomía peculiar, única; es un

dialogue with past, present and future, and does not declare itself independent of its predecessors; instead, it openly proclaims itself as the offspring of past literary ventures, whose traditions it will incorporate as it moves into the virgin territory of a new era.

The second theme of note is that, along with defining itself within an historical context, it also defines its geographical placement, where “geography” is less a physical reality, and more an intellectual and linguistic topography—a delineation of the regional discourses with which it will engage itself as *La Gaceta Literaria* seeks to break form with more traditionally isolationist (isolating?) postures within Spain. This is where the subtitle of the magazine—*ibérica, americana, internacional*—asserts its importance; it is a topic that would continue to develop throughout the course of *La Gaceta Literaria*’s run; and these three categories, proudly and honestly proclaimed, are rife with ideological nuance and political implications. They are also categories that seek to respond to a specific polemic about Spain’s position within Europe and the world, not just in terms of its cultural production, but also regarding its supposed “backwardness” and struggle for modernity. *La Gaceta Literaria* did not propose as its goal to be “merely Spanish”—it would address Spanish letters, surely, but within the much broader context of both Europe and Latin America. The cry of “¡Fuera provincialismo!” expresses this desire to usher Spain into an era of regeneration and renewed contact with the outside world, whereupon its art could finally be evaluated and appreciated on equal footing with other, more dominant national literatures.

Significantly, it is Ortega y Gasset who issues this cry against provincialism; his article, “Sobre un periódico de las letras”, appears alongside the “Salutación” on that initial page (“Sobre un periódico de las letras” 1). Ortega declares that “...Es ya necesario, ineludible que exista un *periódico* de la literatura española—literatura en el sentido más amplio, española en un sentido enorme” (1). Thus, when we examine this statement alongside the idea of *provincialismo* that we encountered in the “Salutación”, we can see that the subtitle of *ibérica—americana—internacional*, for Ortega, means that Spanish letters will cease to be confined to a space within its politically- and geographically-drawn boundaries (which would keep it as a “provincial” phenomenon) and appeal to an exceptionally larger community whose boundaries are less clearly defined—that of the linguistic plurality of a type of Universal Iberian Citizen that he subtly constructs. He continues:

De esta suerte, podrá esta hoja... contribuir a la mayor y más urgente empresa, que es: curar definitivamente a las letras españolas de su pertinaz provincialismo. Provincialismo es angostura, frivolidad y pequeñez de radio moral. Madrid, Barcelona, Lisboa, Buenos Aires se reparten diversos atributos de la mente provincial. Y si esto fué siempre deplorable hoy equivaldría a una deserción. Pues todos los signos auguran que cae sobre las letras españolas una nueva y magnífica responsabilidad.

Las otras grandes unidades de cultura comienzan a fatigarse: tres siglos de esfuerzo continuado por fuerza embotan las retinas que han permanecido de hito en hito fijas en

latido impermutable en la serie del pulso, como lo es cada nota en el desarrollo de una melodía.” José Ortega y Gasset, *El tema de nuestro tiempo*, Colección Austral, 21 ed. (Madrid: Espasa-Calpe, 2003) 63.

los mismos temas. Todo el que sepa leer entre líneas y oír entre palabras percibe esta situación. El relativo descanso de España, la mocedad de nuestra América tienen que ser la fuerza de reserva que acude a la brecha. Tenemos que pensar y escribir, no sólo para la ciudad, sino para el orbe. Es hora, pues, de sacudir los restos de provincialismo y montar las almas en más prócer disciplina. Hay que resolverse a pensar y a sentir en onda larga.

Por este motivo me parece tan acertado el afán que esta *Gaceta* declara, de dilatarse hasta los confines de la Gramática y aun de prestar su resonancia a las lenguas más próximas. Es cosa probada: uno de los factores decisivos que regulan las costumbres de una población es el número de sus habitantes. Cuando éste pasa de dos millones, la ciudad queda inmunizada al provincialismo. Lo mismo en la villa literaria. Si Madrid, Barcelona, Lisboa, Buenos Aires llegan, en efecto a sentirse barrios de una gigante urbe de las letras, neutralizarán mutuamente sus provincialidades íntimas y vivirán y trabajarán con radio ecuménico. Esto es lo único que merece la pena. (“Sobre un periódico de las letras” 1)

Ortega interprets the theme of “*ibérica—americana—internacional*” as more than a goal, more than a desire. It is a nearly moral imperative, a way for the diverse populations of the Spanish-speaking world to find unity; in addition, it is clear that even “Spanish-speaking” is a limiting idea, as Ortega directly implies that Portuguese- and Catalan-speaking peoples are to be included in this belletristic empire (to use a word that would surely be objectionable to Ortega, but perhaps not to Giménez Caballero.) The goal, therefore, of the *Gaceta Literaria*, would be an ambitious one: to create a publication that would express a trans-national unity of literary production, critique and analysis that would assert itself on the world stage, restoring power and recognition to literature in Spanish, Portuguese, Catalan and Galician.

It is important to note that Ortega gave his blessing to the newly formed *Gaceta Literaria*, and then promptly disappeared, almost completely, as a contributor to the magazine. There would be two more articles authored by him in the *Gaceta*, both published within the first eighteen months; his name would appear countless times within the writings of other contributors, which serves to reason, considering his status as a species of godfather to the younger generation of the *vanguardia*.¹¹ Rather than entangle himself with this new journalistic venture, Ortega preferred to present it to the world, and then return to his own intellectual projects, such as the *Revista de Occidente*, which still dominated the world of Spanish periodicals as the premier communicator of intellectual advancements in Spain and the rest of

¹¹The relationship between Ernesto Giménez Caballero and José Ortega y Gasset is complex; throughout the 1920s and early '30s, Giménez Caballero expressed a profound admiration for Ortega's philosophy, especially his treatises on the problems facing Spain as delineated in *España invertebrada*. But after his “conversion” to fascism that occurred following his trip to Italy in 1928, Ortega's publications (if not his ideas/ideals) began to strike him as being too “liberal” and oriented towards the international community (For a thorough discussion of the effect of Giménez Caballero's trip to Italy in 1928, see Chapter 4, “Conversion in Rome” in Foard.) Despite Giménez Caballero's interpretation of Ortega's positions, Foard states that “Ortega was not an internationalist... He did believe, nevertheless, that for too long Spain had been ignorant of, or uninterested in, the most important advances in western culture.” There is, apparently, no simple diagnosis as to the nature of Giménez Caballero's estimation of Ortega; it is a topic that requires further investigation, a subject for a future project. Foard, *The Revolt of the Aesthetes: Ernesto Giménez Caballero and the Origins of Spanish Fascism* 43-44.

Europe. *La Gaceta Literaria* would leave the exposition of these “great ideas” to the *Revista de Occidente*. It did not have ambitions to become the voice of European ascent and exaltation of the intellect. The *Gaceta* did not wish to participate in the creation of a more Europeanized Spain through the publication of articles from beyond its borders, as was the goal of the *Revista de Occidente*. The focus of the *Gaceta* was rather the elaboration and expression of the current voices, literary and otherwise, erupting in Spain at the time, desiring to be the principal forum for the New Art. It would not be anything like the *Revista de Occidente*, except perhaps in the sense that many of the authors writing for the magazines were shared between them—writers such as Cesar M. Arconada, Benjamin Jarnés, E. Salazar y Chapela, Eugenio Montes, Juan Chabás, Eugenio d’Ors, Antonio Espina, as well as many of the poets known as the *Generación del ’27*—for example, Rafael Alberti, Pedro Salinas, Federico García Lorca, and many others.

As previously mentioned in the quote from Enrique Selva, Giménez Caballero’s positions towards his subject matter (all his subject matter) are full of pirouettes and about-faces; coherence and consistency are not his strong suit. Even the unifying signifier of “fascist ideologue” weakens at certain moments, especially when one considers that he proclaimed the political neutrality of *La Gaceta Literaria* until it was impossible to further promote that deceptive, and transparently false, stance. In the pages that follow, we shall visit some of these complexities and subtleties of his argument, as we find them evidenced not just in the subtitles of the magazine, but in the columns themselves, where the proclamation of “*ibérica, americana, internacional*” acts as a directive for the substance of the publication in general.

“*Ibérica*”: certainly, this particular focus cannot be questioned, especially in the light of Giménez Caballero’s efforts to include Catalan, Galician and Portuguese literatures within the pages of the *Gaceta*. This Pan-Iberian vision cannot be regarded as any sort of “internationalism”, with regard to Giménez Caballero’s attitudes towards the objectives of the *Gaceta*. “Internationalism”, as defined by its historical and literary context can best be understood as “Europeanization”, a desire espoused by many of his philosophical forerunners, Ortega y Gasset being the prime example. Giménez Caballero decried this notion as being one of the sources of Spain’s incapacity to realize her own greatness; still, he did not come down on the side of Unamuno, either, who called not for the Europeanization of Spain, but for the *españolización* of Europe.¹² Giménez Caballero’s approach to the revitalization of Spain was never consistent, but it clearly relied on the concept of Spain possessing a unique spirit, its own *genio*, to use a word oft-repeated by Giménez Caballero, that was an immense source of power, and that with a strong sense of Nation and State at the fore, Spain could reassert its vitality and relevance on both the European and American fronts.

Giménez Caballero’s goal regarding the adjective “*ibérica*” to describe his magazine was therefore an ambitious, nearly utopian pronouncement of a profound alliance. As Ángel Nogueira Dobarro notes: “Se advierte su propósito profundo: unir, enlazar una generación con otra, ensamblar, fundir América, Europa, Roma, Portugal, encontrar en cada espacio la huella, el aliento de la vida sembrada por España” (7). Finding the traces of Spain in the internal composition of other nations is a far cry from the Ortegian internationalism—or better, anti-

¹² See Foard, citing Unamuno’s classic treatise *En torno al casticismo*, (1902). Foard, *The Revolt of the Aesthetes: Ernesto Giménez Caballero and the Origins of Spanish Fascism* 98.

provincialism—that we find in the inaugural article “Sobre un periódico de las letras”. The new Iberia that Giménez Caballero proposes (with the blessing of Guillermo de Torre, as we shall see) is not rooted in any spirit of international cooperation, but rather comes as an assertion that Spain’s unique political, historical and cultural circumstance have left indelible traces in the national constitutions of its neighbors (Portugal, Italy and, arguably, Cataluña) and its offspring (Latin America, in particular, Buenos Aires) and that *La Gaceta Literaria* could serve as a means to detect, amplify and perfect those *huellas*, and find in them a source for Spain’s resurgence as not only a touchstone for all Hispanic cultures, but as an argument for Spain’s superiority in these matters as well.

As Giménez Caballero would have it, the melding of cultures would serve as a life-saving transfusion for suffering Spain, which at all costs, needed to return to its former glory under *los Reyes Católicos*, as he would comment in his work *Circuito imperial* and *Arte y estado*. For example, discussing El Escorial in *Arte y Estado*, Giménez Caballero utters a manifesto of “*españolidad*” that can be found embodied in the architecture of the palace. He writes:

El ideal de un individuo, de un pueblo, de una cultura, solo es *voluntad de ser* plenamente lo que se es. El ideal que se lleva dentro es el que se proyecta fuera y al que se deben tender los brazos como el escalador de Alpes tiende sus dedos crispados por las juntas de los amenazantes peñascos, hacia arriba.

Quien vea de una mirada clara, simple, elemental—sin complicaciones meditabundas—, El Escorial, ha visto lo que “es” España. El *Estado* de España. Lo que quiso ser desde los tiempos románicos e imperiales de Alfonso X el Sabio (siglo XIII) hasta los Reyes Católicos: hasta Carlos V.

¿Acaso no se sabe que la primera preocupación de Felipe II—tras la primordial de *centrar* su mando en el centro de España, que era ése; y en el centro del mundo, que era ése (entre Europa y América)—fue aquella de centrar también bajo el altar mayor los muertos de su dinastía?

...

El Escorial no es un *tratado*, no es un *ensayo filosófico*, sino un resultado: un *estado* que fue, mientras ese estado se sintió *estante*, sostenido en vilo por una voluntad de plenitude. ¡Llega a ser lo que eres, España! He ahí: El Escorial. (“Arte y estado” 234)

Ernesto Giménez Caballero’s Iberia is a search for a quintessence of Spain, the elevation of that essential element, and using it to unite a diverse body of people under a banner proclaiming the uniqueness of the Spanish cultural zone.

Giménez Caballero showed a distinct preoccupation with the rest of the Iberian Peninsula, and actively began to create a program of Pan-Iberian integration that would be inclusive of all the peninsular languages and literatures—in particular, Catalan literature, but extending as well to Portuguese literary production, and also works in Galician, not to mention

Giménez Caballero's fascination with the Sephardic Diaspora which spawned its own subsection in the *Gaceta* titled "Judíos", and later, entire pages of the publication designated as *La Gaceta Sefardí*.¹³ Giménez Caballero busied himself with the "Exposición del libro catalán" in 1928 and later, the less-successful "Exposición del libro portugués". It is likely that the festivals themselves were not neutral celebrations of literature, but, coming as they did after Giménez Caballero's conversion to fascism, were perhaps more oriented towards fostering a sense of national identity—a unity-in-diversity program, that had as its endpoint the goal of a culturally (if not politically) unified Iberian peninsula.

On the other side of the Atlantic, the connection with the Americas was almost immediately fraught with controversy, mostly due to an article written by the *Gaceta's* founding secretary, Guillermo de Torre. The author of *Literaturas europeas de vanguardia* was one of the stronger influences in the career of Giménez Caballero, and it was, quite possibly, this close association with de Torre that prompted the recognition of the need for a dedicated literary forum, and thus the launching of *La Gaceta Literaria* two years after the release of his landmark work.

Guillermo de Torre, después de describir el estrecho contacto que mantuvo con Giménez Gaballero en los días de gestación del periódico, ve así el nacimiento de *La Gaceta*: "Si no sonara demasiado atrevido, osaría decir que el germen, el ímpetu inicial, venía de más atrás: le fue dado por mis *Literaturas europeas de vanguardia* (1925), libro que en [sic] Ernesto descubrió horizontes antes insospechados." (Collins viii)¹⁴

De Torre was secretary of *La Gaceta Literaria* until August of 1927, at which point he left Spain for Latin America in order to marry Norah Borges. He would be one of the principal contributors to the section dealing with Latin American letters, especially the surging literary scene in Buenos Aires and continued to write for the magazine as a correspondent, but he no longer belonged to the editorial board that directed the *Gaceta*.¹⁵

It was not without first igniting ardent controversy that Guillermo de Torre departed for Latin America. In the eighth issue of the *Gaceta Literaria*, he wrote an article titled "Madrid, meridiano intelectual de hispanoamérica" which spoke disparagingly of the tendency of the people of Latin America to view other European cities, in particular Paris, as being their main cultural referent. He argued instead that it should be Madrid that carried that particular distinction for the Spanish-speaking world, as would be both linguistically and culturally appropriate. Foard summarizes de Torre's argument neatly: "The author scolded Latin America for sending its sons to Paris for their education and cultural enrichment instead of Madrid. It even alleged that the phrase 'Latin America' was a French invention which denigrated Spain's role in the formation of the New World's civilization" (79).

¹³ Interestingly enough, not a single article was ever published in the Basque language, and significantly, publications in the other Peninsular languages diminished greatly as Giménez Caballero's dedication to Spanish nationalism and the fascist cause increased.

¹⁴ The citation within the quote is from Guillermo de Torre, *El espejo y el camino* (Madrid, 1968) 293-294.

¹⁵ For a complete cataloging of Guillermo de Torre's contributions to the *Gaceta Literaria*, see Collins, *Indice analítico de La Gaceta literaria* 158-60.

The reaction from Latin America was fierce, especially in the magazine *Martín Fierro*, which argued that Buenos Aires, in actuality, served as this “cultural meridian” of Latin America, which had definitively thrown off the cultural imperialism of its erstwhile-colonizer.¹⁶ Neither Guillermo de Torre nor Giménez Caballero was seeking to reinstate Spanish dominance in the region; they were more interested in tearing down the pedestal upon which French and other northern European cultures had been placed after the colonial revolutions in the early 19th century. The tensions between the *Gaceta Literaria* and other Latin American cultural institutions proved to be short-lived, and the *Gaceta* continued to develop its readership in urban areas, especially Buenos Aires, where the presence of Guillermo de Torre served as a self-generating source of promotion.¹⁷ With regard to the “Americana” content of *La Gaceta Literaria*, a quick glance at an index of the magazine (such as Collins’ exhaustive doctoral thesis), or a cursory overview of the three volumes that comprise the Topos Verlag reprints of the magazine themselves, shows that *La Gaceta Literaria* did indeed have a healthy portion dedicated to literary production in Latin America (or Hispano-America, as Guillermo de Torre and Giménez Caballero would have it), going so far as to create a subsection called the *Gaceta Americana*, which began in number 49 and was headed by Guillermo de Torre and Benjamín Jarnés (Mainer 43). The *Gaceta Americana* appeared with some frequency, and was usually allotted an entire page; an entire issue is devoted to the state of Uruguayan letters. De Torre also offered an occasional section called “Lo que dicen los editores bonaerenses”, and almost every issue carried a review of current periodicals (mostly magazines) from Latin America. Considering this amount of coverage of American affairs, it can be said that Douglas W. Foard’s assertion that “the ‘international’ aspect of the *Gaceta* was allotted an insignificant amount of space except for a very specific category of contributions” and that “only the occasional articles... and de Torre’s frequent attempts to contribute something to the ‘American’ columns of the *Gaceta* redeemed the journal’s inaugural pledge of encompassing all literature ‘from America to the Pyrenees’” is, in my opinion, misleading (79). True, the international content provided by *La Gaceta Literaria* was not done in the spirit of authentic international exchange—if there is such a thing; but the international content of the *Gaceta* is frequently downplayed by critics in an attempt to make their case for Giménez Caballero’s nationalistic project that dominated the *Gaceta*’s later years. And let us not forget the “Postales”, a section that included impressions from a variety of writers in their travels across Europe and Latin America. Again, these were not necessarily written in accordance with the project of the Europeanization of Spain—if anything, they have the tendency to put these other nations, peoples, and cultures at the periphery of a Hispano-centric worldview, or at the very least to be highly contrastive with Spanish culture, thus painting a distorted picture of the world(s) surrounding Spain. Such things notwithstanding, while Giménez Caballero did privilege Spanish culture and politics, and definitely promoted Spanish nationalism, he did not exclude, eliminate or otherwise censor international content. He simply shaped it according to his own personal vision of Spain’s place in the world. This was Ernesto Giménez Caballero’s brand of nationalist internationalism (to use

¹⁶ See the following article for the complete reaction to “Madrid, meridiano intelectual de hispanoamérica: Campeonato para un meridiano intelectual,” *La Gaceta Literaria*.17 (1927): 3.

¹⁷ See discussions by Foard and Hernando on the effect of Guillermo de Torre’s presence on circulation of the *Gaceta Literaria* in Latin America.

an oxymoron that is still somehow accurate). Suffice it to say that *La Gaceta Literaria* was at the forefront of a much larger polemic involving Spain's stance towards modernization, modernity, and its role on the world stage. The players who will become involved in this dynamic are an intriguing pair: Giménez Caballero's sometime political inspiration, José Ortega y Gasset, and his political protégé, the *Gaceta's* columnist for both science and philosophy, Ramiro Ledesma Ramos.

La Gaceta Literaria: Physical Spaces, Conditions and Limitations

Let us turn now to a discussion of *La Gaceta Literaria's* physical form, the implications of that form, and at last bring to light the role that the *Gaceta* had as a promoter of scientific content within its reading public. The *Gaceta* was an entirely new organ for the *vanguardia*; in some ways, it could be said that the exigencies of its format shaped its dynamic, independent of the desires and declarations of its founder. *La Gaceta Literaria* was essentially a newspaper, folio-sized, confined to around seven pages per issue, published on the first and fifteenth day of each month. Its space was strictly limited, and became even more so when control of its publication was handed over to the C.I.A.P. (*Compañía Ibero-americana de Publicaciones*) in 1929, and Pedro Sáinz Rodríguez became co-director. By 1930 its physical area had been reduced, but its pages actually doubled to make up for the change in format, and thus the amount of content remained virtually unchanged—until, of course, Giménez Caballero began to lose his collaborators, at which point we start to note an attempt to fill empty space with advertisements for upcoming articles, local bookstores, and many more graphics, as well as the increased spacing between lines in the majority of the articles. Says Hernando of the aftermath of the takeover of the *Gaceta Literaria* by the C.I.A.P.: “Se redujo el formato a la mitad y aparecen colaboradores y temas antes ajenos al espíritu de la publicación” (*La Gaceta literaria, (1927-1932): biografía y valoración* 24).¹⁸ On the other hand, Giménez Caballero himself called the change in format “más recoleto, difusible y manejable, apto a la colección y la concentrada lectura” (Mainer 43). These problems (or benefits, depending on one's point of view) of the *Gaceta's* format are not necessarily significant on their own, but when one juxtaposes the space allotted in the *Revista de Occidente* to the exploration of a subject, versus how much space the *Gaceta* could afford a similar topic, the difference is extraordinary, and in itself has important implications for the presentation of scientific themes.

As a point of contrast for the spatial shortcomings of *La Gaceta Literaria*, we can take a glance at the *Revista de Occidente*, which had ample room in which to publish lengthy articles on topics in physics, biology, chemistry, mathematics, sociology, etc. Virtually any subject of importance to the development of the Western mind during the years of its publication was available within its pages, and was rarely given short shrift. Articles of twenty pages or more were common; frequently there were essays of even greater length that were split across two or three issues of the magazine. The format of the magazine was naturally amenable to the

¹⁸ Also according to Hernando, along with changes in format, the handing over of the previously privately sponsored *Gaceta Literaria* proved detrimental to the publication's emphasis on publicity for other publishers, book stores, and literary enterprises outside of the *Gaceta*.

importation of heftier essays. Authors had at their disposal more space for exposition, as was necessary at the time to explain the newly emerging principles of quantum mechanics, for example, or for the publication of the latest studies by prominent national scientists and physicians such as Blas Cabrera, Gustavo Pittaluga, or Dr. Gregorio Marañón, all of whom would participate in the *Gaceta* as well, but to a much different degree and position.

The *Gaceta* was, however, more widely read than the *Revista de Occidente*, and was published on the first and fifteenth of every month. In terms of its overall print run, it was comparable to the *Revista de Occidente*—about 3,000 copies were printed of each issue (Hernando *La Gaceta literaria, (1927-1932): biografía y valoración* 11). But when we consider that it appeared twice monthly, and that it was generally more accessible to the public—not to mention that copies of the *Revista de Occidente* “casi nunca se agotaban”¹⁹—it is possible to conclude that the *Gaceta Literaria* had a much more immediate impact on the trajectory of literary developments in Spain. Despite this literary preeminence, in other areas it lacked efficaciousness—the format of the magazine itself severely crippled it as a forum for scientific advancement. The lack of space drastically restricted the amount of information that could be communicated to the reading public about scientific matters. For example, one can find only two explicit mentions of the developments in quantum mechanics that so dominate the issues from the late 1920s of the *Revista de Occidente*, although there exist a few oblique allusions to “the New Physics” (*la Física actual*).²⁰ Two passing references and a few scant mentions of the world-warping discoveries of quantum mechanics are, at the very least, suspect, and at worst, bordering on negligent. One possible explanation of this fact could be that there was simply not enough room for it in the *Gaceta Literaria*. Indeed, Ramiro Ledesma Ramos mentions the lack of expository space in his article “Hans Dreisch y las teorías de Einstein”. Ledesma Ramos is discussing the new findings in non-Euclidean geometry when he says the following: “*No podemos entrar aquí en su análisis. Basta señalar que siempre aparecen los cálculos euclidianos como simples casos particulares*” (“La Gaceta Científica: Hans Dreisch y las teorías de Einstein” 8).²¹ This is not the only time that Ledesma Ramos shortens his analysis due to lack of space, and one gets the sense after reading several such comments that the author was decidedly aware of the fact that he was sacrificing important content in order to meet with standards for column length, and that the author was not pleased with such emphasis on concision.

In sum, *La Gaceta Literaria*, while it did present a modicum of scientific information to its readers, really did not have the format required to give the advances of science their due, and thus much of what is present that pertains to science (such as in the infrequent sub-section *La Gaceta Científica*) is either a superficial treatment of the topic, a mere summary, or hyper-condensed so that only the facts remain and the nuances of the topic in itself are left for publications with more resources for such content—*Madrid Científico*, for example, or the

¹⁹ Fernando Vela, quoted in López Campillo, *La «Revista de Occidente» y la formación de minorías (1923 - 1936)* 60.

²⁰ These references to quantum mechanics appear in Ramiro Ledesma Ramos, “Filosofía, ciencia. Las lecciones del físico Blas Cabrera sobre el átomo,” *La Gaceta Literaria*.48 (1928). and Ramiro Ledesma Ramos, “Actualidad: Filosofía, Ciencia: Lógica y matemática. Comentarios sobre *La lógica en la matemática* de Francisco Vera,” *La Gaceta Literaria*.61 (1929).

²¹ Emphasis mine.

Revista de Occidente, which had its own publishing house in part dedicated to presenting translations of important works by eminent thinkers abroad, as well as original works by Spanish authors. In spite of this seeming lack, however, the presence of science remains significant for a variety of reasons which will be explained over the course of this discussion.

Towards a Definition of *ciencia*: Development, Trajectory and Endpoint

To begin, a point of contrast: in a magazine devoted to the promulgation of the latest advancements in Western thought, as was the *Revista de Occidente*, the presence of science—while still providing a suitable shock when placed alongside articles dealing with literary or artistic interests—is comprehensible, especially considering the broad definition of science that Ortega y Gasset, the magazine’s founder, ascribed to at the time. Science, in the case of the *Revista de Occidente*, was comprehensive, including social phenomena, psychological study, medicine and the hard sciences under the same umbrella of *ciencia*, perhaps best translated as “knowledge.”²²

Assessing the *Gaceta Literaria*, founded four years after the first issue of the *Revista de Occidente*, and proclaiming in its second subtitle its preoccupation with all matters concerning “*letras – arte – ciencia*”, the first question that must be asked is: How does *La Gaceta Literaria*, on the whole, define *ciencia* within its pages? Does its definition differ from the one we discern in the *Revista de Occidente*? And, more generally, why is *ciencia* even present at all in “*un periódico de las letras*”? These are questions that we must bear in mind as we move forward with our analysis, and we will be returning to them repeatedly as we attempt to understand why it was so imperative that a literary magazine be inclusive of disciplines so far afield from its supposed focus.

La Gaceta Literaria was not equipped to be a forum for the popularization of scientific works and/or knowledge. As has been established, it lacked the appropriate format in which major treatises could be published that would have been of interest to a public visibly enchanted by the scientific and technological advances of their day. What the *Gaceta Literaria* did possess, however, was a space that privileged the quick summary of the latest controversy, the succinct book review, the announcement of an event recently held, or about to occur—in other words, the cultural news of the day. Particularly relevant is the fact that scientific content was presented within the personalized context of an author, and therefore, allowed for independent reaction to scientific advancement, rather than presenting it whole and without a frame of reference, as it appeared in the *Revista de Occidente*. And, quite frequently, it was the state of science in Spain that was being discussed by many of the authors, taking issue with the historical lack of interest—and lack of output—in the sciences that had characterized Spain as lagging behind its Western counterparts, as well as recognizing that, as we discussed in Chapter One, there were forces in play aimed at undoing the centuries of neglect in the sciences, thereby allowing Spain to have a parallel *Edad de Plata* in areas such as physics, mathematics and medicine. In this aspect—the fact that the *Gaceta* was able to present a variety of opinions alongside the factual developments in science—*La Gaceta Literaria* is a more accurate gauge of what was of

²² See Chapter 2 of this project for a detailed discussion of “*ciencia*” in the *Revista de Occidente*.

quotidian interest to the reading public, where concision and frequency are the dominant forces in the apprehension of new information, be it scientific, literary, or, ultimately, political in nature, and also where opinions are valued as points of departure for reflection, discussion, or even action.

Affirming that *La Gaceta Literaria* was an “accurate gauge” of scientific topics of interest to the public, however, does not mean necessarily that science as an *independent* topic was ever greatly featured by the publication. Sections devoted to science were, generally speaking, sporadic, with a preference for articles on medicine and the life sciences, and even some quasi-scientific ideas—sexology, in particular—that were in vogue at the time.²³ When one examines the scientific content of the magazine, however, it quickly becomes clear that it was not the desires of the public that were shaping the scientific presence in the *Gaceta Literaria*, nor the interests of Ernesto Giménez Caballero who, according to one biographer, professed a real aversion to the sciences, mathematics in particular: “Le encantaban la Geografía y la Historia. Y mucho menos las Matemáticas, la Física y la Química. Por lo que le causaban esas materias verdaderos sufrimientos” (Tandy and Sferrazza 30). Giménez Caballero offers only one article in the publication that has been classified as “*Ciencia miscelánea*” in Collins’ index of the magazine’s content—an article called “La gente menuda de Dios”, a review of a book on entomology, which exalts the magnificent world of insects in a poetic, decidedly unscientific manner, by creating an analogy between intellect (human, rational, classical thought) and instinct (the romantic—in the philosophical and ethical sense—world of the insect). He notes with some humor the way that many books on these creatures use the word “*maravilla*” as a near cliché when describing insects:

¿Qué mutua simpatía hay entre esos dos sustantivos? ¿Por qué se infiere el uno al otro? Hacer la historia de los insectos es hacer un poco la historia de la filosofía. (Ortega, ¿es verdad?) La ‘maravilla’ de los insectos aparece en los altibajos por la Historia, según que la Historia lleva un sí o un no de racionalismo. (“La gente menuda de Dios” 2).

Examining this mildly comic example of Giménez Caballero’s single attempt to speak about scientific matters, converting biological matters into philosophical imperatives, one can quickly deduce that the motor behind the publication of articles concerning *ciencia* was not to be found in Giménez Caballero himself.

Instead, the source of this power would be found among a bevy of other collaborators, each with their own specializations (and quirks, as we shall see). The first page of the first issue of *La Gaceta Literaria* lists a variety of science editors, varied by discipline:

²³ The articles on sexology, and sexology’s popularity as a subject in both *La Gaceta Literaria* and the *Revista de Occidente*, can be attributed to the public’s high estimation of Dr. Gregorio Marañón, who showed a particular interest in sexology, and published several articles pertaining directly to its study in the *Revista de Occidente*. Dr. Marañón was frequently fêted by *La Gaceta Literaria*, and therefore it comes as no surprise that the magazine should pay attention to the field of study that was dominated by him.

Filosofía: F. G. Vela; Matemáticas: T.R. Bachiller; Física: M.A. Catalán; Naturales: J. Pérez de Barradas; Filología: A. Alonso; Derecho: A. Garrigues; Medicina: J. Segovia Caballero; Pedagogía: A. Ballesteros; Ingeniería: R. Urgoiti; Arquitectura: C. Arniches (“Salutación” 1)

Note that philosophy, philology, pedagogy and law appear under the category of “science”: this is the closest approximation of a definition of *ciencia* that the *Gaceta* ever directly offers. It oddly coincides, somewhat *a posteriori*, with a definition of the “positive sciences” offered by Max Scheler, the sociologist, in his *Philosophische Weltanschauung*, and critiqued (albeit rather negatively) by Ramiro Ledesma Ramos in an article published in the *Gaceta* in 1930 about metaphysics.²⁴ Regarding the editors listed above, very few of these names appear within the pages attached to an article, nor as the topic of the article itself. They stay decidedly behind the scenes and their role—their specific input—remains mysterious: there is little to no research that details their involvement.²⁵ As for the articles included under the umbrella of *ciencia*, they are as remarkably diverse as the list of editors, and deserving of a detailed analysis.

The first part of this analysis must discuss the means by which science was presented in *La Gaceta Literaria*, how it developed, and the nature of its constitution. In other words, the implied meaning of *ciencia* as it is manifested in *La Gaceta Literaria* must be outlined and specified. Examining the table of contents and the titles of sub-sections of the magazine, it is possible to discern a very general process by which science entered and left the pages of the *Gaceta*. In very broad terms, science appears directly in the very first issue with the article by the Catalan scientist/physician Augusto Pi Suñer, titled “Cientistes o científiques?” and written in Catalan.²⁶ Its principal thrust: the relationship between philosophy and science. The second article, “Ciencia i cultura”, by Joaquim Xirau, another Catalan scientist, takes up the same thread of science’s connections with other disciplines, and thus we have the initial traces of a very significant trend that will continue throughout a large portion of *La Gaceta Literaria*’s reporting of scientific affairs—the couching of science within humanistic discourse.²⁷

Continuing with this close textual analysis of the organization of the *Gaceta*’s contents, the second stage of the development of the presentation of scientific content comes in the form of a label placed above articles of scientific themes: the magazine begins to designate these columns as “*Ciencia*”. Two articles in issue numbers ten and sixteen fall under this category: “Radiotecnia” and “La vida de los animales y de los hombres fósiles descifrada,” respectively. From these few articles alone we can perceive the range of “*ciencia*” as it begins to flower within the pages of the *Gaceta*: from the difficult technicalities of radio broadcasting over long- and short-wave frequencies to new discoveries about the origins of humankind, science in the *Gaceta* appears in these first few issues as a diverse object of study, whose multiple nuances and specializations are opened for exploration without giving privilege to any one discipline.

²⁴ See Ramiro Ledesma Ramos, “¿Qué es Metafísica?: Notas sobre Heidegger,” *La Gaceta Literaria*.75 (1930): 11.

²⁵ Which is not to say that their presence is insignificant. For example, Miguel Ángel Catalán was the protégé of Blas Cabrera, and Francisco Vela quite renowned as an author who, in addition, also collaborated extensively with the *Revista de Occidente*.

²⁶ See Augusto Pi Suñer, “Scientistes o científiques? Estudio,” *La Gaceta Literaria*.1 (1927): 3.

²⁷ See Joaquín Xirau, “Ciencia i cultura,” *La Gaceta Literaria*.5 (1927): 3.

In number twenty-one we see the first appearance of *La Gaceta Científica*, with scientific topics now officially garnering their own sub-section heading. *La Gaceta Científica* appeared in seven separate issues, between November of 1927 and April of 1929.²⁸ Appearing as subject matter were articles on: the parsec, “el metro inconcebible” of modern astronomy;²⁹ the Glozel affair, dealing with a recent scandal in the fields of archeology and anthropology; classroom pedagogy; the sociology of A. Schulten; the philosophical thought of Hans Driesch and his critique of the theory of relativity; a discussion of prehistory; a geographical treatise on the state of Spain’s rivers; an anecdote about a conversation between Francisco Vera and Luis Araujo-Costa, steeped in philosophical controversy and marred by the Spanish summer heat; a critique of Ortega y Gasset’s course on philosophy (*¿Qué es la filosofía?*); a critique of the French philosopher Cournot; the movement of glaciers at the poles; and finally, under the sub-category of “Medicine”, endocrinology and “*opoterapia*,” or, the therapeutic use of hormones for glandular diseases. It should be readily apparent that *La Gaceta Científica* did not use as its only inspiration the hard sciences, but rather drew on an impressive well of knowledge—*ciencia* in its most ample sense—to fill the three-quarters of a page (maximum) that the section was given. An examination of these articles alone can lead to a basic, but accurate, approximation of the *Gaceta*’s attitude towards science: should it have a method, and should it be studied with some rigor, and should it comprise as a part of it a disciplined approach, then it is *ciencia*. Then, it is *knowledge*. Despite the brevity of the existence of *La Gaceta Científica* and its (at best) intermittent appearances, science remains visible relatively consistently through 1930. This is directly attributable to a cluster of personalities deeply involved in the magazine’s publication and success: Dr. Gregorio Marañón and his disciple Rafael Resa, and the versatile mathematician-*cum*-philosopher, Ramiro Ledesma Ramos.

The Biomedical Sciences: Rafael Resa and the Eminence of Dr. Gregorio Marañón

It is Biology, of all the branches of the sciences, that first makes its way to the pages of *La Gaceta Literaria*. Beginning with an article that harshly criticizes the university system for its backwardness in teaching zoology and botany, it is apparent from the very outset that the study of biology is struggling in Spain, along with most of the hard sciences, with the possible exception of medicine. A possible explanation for this particular “time-lag” in the life sciences could be that in Spain, the issues raised by Darwinism in the 19th century were never thoroughly resolved, and continued to be divisive well into the following century. In *La Gaceta Literaria*, as testament to the continuing problem of Darwinism, there are two articles that explicitly affirm the view that Darwinism (and neo-Darwinism) is an incomplete system, still open to critique. The first article to support this view is by Nicolás Percas, who declares that while no one questions the fact that all living beings have transformed over time, the Darwinian explanation of natural selection fails to illuminate sufficiently all the factors that could play into

²⁸ *La Gaceta Científica* appeared in the following numbers: 21 (1 November 1927); 24 (15 December 1927); 25 (1 January 1928); 26 (15 January 1928); 44 (15 October 1928); 48 (15 December 1928); 56 (15 April 1929).

²⁹ Arturo Uccelli, “Pársec, el metro inconcebible,” *La Gaceta Literaria*.21 (1927). The parsec measures the vast distances of space, such as those that lie between galaxies.

“transformismo,” as it promotes the theory of natural selection without admitting other explanations. He writes:

El desbarajuste que impera hoy en Biología es debido especialmente al sinnúmero de teorías parciales y contradictorias elaboradas particularmente por los especialistas. Porque estas teorías no abarcan más que un número limitado de fenómenos, y, sin embargo, sus autores quieren darles un significado universal. Esto ha dado lugar a que se proclamara por algunos el fracaso del “transformismo”. No. Lo que ha fracasado no es el transformismo, sino su explicación Darwiniana.

Todos los hombres de ciencia admiten el transformismo; en lo que no están todos conformes es en la teoría darwiniana de la “selección natural”. Efectivamente, pasado el entusiasmo, después de algunos años de la publicación del “Origen de las especies”, empezaron a elevarse algunas voces aisladas, apuntando que la ‘selección natural’ no bastaba para explicar el transformismo, y que hacía falta volver a las ideas geniales de Lamarck. (Percas 2)

These comments are actually part of a book review of a Rumanian biologist, whose study, *La Vie des Mammifères et des Hommes fossiles*, had just been released in Spanish translation. And while the reviewer Percas shows much enthusiasm for the book, saying that it would give rise to “por todo el mundo apasionadas discusiones y abrirá el camino para alcanzar nuevos y fecundos horizontes,” it remains a fact that the scientist himself was not a Spaniard, and that neither were any of the other books on biology reviewed in the *Gaceta* (Percas 2). The discussion of Darwinism vs. Lamarckism was not outdated *per se*, but the conflict was in its twilight elsewhere, certainly. But not in Spain, where even Ledesma Ramos takes up his pen in order to review a book by the German biologist Oscar Hertwig, pausing to opine that “Como toda teoría científica de amplias márgenes que tiende a una concepción absoluta del universo, el darwinismo ha periclitado. El darwinismo tenía algún sabor a cosa definitiva y conclusa, y ha desaparecido por asfixia entre sus propias metas” (“Hertwig y el postdarwinismo” 2) The anti-Darwinian flavor found in *La Gaceta Literaria* is undeniable, but it must be added that while these authors speak out against Darwinism, they do not necessarily reject it completely, nor do they contradict the basic principles of the theory. In other words, they are not retrogressive in their assessments, and so we cannot accuse the *Gaceta* of promoting any sort of traditionalist discourse refuting Darwin’s theories. What is significant here, especially when we compare with the *Revista de Occidente* and its presentation of biology³⁰—for example, the article by Uexküll on bivalve

³⁰ I chose to leave out a discussion of biology and medicine in Chapter 2 of this study, since its inclusion would have extended the chapter significantly, and I felt that the materials on physics and chemistry were more in line with the overall goals of this study. I am including biology and medicine in this discussion of *La Gaceta Literaria* because it is necessary to illustrate my hypothesis that scientific matter was not presented neutrally, as it generally was in the *Revista de Occidente*. I do not plan on exploring in detail the relationship between biology and medicine and the *vanguardia* in a linguistic sense, believing as I do that the breakthroughs in physics and chemistry had more to do with the ruptures and slippages that are found in vanguard literature.

structure³¹—we note yet again how influential the format of a publication can be, in that the biological articles of the *Revista de Occidente* (and all scientific essays in general) are presented without editorial comment, except of course for the indirect affirmation their stance receives by their mere inclusion. By contrast, in *La Gaceta Literaria*, what we have is a much more explicit evaluation of current scientific thought, offered without any attempt at neutral presentation, the author's personal reflection and commentary being, perhaps, arguably of more interest than the scientific material in question.

Aside from Darwinism, *La Gaceta Literaria* had another fascination with biology that requires discussion. There is a notable presence regarding the field of sexology and investigations of gender differences that, while not strictly adhering to the strict principles of scientific investigation and often listing towards the discipline of sociology, still manages to have enough of the makings of a discipline to qualify it as “scientific study”. Four articles treat the issue of sexology and/or gender differences in terminology varying from the highly specific and technical (as we see in the title alone of the article “Los caracteres sexuales secundarios en las plantas fanerógamas dioicas”)³² to the highly subjective and hyperbolic, as employed in the article “La moda como hecho biológico.”³³ What remains constant, however, is a fascination with the differences between *macho* and *hembra*, be it in plants, animals or humans. How one gender differs from the other was a topic of decided interest at the time, and it is possible to trace the interest in these topics to the works of Dr. Gregorio Marañón that were being published at the time. Works such as *Tres ensayos sobre la vida sexual* (1926) made a huge impact on the reading public, and the later works such as *Los estados intersexuales en la especie humana* (1929), *Amor, conveniencia y eugenesia* (1929), and *Amiel. Un estudio sobre la timidez* (1932) were all reviewed in *La Gaceta Literaria*, and each dealt in its own way with the relationship between the sexes, and the socialization of gender, if not the entire human being. Marañón based his observations in endocrinology, a discipline that was surging in the wake of the discovery of the secretion of hormones in 1905. Between Freudian psychology and endocrinology existed this world of sexology, of which Dr. Gregorio Marañón was the appointed guru. He had a dedicated group of followers, one of whom was a consistent contributor to *La Gaceta Literaria*: Rafael Resa.

Rafael Resa was present in the pages of *La Gaceta Literaria* from the inception of the magazine until 1930. He was a medical writer—and practicing physician—deeply indebted to the work of Dr. Gregorio Marañón.³⁴ The majority of Resa's articles (I have counted nine total)

³¹ See Jacques von Uexküll, “La biología de la ostra jacobea,” *Revista de Occidente* 3.9 (1924).

³² See Carl Correns, “Los caracteres sexuales secundarios en las plantas fanerógamas dioicas,” *La Gaceta Literaria*.10 (1927): 6.

³³ See Manuel Bastos Ansart, “La moda como hecho biológico,” *La Gaceta Literaria*.35 (1928): 2. A brief excerpt: “Vamos a ver, pues, cómo estos cuatro elementos: *expresión, individualidad, necesidad de variación e imitación*, juegan y se entrelazan en el hecho de la moda, elevando a fenómeno universal cósmico esa cosa que en su acepción más corriente parece una futilidad odiosa a los moralistas gruñones y a los maridos cicateros.”

³⁴ Resa's professional articles (totaling three) are documented in a book compiled in 1935 by the self-titled “disciples” of Dr. Gregorio Marañón. This bibliography was compiled in homage to the work of Marañón. The prologue to the bibliography states in adulation of Marañón: “los que llevamos muchos años de colaboración y trabajo al lado del profesor Marañón, hemos pensado en la utilidad que podría tener el recoger su labor de veinticinco años de Médico del Hospital Provincial, de Escritor y de Maestro. Para nosotros el hacerlo tiene el placer

directly reference (and once or twice, dissent from) the opinions and findings of Dr. Marañón. Marañón himself appears in the title of no fewer than ten separate articles, and is mentioned in (at the very least) seventeen individual essays—an exhaustive reading of the entire run of *La Gaceta Literaria* needs to be done that would definitively catalogue the importance of Dr. Gregorio Marañón's presence in the magazine. Resa's commentary on medicine, medical literature, and Marañón's work, coupled with the adulation heaped upon Marañón by journalists such as Miguel Pérez Ferrero who wrote three articles also dealing with his work, creates the impression that this particular physician was of singular importance to one editor or another.³⁵

To return to the subject at hand, Rafael Resa's first article deals with a "recent scientific controversy"—the reality of miracles. In an assured tone, he issues his pronouncement against the possibility, while also subtly calling into question the role of the Church as a possible force delaying Spain's scientific progress:

Todos sabemos que el mayor desarrollo religioso de los pueblos coincide con sus épocas de más grande ignorancia, y ésta logra confundir con la pureza doctrinal de una religión un número infinito de supercherías, fanatismos y supersticiones. El terreno más abonado para ellas lo constituye el hecho de las curaciones milagrosas, que han servido a profetas y santones para aumentar sus medios de convicción, acreditándolos como seres sobrenaturales u oráculos de la voz de Dios. Añadamos a esto la incertidumbre en el difícil arte del pronóstico y la falta de exactitud matemática de la ciencia médica, para que

de contemplar en conjunto toda su obra, que hemos ido viviendo diariamente, y la que, acaso por lo mismo, no habíamos apreciado en toda su magnitud. Para los que no han tenido con nosotros esta misma comunión, estas páginas servirán para ver en su plenitud y para juzgar la obra de un hombre a quien, aun los más remisos en unirse a la voz universal, han de reconocer un trabajador infatigable." *Veinticinco años de labor; historia y bibliografía de la obra del Prof. G. Marañón y del Instituto de patología médica del Hospital de Madrid por sus discípulos*, (Madrid: Espasa-Calpe, 1935) 10.

³⁵Considering that Dr. Gregorio Marañón was one of the initial *mecenas* of the publication, contributing a significant sum to the funds that would eventually allow for the publication of *La Gaceta Literaria*, it comes as no shock that the magazine would esteem him so greatly, nor that the last issue of *La Gaceta Literaria* would feature the conferring of the Dr. Gregorio Marañón prize for excellence in scientific writing to one Juan López Ibor, a medical doctor from Valencia. This prize was awarded even after Marañón had distanced himself from Ernesto Giménez Caballero, withdrawing his public backing of *GeCé's* enterprise in a letter to the editor published on 15 March 1931 in the *Gaceta Literaria*, due to Giménez Caballero's denunciation of the artwork of Pablo Picasso. The liberal Marañón would not tolerate what he deemed an attitude not of *vanguardia* but of *retaguardia*, which appeared to be the direction in which Giménez Caballero's fascist leanings were leading him. Of this incident, Douglas W. Foard writes that "Speaking on [the behalf of the most celebrated members of the Spanish intellectual community], Dr. Marañón addressed a letter to the *Gaceta*, pointedly directing it to Sáinz Rodríguez, not Giménez Caballero. He thanked Sainz for printing Giménez Caballero's words, quoted some of them, and the produced the following indictment of their author: 'Many times I have protested that there are people, who are possessed of a rearguard spirit, hostile to the emotion of human progress, who disguise themselves from us by calling themselves Vanguardists.' Marañón had been one of the original financial backers of the *Gaceta* and had contributed numerous articles to it during its initial years. Then, on the eve of the founding of the Republic which he was instrumental in creating, he publicly condemned "El Gecé" as a fraud, a "rearguard" instead of a Vanguard. This letter was a most uncompromising augury for the future of the journal under a republican regime." Foard, *The Revolt of the Aesthetes: Ernesto Giménez Caballero and the Origins of Spanish Fascism* 149.

los hechos más ordinarios y comunes sean extraordinariamente aumentados y alterados por la fantasía popular...

La ciencia médica, a la que tanto trabajo le han costado sus conquistas, siguiendo la natural evolución de todas, y dentro siempre del cauce de las leyes naturales, está de nuestra parte. Por tanto, mal podrán argumentar los adversarios, dentro de un criterio razonable, contra la realidad de los hechos si no es anteponiendo el pálido espectro de la fe. Y como para que se haga la luz en una discusión se ha de partir de una convicción común, como es la de citada creencia, pensamos que pueden tener poca transcendencia científica estas enmarañadas controversias. (“Sobre una reciente controversia científica” 6)

Resa declares himself a scientist from the outset. There will be no pandering to any authority other than that of science itself... and perhaps Gregorio Marañón.

Resa’s next article deals with the state of *opoterapia*, a branch of endocrinology (Marañón’s specialty) that would have hormones used therapeutically for everything from diabetes to sexual dysfunction. The article is actually a review of a book by Eduardo Bonilla, another medical personality who appears several times in *La Gaceta Literaria*—another authority figure in the field of medicine who has captured the eye of the public.³⁶ Resa’s evaluation of Bonilla’s work, as it does coincide with that of Marañón—this he states explicitly in the article—is highly favorable (“Estado actual de la opoterapia” 4).

Resa’s work as a critic of medical literature, when he is not slavishly proclaiming the wisdom of Marañón, is actually quite astute. He offers reviews of several major works by Marañón: *El problema social de la infección* (1929), which Resa calls a “sin fin de provechosas enseñanzas” (“El problema social de la infección” 4); a review of a book of Marañón’s essays, which has significant observations about the relationship between science and literature; *Amor, conveniencia y eugenesia* (1929) and its subsection “El deber de las edades” each get their own article. In these reviews, an image of Resa emerges that shows him to be a man of his time: he problematizes Freud within the context of medicine, comes out in favor of eugenics,³⁷ and puts great stock in the analysis of “character” as the new *sino* of the modern man. In this way, Resa shows himself to be a faithful disciple, not only to his mentor, but to the prevalent scientific and medical authorities of the time.

So why, might we ask, feature him so prominently if he does little more than echo what greater figures were saying in other venues? The answer to this question is simple: Rafael Resa,

³⁶ The articles that appear about or by Eduardo Bonilla are the following: Eduardo Bonilla, “El problema de la etiología y profilaxia del bocio endémico. Información científica,” *La Gaceta Literaria*.19 (1927).; Rafael Resa, “La Gaceta Científica: Medicina: Estado actual de la opoterapia,” *La Gaceta Literaria*.56 (1929).; Anonymous, “El Dr. Bonilla al Congreso de Montevideo,” *La Gaceta Literaria*.89 (1930).; Eduardo Bonilla, “Impresiones de un viaje al Plata. Impresiones del Congreso de Medicina en Montevideo,” *La Gaceta Literaria*.98 (1931).

³⁷ In his review of Marañón’s book, Resa states that “la única preocupación social debe ser la del matrimonio eugenésico” and asks the practical question, “¿cómo llevar a cabo este método de ideal selección humana?” Both an idealist and a pragmatist, Resa had an eye for medical theories that held great promise, but often perceived their impracticality and the potential for failure, as he does here with the eugenic ideal. Rafael Resa, “Amor, convivencia y eugenesia. Comentarios sobre el libro de Gregorio Marañón,” *La Gaceta Literaria*.73 (1930): 15.

while being a competent physician and scientist, was also well acquainted with the world of letters, and thus was able to pronounce not only on the quality of the thought produced by his subject, but also upon the manner in which it was communicated. Resa knew a little bit about style, and about what type of reading would be of most interest to the public, whose avid interest in scientific or medical popularizations was unflagging during this time (as the public adoration of Gregorio Marañón attests). Thus, Rafael Resa served a dual function for the *Gaceta Literaria*—medical correspondent and reviewer of medical literature, which, by 1930, the date of his last article, formed its own genre and merited its own space in the magazine. This phenomenon of scientist-as-literary critic is significant in terms of the way that *La Gaceta Literaria* tended to present science: as a cultural event. We shall return to Resa’s work momentarily, as a part of a broader examination of the *Gaceta*’s posture towards science. First, however, we must examine the work of another important contributor to *La Gaceta Literaria*—Ramiro Ledesma Ramos.

As Seen from All Angles: The Consummate Science Writing of Ramiro Ledesma Ramos

Ramiro Ledesma Ramos published over 45 articles in the *Gaceta* about science and/or philosophy. He was granted, at the end of 1928, his own column titled “Actualidad: Filosofía, Ciencia” which appeared with regularity until July of 1929. “Actualidad” was removed from the title of the column in December of 1929 and by the time of his next dedicated column in early 1930, “Ciencia” had disappeared as well, leaving Ledesma as the chief critic of modern philosophy still working for the *Gaceta*—by that point, many other philosophical commentators had begun to depart due to ideological differences. Ledesma Ramos would also depart in 1931 to found his own magazine, a publishing venture that would also involve Giménez Caballero, but decidedly *not* as a voice of the diminishing vanguard, but rather in the political arena.

Ledesma Ramos held a prominent position in *La Gaceta Literaria* in that he was, essentially, the only writer who had the knowledge and the ability to address issues of physics and mathematics coherently. He wrote fifteen articles that dealt with physics and/or mathematics; only two other articles exist in the *Gaceta* that were written by other authors pertaining to similar topics: an article by A. Uccelli about the parsec (previously mentioned), and an article by J. Varela Gil that amounts to little more than a travelogue recounting the mathematician Rey Pastor’s most recent sojourn in Argentina. Ledesma positively dominates the sphere of science and mathematics, owing in part to the fact that he held a degree in mathematics from the University of Madrid. Perhaps the most remarkable aspect of Ledesma’s science writing for the *Gaceta* was that he was astute enough to recognize that the relationship between physics and mathematics, with the advent of Einsteinian relativity, had deepened significantly; thus, it would be an uncommon article that touched merely on topics in physics, if it were written by Ledesma—there is one, but only one, and that is the article on Blas Cabrera, whose work was discussed thoroughly in Chapter Two. Ledesma acutely perceived the shifts that were happening in the related fields of physics and mathematics, and managed to capture some of the more salient connections between the two in his articles.

Discussion of the presentation of these two subjects in the *Gaceta Literaria* must ground itself in the fact that all perspective on the material issues from a single source, and that is the view of Ramiro Ledesma Ramos. Ledesma's approach to the sciences was one of a realist—he recognized the impoverished history of scientific research in Spain, called attention to the need for a renaissance in the study and teaching of mathematics, and acknowledged that although certain improvements had been made in the means of research of the physical sciences, still more needed to be done to bring Spain to a competitive level with other nations. Ledesma was thoroughly preoccupied with the state of Spanish science, but he did not allow his focus to fall exclusively on scientific progress in Spain. He occasionally glanced outward as well to the advances in physics and mathematics happening in other nations, bringing this information back to his compatriots through the pages of the *Gaceta Literaria*, and using it as a platform to launch a specific critique of the shortcomings of the system in which he was trained. Ledesma Ramos' tone is frequently one of agitation and frustration as he confronts the circumstance of science at that moment in Spain. We shall now examine some of his critiques and the major themes that he explored in his articles pertaining to physics and mathematics during the years 1928 and 1929, after which he ceased to produce commentary on these topics.

As previously mentioned, Ledesma Ramos frequently drew attention to the interconnectedness of mathematics and physics, a fact that was undeniable at the time. It was the innovations in geometry in the 19th century by Gauss, Riemann and Lobatschevski that allowed Einstein to make his discoveries in the 20th. In his first full article for the *Gaceta*, which was featured prominently on the first page of the 30th issue, 15 March 1928, Ledesma interviewed the eminent Spanish mathematician Rey Pastor, who had achieved international fame, and was working to improve the instruction of mathematics in universities in both Spain and Argentina. In the words of Ramiro Ledesma Ramos, Rey Pastor had managed to “atrapar el pulso matemático de Europa, pulso deslizable y fino como un pececillo” (“Transeunte Eximio” 1). He astutely observed the way in which mathematics had become a rarefied field in recent decades, with Riemannian geometry, matrix mechanics, and set theory dominating the research world, creating an elite group of intellectuals who alone were equipped to advance the boundaries of mathematics. Stylistically, this quote is an excellent example of Ledesma's capacity for analogy, a necessary quality in modern science writing which almost always requires that the writer find an appropriate metaphor or image to express concepts that, in their purity, would elude the average mind. His creativity in this matter is matched only by his tenacity, and he launches the interview with Rey Pastor with the following question: “Usted, Rey Pastor, ha hecho trabajos sobre la Historia de las Matemáticas en España y conoce bien los núcleos estudiosos actuales. ¿Es lícito hablar de la incapacidad de nuestra raza para la investigación de las ciencias exactas?” (“Transeunte Eximio” 1). The response of Rey Pastor will be discussed later in this chapter; of importance at the moment is the immediate awareness demonstrated by Ledesma Ramos that, historically, the Spanish were not known for their scientific achievements. This aforementioned tenacity in Ledesma's writing consists of his willingness to recognize these shortcomings, and yet still continue to pursue a larger goal: increased publicity and awareness of the state of Spanish science and its importance to Spain's progress as a nation in the process of modernization.

This same interview with Rey Pastor is an effective demonstration of the previously stated interconnectedness of the physical sciences with mathematics. He asks Rey Pastor if the theory of relativity has raised new questions for mathematicians, noting that “se ha dicho que Einstein carecía de instrumental matemático suficiente para la exposición total de sus teorías y que éstas, y no otras, eran las causas de sus dificultades últimas” (Ledesma Ramos “Transeunte Eximio” 1). In other words, relativity theory was completely dependent on the discovery of a mathematical basis that would allow for the expression of phenomena such as the curvature of space. Ledesma is critical of Einstein in this regard on more than one occasion. In a later article, he exhorts the public to question Einstein’s use of higher math:

Dígase, dígase ahora si Einstein cometió pecado de ligereza científica al fundamentar sus teorías en cálculos noeulidianos. Nada puede deducirse de aquí en favor de una dogmatización acerca del cuál sea la esencia geométrica del espacio físico... Einstein resuelve este pleito diciendo que no puede hablarse de espacio euclídeo o noeulídeo, sino que es dependiente de los estados de gravitación. La teoría de la gravitación, repetimos, es la esencial contribución de Einstein a la nueva Física... La gravitación es la única fuerza que no necesita tener en cuenta la naturaleza física ni química de los cuerpos, y es, según Einstein, “el fundamento intrínseco de las relaciones métricas del espacio-tiempo: Las ecuaciones diferenciales de los potenciales gravitatorios..., que son el gran resultado de la nueva teoría, se convierten en primera aproximación en las ecuaciones de la Mecánica clásica. Prescindiendo de las pruebas experimentales—todas ellas astronómicas—, tiene la teoría de la Relatividad la prueba que suministran las matemáticas. (“La Gaceta Científica: Hans Dreisch y las teorías de Einstein” 8)

Although Ledesma here brings into doubt the foundation of relativity in advanced mathematics, he eventually finds a resolution to the problem in the fact that it is experiment that brings the theoretical aspects of relativity into line with the revered rules of Newton’s mechanical principles. On this account, Ledesma Ramos appears to side with Rey Pastor in his assessment that Isaac Newton is “la figura científica más ponderosa que ha existido [porque] tuvo que construir, a más de la formidable teoría física, el instrumento matemático. Así que inventó el Cálculo infinitesimal” (Ledesma Ramos “Transeunte Eximio” 1). While not damning of Einstein’s advantageous usage of mathematical theories not of his own devising, this posturing lends weight to the idea that even though Ledesma viewed the physical sciences in relation to the mathematical ones, it was, in the end, the mathematical sciences that received his greater admiration. For example, he reserves great praise for the Argentinean engineer Enrique Butty, who specialized in mathematical physics:

D. Enrique Butty es uno de los contadísimos ciudadanos que han comprendido íntegramente la armazón relativista de Einstein. Y su *Introducción filosófica a las teorías de la relatividad* es, quizá, el libro elemental más ágil y enjundioso que conocemos sobre estas materias. No hay en él la menor concesión a la falta de rigor, logrando, con una simbólica matemática muy sencilla, colocar las cuestiones en la más favorable arquitectura. Parece que el Sr. Butty trabaja actualmente en una paralela *Introducción*

matemática a esas teorías, obra en extremo necesaria para los que pretendan iniciarse con rapidez en el corazón mismo de la Relatividad, y que nadie mejor que Butty puede realizar con las máximas garantías. (“El profesor Butty” 6)

Here we can see clearly Ledesma’s priorities: Physics without Mathematics is an impossibility; to understand the heart of the New Physics, one must be at the very least gifted in mathematics (which Einstein purportedly was not, thus opening himself to pungent critique from known mathematicians). In one of his later articles, touching for once on the topic of quantum mechanics—the only mention of Heisenberg in the entire run of the *Gaceta Literaria*—he denounces the new physicists for being “hoy desorientados en su terrible afán de novedades.” He asks then, “¿Qué supone ya la relatividad de Einstein frente a esta nueva cosa que es la física indeterminista y el carácter estadístico que quiere imprimir Heisenberg a la mecánica?” (Ledesma Ramos “Actualidad: Filosofía, Ciencia: Lógica y matemática” 2). There is no real discussion that follows on the heels of this aside about the revolution in quantum mechanics—would that there were, as it would be of much interest to know Ledesma’s views on the Uncertainty Principle. The quote here, though, suffices in the sense that it gestures towards a reticence in Ledesma to let go of traditional mechanics, or even the mechanics of relativistic gravity, in favor of a statistically determined reality. Though we cannot judge by a single comment Ledesma’s attitude towards quantum mechanics, it is possible to see a reluctance in his writing to accept these advances as logical outgrowths of the partnership between mathematics and physics. Quantum mechanics, in this regard, seems to leave Ledesma’s desire for synthesis behind, owing, as it does, more to—as Ledesma himself notes—the field of statistics than to the calculus or geometry or traditional mechanics.

Other topics in mathematics that Ramiro Ledesma Ramos explored in his articles varied greatly. From his obituary in honor of the death of a young Indian mathematician, S. Ramanujan³⁸ to his summary of the critique of Euclidian geometry offered by André Metz,³⁹ and his article discussing transfinite math,⁴⁰ Ledesma Ramos did his best to represent the cutting edge of mathematics, physics, and mathematical physics. Much more could be said about his attitudes towards the theory of relativity, or his opinions of advances in mathematics, but we must limit our discussion of these elements in order to take a broader view of *La Gaceta Literaria*’s attitudes towards science and science’s place in society.

Science as Cultural Event: *La Gaceta Literaria* Broadens the Scope of the Vanguardia.

We have established that science, though presented in a limited framework, was important to the *Gaceta*’s overall mission. But how did it connect with the other *artistic* and

³⁸ See Ramiro Ledesma Ramos, “Actualidad: Filosofía, Ciencia: El matemático indio, S. Ramanujan,” *La Gaceta Literaria*.46 (1928): 3.

³⁹ See Ramiro Ledesma Ramos, “Actualidad: Filosofía, Ciencia: André Metz y la geometría euclidiana,” *La Gaceta Literaria*.54 (1929): 2.

⁴⁰ See Ramiro Ledesma Ramos, “Sobre la matemática trasfinita. Comentarios,” *La Gaceta Literaria*.50 (1929): 2.

literary components that were of even greater value to the magazine? What sorts of parallels were drawn in the *Gaceta Literaria* between science and art? What was the mechanism by which science acted as a cultural event? As we have established, the *Gaceta Literaria* had a unique approach to its presentation of scientific content. The commentary was specific to the point of view of the author of the article, and presented within the context of *la actualidad*. Ledesma Ramos' column on the sciences for a time carried the heading of "Actualidad: Filosofía, Ciencia", which attests to the fact that for the *Gaceta*, context was as important as content. And the context in the matter was, as a general rule, that of culture and cultural production. Thus, we have Rafael Resa writing of a specific genre of *la literatura médica*; we have Ledesma Ramos' writing articles that connect trends in philosophy with trends in physics; also present is the column "Nuestros médicos y la literatura", where Drs. Marañón, Pittaluga and Recaséns are all questioned about their literary preferences. These interviews, as well as the overall construction of scientific discourse, its couching in the cultural matrix, give the reader the sense that the men of science (and one woman, María Luisa Navarro de Luzuriaga, who wrote the article "Feminidad y feminismo. El problema en el marco de la Biología" [1929]), as depicted, were participating in a much larger forum than that of their own research interests. Instead, their work and their lives were a part of a larger cultural fabric that asked them to draw connections between seemingly disparate fields. It was the *Gaceta Literaria's* job to capture this synthesis and present it to the public as a model for a new society, one in which the divisions between areas of knowledge would be more porous than rigid, and there would be no boundaries placed on what was permissible awareness. All was culture—*letras, arte, ciencia*—and it would bring Spain out of a dark slumber and allow her to reawaken, revived and powerful, on the world stage: *una verdadera regeneración*.

Speaking chronologically, the evidence of the *Gaceta's* stance of science-as-culture is in evidence from the very first issue. On the third page of that issue appears an article written in Catalan by a prominent physiologist from Barcelona, already mentioned in Chapter One, Augusto Pi Suñer.⁴¹ Pi Suñer, who collaborated with Gregorio Marañón in his work on endocrinology,⁴² was also a part of the core group who initiated the *Junta para Ampliación de Estudios* in 1907. In other words, Pi Suñer was a widely respected scientist whose influence was notable among the embryonic scientific renaissance that was emerging in period of the *entreguerra*. Pi Suñer's article in *La Gaceta Literaria* does not, however, address any issues of endocrinology, as would later articles by other physicians such as Rafael Resa. Instead, he directs his inquiry towards the relationship of science and philosophy, forging the first of many connections that would be drawn between the two disciplines, and asking the question, as stated in the title, "Scientistes o científics?". He begins by posing a rhetorical question: "Qui ens dirà allà on acaba el concepte científic i comença el filosòfic o bé la justificació d'una metafísica que volti una ciència?," and concludes by noting that "Qu'es ben freqüent qu'els que han elaborat les

⁴¹ For a detailed history of the work of Augusto Pi Suñer, see section 15.3d in Francisco Giral, *Ciencia española en el exilio (1939-1989): El exilio de los científicos españoles* (Madrid: Editorial Anthropos, 1994) 210-16.

⁴² For a discussion of this collaboration between Marañón and Pi Suñer, see José Luis Peset, "El *Hernando-Marañón* y la enseñanza de la Medicina en España," *Ciencia en expansión: Estudios sobre la difusión de las ideas científicas y médicas en España (siglos XVIII-XX)*, eds. Elvira Arquiola and José Martínez-Pérez, Cuadernos Complutenses de Historia de la Medicina y de la Ciencia (Madrid: Editorial Complutense, 1995).

doctrines filosófiques més fecondes han estat els homes de ciencia superiors!” (Pi Sùñer 3). Pi Sùñer, in this fundamental article draws attention to the mutual nurturing happening at that moment between the philosophical disciplines (sciences?) and science itself. While he draws distinctions between the realm of the imaginative and the poetic, and the study of what is material fact, he still is able to connect the two modes of perception through their need for thought and knowledge. The only difference, he says, between the two is the “extensió del pensament”—a semantic difference, at best (Pi Sùñer 3).

Joaquim Xirau’s article, “Ciencia i cultura”, appearing in the fifth issue of *La Gaceta Literaria* attempts to clarify one specific commonality between science and culture: that they are both based on systems of thought. He reasons that “Com la ciència feia possible la natura física, la moral possibilita la natura social. La vida pràctica surt de la anarquia mitjançant la construcció d'un ordre moral” (Xirau 3). Without order, be it scientific or moral, society cannot function. And thus science and culture share a common epistemological need for structure in order to complete their separate functions, which really are not so separate after all. These two articles do much to create a basis for the future column, “Actualidad: Filosofía, Ciencia” for which Ramiro Ledesma Ramos would be responsible, and whose work would continue to both question and strengthen these affinities between science and culture. Overall, these two introductory articles are essential to understanding the conjunction of science and culture as it was constructed and developed by *The Gaceta Literaria*, even in its earliest stages.

Another important section that appeared three times was titled “Nuestros médicos y la literatura,” in which Drs. Pittaluga (no. 15), Marañón (no. 20) and Recaséns (no. 30) were interviewed about their literary tastes. These physicians were high-profile intellectuals with enormous reputations within Spain, and in Dr. Marañón’s case, internationally as well. Of particular interest to this study is a single question asked in all three interviews: What is your opinion of *la joven literatura*—in other words, the *vanguardia*? Francisco Ayala notes in his prelude to the interview with Pittaluga that on his bookshelves one could find both issues of the *Revista de Occidente* and *El profesor inútil* by Benjamín Jarnés—a book published in the *Revista de Occidente*’s “Nova novorum” series and famous as one of the best examples of the vanguard novel—an ill-fated species that will be of interest to us in Chapter Four of this study. Despite the presence of these works, Dr. Pittaluga professes a preference for the Greek and Latin classics; within Spanish literature, Galdós, Unamuno and the ubiquitous Ortega y Gasset. As for the youngest generation, when asked about his preferences, he is evasive, but optimistic:

Creo en los jóvenes. El deber de un hombre maduro es renunciar a sus apetencias antiguas y estar en contacto con lo que hacen los jóvenes. Aun cuando no los comprenda del todo. El contacto no se establece por las vías del juicio intelectual, sino por otras más intuitivas, como -- en distinto aspecto -- ocurre con las cosas amadas, cuya afición--a veces--no tiene nada de lógica: deriva de una atracción sensual. Espiritualmente, es el mismo caso: una apetencia intuitiva de la dinámica juvenil. (Ayala 1)

The stance of Dr. Pittaluga toward the *vanguardia* is honest—there indeed exists the element of the incomprehensible in the artwork emerging from that generation; but there is an

acknowledgment of the dynamism of the new art, something which does not emerge in the interview with Dr. Marañón and only with reserve in the interview with Dr. Recaséns.

Dr. Marañón, when asked by Miguel Pérez Ferrero about the *vanguardia* and *los jóvenes* that comprise it responds by redefining the semantics of the youthful movement:

Hay que aclarar antes qué debemos entender por juventud. Llamarse joven por tener pocos años lo juzgo tan superficial como llamar grande a un hombre porque tenga dos metros de talla. La juventud se mide por la intensidad de las virtudes específicas de esa edad: inquietud, noble rebeldía progresiva. En este sentido, cuando dentro de unos años contemplen nuestros hijos el panorama actual de España, los autores que, parecerán más jóvenes serán gentes que hoy tienen de cincuenta para arriba. De los jóvenes actuales me gustan: Unamuno, Valle-Inclán, Andrenio. (Pérez Ferrero “Lo que lee y escribe el Dr. Marañón” 1)

Marañón displays a decided reserve towards the latest generation of artists; Dr. Recaséns does not. The only problem for Dr. Recaséns is that, being the dean of the Facultad de Medicina, he lacks the time to explore the new literature. He praises the emerging artists, with a mild critique of the fact that there exist among the vanguard artists a few “aberrations”. José María López Avellán paraphrases the response of his subject to the question about *la juventud*:

Al Dr. Recasens le interesa mucho la Literatura de ahora. Con las limitaciones--claro está--del tiempo. Del tiempo libre de que puede disponer, tan exiguo. Y considera que se ha progresado una enormidad. Ahora es muy fácil gozar espiritualmente, intelectualmente. Un placer más que estaba antes vedado. Antes, en sus años de mozo -- nos dice-- solamente producían los libros una emoción sensibilera. La nueva literatura proporciona una emoción y un interés muy distintos. Aclaremos, no obstante, que esto no es extensible a toda la Literatura de hoy. A mi parecer, hay, al lado de muchos valores indiscutibles, aberraciones bastantes. Nos tiene también unas palabras de elogio, cálidas, para *La Gaceta Literaria*--y para los de *La Gaceta*--, que le resulta novedosa en extremo, en medio de la avidez diaria. (López Avellán 1-2)

Regardless of the differing opinions of the three doctors, it is clear that each one has a respect for the contemporary literature being written in Spain, and the fact that they willingly offer themselves for interview by the *Gaceta Literaria* attests to this respect, as the *Gaceta* was, at the time, the major organ of vanguard literature. By connecting these physicians with the artistic world, by discussing not only what they read and their attitudes toward literature, but their own writings as well,⁴³ the *Gaceta* creates the vision of the scientist as cultural consumer,

⁴³ The interview with Marañón includes a section in which the doctor is asked to reflect on his own writings as literature. He responds by saying that while he believes in the literary value of his work, he never intended to create literature itself, thereby drawing a distinction between artistic and scientific creative efforts, while still allowing for there to be mutual influence between the two fields, helping to fortify the image of science as culture, although not in the sense that science creates culture, but rather that it is an active participant in the cultural matrix, of which Marañón was most definitely a part.

commentator and contributor, all of which are relevant to establishing science as an intrinsic part of the intellectual fabric of Spain.

Establishing science as a part of culture necessarily implies that science was a communicable subject, not out of the reach of the masses, even with the innovations taking place in physics and mathematics that had some speaking of the possibility that only an intellectual elite, could comprehend the matters being discovered and tried. It would seem that Ramiro Ledesma Ramos was one of these who felt that the New Science was beyond comprehension by the reading public, whose market was currently flooded with popularizations on topics in physics, mathematics, and medicine, to name just a few. The idea of turning complex theories into facile metaphors was distasteful to Ledesma, who upbraids his colleague Francisco Vera, a very talented scientist with a gift for simplification, in a review of Vera's book *Espacio, hiperespacio y tiempo* (1928):

Se trata, hemos dicho, de un libro de divulgación, compuesto con miras a un público no matemático ni científico. Yo no sé hasta qué punto resulta esto posible. Ni legítimo. Sólo a costa de sacrificar el rigor y la esencialidad. Es más grande cada día la tendencia a recluir las especulaciones en recintos de amplia muralla. Se va advirtiendo que caminamos hacia una época oscura y desértica, de la que sólo se salvarán los esfuerzos gigantes y continuados. No más frivolidad ni más *ciencia al alcance de todos*, según frase estereotipada e ilusa. Por esto, yo discutiría al simpático camarada Francisco Vera la legitimidad de su libro. Y hasta la imposibilidad de una realización así. Me refiero a que siempre he encontrado de comprensión más difícil las cuestiones científicas tratadas en los libros divulgadores que su mismo estudio directo en las fuentes de los sabios. ("Escaparate de libros: Tres libros de filosofía" 3)

Ledesma displays a patent professionalism that is undeniable, but his critique is significant in that it outlines the insurmountable frontier between the disciplined exploration of a scientific discipline and its mere consumption by the curious. That is, Ledesma is aware of the fact that there is a need for popularizations to satisfy the public's desire for knowledge; but he does not equate this with any potential for the public to become experts in what is, for them, essentially, a hobby, or at worst, bourgeois tea-party fodder for the falsely erudite. Ramiro Ledesma Ramos is against not the diffusion of knowledge (and thus its becoming a part of its surrounding culture)—he is against the continued creation of a crop of dilettantes.

Thus, in his writings for *La Gaceta Literaria*, Ledesma Ramos displays a rare cautiousness when it comes to painting too large the connections between science and culture, and precisely defines the relationships which he does choose to point out. He takes to task Hans Driesch, a philosopher, for his logical critique of the theory of relativity, pointing out the weaknesses in using logic to attempt to refute non-Euclidian geometries. He states:

Nada puede deducirse de aquí en favor de una dogmatización acerca del cuál sea la esencia geométrica del espacio físico, como erróneamente cree Hans Driesch. Einstein resuelve este pleito diciendo que no puede hablarse de espacio euclídeo o noeulídeo, sino que es dependiente de los estados de gravitación. La teoría de la gravitación,

repetimos, es la esencial contribución de Einstein a la nueva Física. Que es adonde Hans Driesch debió haber apuntado... Prescindiendo de las pruebas experimentales—todas ellas astronómicas—, tiene la teoría de la Relatividad la prueba que suministran las matemáticas. Pero éste es, precisamente, su máximo pecado para Hans Driesch. Su crítica es una crítica de los métodos matemáticos. Nada más. Que no los cree suficientes para fundamentar una ciencia natural. El problema, como se ve, es antiguo. En Hans Driesch es, sin embargo, tan sólo un resabio de aquellos su tiempos de biólogo. No la moda del antimatematismo. (“La Gaceta Científica: Hans Dreisch y las teorías de Einstein” 8)

Ledesma Ramos, as a mathematician, obviously could not let a weak “antimatematismo” go unchallenged; nor could he allow for the philosophical connection between mathematics and philosophy, when done correctly, go unnoticed. When speaking of “el sabio italiano” Federico Enriques, he first discusses the value of the work of Enriques’ colleague, the illustrious Rey Pastor, who he claims:

fija sagazmente las direcciones científicas de los sabios más ilustres de nuestro tiempo en relación con las actividades filosóficas. Y reconoce que su espíritu vuela por encima de las bardas de sus especialidades, demasiado estrechas, para dominar el panorama circundante y descubrir las fuentes donde nacen las corrientes ideológicas que las fecundan. (“Filosofía, ciencia: Rey Pastor y el sabio italiano Enriques.” 3)

Enriques’ work is similar to Rey Pastor’s in this aspect, Ledesma claims, and in Italy, it is comparable with the work of Italian philosopher Benedetto Croce— high praise, indeed, coming from Ledesma, whose scholarship in both philosophy and the sciences was indubitably comprehensive.

Ledesma Ramos’ vision of the communion between physics, mathematics and philosophy is tightly bound and regulated, as we can see from the previous examples. Of the nearly fifty articles that Ledesma wrote that in some way touched on either philosophy, science, or the relationship between the two, nearly all of them establish this pattern of a rigid definition of what defines rigorous scholarship in any of the aforementioned disciplines, while still admitting the interpenetration of the two disciplines. It would be possible to write an entire treatise on Ramiro Ledesma Ramos’ posture in this regard; unfortunately, our space is limited (as was Ledesma’s when he wrote for the *Gaceta*), so I will leave off with a quote from his review of a work by a Professor Carrasco, *La filosofía de la mecánica* (1928), that I believe sums up neatly Ledesma Ramos’ attitude, bringing science and philosophy together, but certainly conceding superiority to the scientific disciplines, because of their absolute precision and clarity, sorely lacking in philosophy, and a quality prized by the author:

La Historia de la Filosofía y la Historia de la Ciencia son un entrecruzamiento constante de problemas. La influencia es recíproca, y sería aventurado afirmar de qué recinto proviene la ola de más empuje. Dilucidar esta cuestión supone, quizá, estructurar toda la Filosofía contemporánea. No hemos de resolverla nosotros. Es bien patente, sin embargo, que todas las teorías científicas de amplio radio rezuman una filosofía. La

inversa no se realiza siempre, entre otras razones, porque la Filosofía no puede tener como única finalidad el incremento científico. (“Filosofía, ciencia: El profesor Carrasco” 3)

It is ironic, considering that Ramiro Ledesma Ramos prized so highly scientific accuracy that he should end up leaving off the “*ciencia*” from his column that comprised both philosophy and science. His penultimate article for *La Gaceta Literaria* is a summary of the philosophical activity in Spain in 1930, which he describes as a period (speaking of the last several decades, if not entire centuries) of reception, rather than production. “No sé cuándo podremos aspirar en España a salir del estricto periodo de aprendizaje. Puede muy bien suceder a un pueblo que haya una época en que predominen las capacidades receptoras, no creadoras, que persigan el saber de los demás y agoten en una tarea así todas sus reservas” (“Filosofía 1930” 16-17). One can sense the frustration in Ledesma’s critique of Spain and its passivity with regard to intellectual matters (this in spite of Ortega’s overwhelming presence in the philosophical theater); soon that critique would force him to leave *La Gaceta Literaria*, where he was reduced to mere commentator, to form his own publishing venture, in which he would achieve a vigorous activism that brought him past the boundaries of philosophy and science into the roiling world of Spanish politics at the dawn of the Republic—a publication titled *La Conquista del Estado*.

Science as Progress: The Weakness of the University System

Preguntan con asombro los profesores de Zoología y de Botánica de las Universidades extranjeras a qué se debe que no existan en nuestro país zoólogos y botánicos; es decir, naturalistas que, además de saber clasificar las plantas y los animales, estén capacitados para estudiar dichos seres científicamente, por conocer los métodos de la Anatomía comparada, Fisiología y Embriología, al modo como han hecho centenares de naturalistas en Francia, Inglaterra, Alemania y los Estados Unidos, y cuyos nombres sería prolijo enumerar...

...En todos los países civilizados, la sistemática--cosa completamente distinta de la Botánica y de la Zoología--se enseña en los trabajos prácticos manejando las claves y reconociendo los caracteres, con lo cual los estudiantes de las Universidades europeas saben clasificar los vegetales y animales que más interés ofrecen, desde el punto de vista de sus aplicaciones, parasitismo, etc. En cambio, en España, con el método de los discursos, se sale de nuestros centros docentes sin saber clasificar los vegetales y animales llamados 'de laboratorio'. Yo he terminado la carrera de Ciencias Naturales en Madrid, sin haber clasificado ni un protozoo, ni un insecto ni un molusco.

—M. Sánchez y Sánchez, *La Gaceta Literaria*, 1927 (2)

Appearing in the sixth issue of *La Gaceta Literaria* was a condemnation of the ways in which zoology and botany were taught—or rather, *not* taught—in Spanish universities. Instead of learning what had become the basis of these disciplines in the rest of the modern(ized) world, Spanish universities were still teaching according to 18th century principles such as “zoografía” and “fitografía”, research areas that M. Sánchez y Sánchez, a former student of the natural sciences, deemed “pseudoscientific courses” that amounted to nothing when compared to the rigorous training offered by other Western nations in their university systems. It is the first voice recorded in the *Gaceta Literaria* that would condemn Spanish universities for their backwardness, their laxity, and their general failure to produce a new generation (or, indeed, *any* generation, going back hundreds of years) of productive, creative, innovative scientists.

The complaint of Sánchez y Sánchez about the lack of scientific training in Spanish universities is far from being a lone cry in the wilderness. In fact, the *Gaceta Literaria*, before even the advent of the sub-section the “Gaceta Universitaria,” has as one of its major themes this universal failure of state-sponsored higher education in most areas, not only science. The bell tolls early on, with a front-page article by the revered Dr. Gregorio Marañón, titled “El ocaso de las universidades.” Perhaps for reasons of censure—*La Gaceta Literaria* was subject to review by state censorship authorities under the dictatorship of Primo de Rivera—Marañón’s article speaks not of the twilight of the Spanish university system alone, but of a general incapacity worldwide to produce disciplined young scholars. It is hard to believe, though, that this criticism is meant to be applied so broadly, when at the time universities all across Western Europe and the Americas were creating both brilliant students and stunning discoveries, especially in the areas of physics, chemistry and mathematics.

Initially, Marañón critiques the University for its trending towards pre-professional education, whose degrees, he felt, were more bought than earned. His major complaint, however, is that the universities had grown musty and outdated. More, he believed that they had also become subservient to the State, as is demonstrated in the following citation:

...[L]a mala organización, la mala técnica de la enseñanza. El régimen universitario está ideado para el saber y la psicología de una época de la que nos separa un abismo, más que de distancia, *de profundidad* de tiempo: que éste tiene también dimensiones y con frecuencia no es el número, sino la calidad de los años, o de los minutos, lo que nos acerca y nos aleja de las cosas. La estructura actual de la Universidad es vieja, como lo son tantas otras instituciones oficiales; en realidad, como es todo lo oficial en los Estados actuales. Y las instituciones viejas hacen viejos a cuantos viven a su sombra. Sólo los hombres de genialidad excepcional son capaces de superar la acción aniquilante de los ambientes caducos, de igual suerte que sólo los organismos de superior energía física resisten a los ambientes insalubres.

Pero, además, la Universidad ha perdido su independencia frente al Estado, y con ello la casi totalidad de su eficacia espiritual. Es la misma tragedia que tiene casi desmontada a la Iglesia. La Iglesia, la Universidad, representan, dentro de su progreso, los valores eternos: moral y saber. Por eso debieran ser como los hitos, que sirven a la Humanidad para recobrar terreno firme cuando todo lo demás está instituido sobre bases arbitrarias

que sólo el tiempo da una apariencia de legitimidad. Hay que aceptarlo así, y ya van pasados muchos siglos para que tengamos la esperanza de que algún día tenga mayor peso específico en la conciencia colectiva la justicia que la fuerza. Por eso la eficacia de la Universidad—como la de la Iglesia—debieran hacerse patentes, antes que nada, en su actitud de independencia y permanencia frente a las fluctuaciones del Estado. (Marañón 1)

Other critics of the university system said little more with regard to its deference to the State, and one has the impression that the only reasons these comments were published in *La Gaceta Literaria* were due to the fact that, primarily, it was Dr. Marañón—whose prestige and authority were virtually unchallenged at the time—who wrote the commentary, and, second, the general and universalizing terms that were employed by the author did not directly implicate the Spanish government. Even without the stinging upbraiding of the University for its subservience to State directives, the charge of being an undisciplined, outdated and essentially corrupt institution still carries a remarkable weight.

A later, anonymous critic sums up the university system and its students as being “todo técnica”—that is, devoted to the creation of practical scientists and engineers, not pure science as Marañón would presumably prefer and encourage. The critic notes that:

La cultura universitaria es un arma. Puede traducirse por este concepto: *Técnica*. Sabiduría es adoración de lo ya creado. Técnica es aptitud para crear lo que no se ha creado todavía. De la Universidad se sale sabiendo cómo se pueden hacer cosas y dónde buscar los libros, las fuentes que enseñan a hacer cosas. Esto sólo se aprende en la Universidad. Es totalmente extraño a toda autodidáctica. La Universidad es *La Casa de la Técnica*. Término societario. Justo. Preciso. Exacto... Todo técnica. Hasta la filosofía. (“De la Universidad” 4)

In this particular article, the accusation of being “todo técnica” does not appear to be directly pejorative, implying as it does that students emerging from the university should be, at least, able to produce tangible results, that which “has not yet been created”. But it does admit to the notion that there is a difference between pure knowledge (*sabiduría*), which here is conveyed as being an impractical pursuit, and technical knowledge, which, considering the state of modernization in Spain, would be seen by some as being the more useful type of study, yielding as it did civil engineers capable of enacting improvements in the national infrastructure.

The problem of “practical” versus “impractical” education had previously appeared in the words of yet another exceptional intellectual figure interviewed in the *Gaceta*, the discussion with Rey Pastor conducted by Ramiro Ledesma Ramos in his debut article. Published in the thirtieth issue, the tone is slightly more optimistic (and adulatory on the part of Ledesma, a theme which will be discussed presently), at least when the question is posed to Rey Pastor if there is “un posible renacer de los estudios matemáticos”. His response is hesitant: “Hay... todavía una ausencia total de estímulos que hiere de muerte a la investigación. Mientras esto no desaparezca, serán infructuosos casi todos los intentos. Los alumnos mejores van a la conquista de las técnicas, se hacen ingenieros...” (Ledesma Ramos “Transeunte Eximio” 1). Rey Pastor’s

comments on the lack of students going on to pursue pure research echoes the sentiment professed by Gregorio Marañón and prefigures the article “De la Universidad” which appeared nearly two years later, about the overwhelming pre-professionalism undermining Spain’s ability to produce a new crop of investigatory scientists, or in this case, mathematicians.

Still, for those whose pursuit was *sabiduría*, research and advancement, the creation of a competitive, world-class university system, *técnica* did not fit the bill. One of the most outspoken critics in *La Gaceta Literaria* was, of course, Ledesma Ramos, whose training as a mathematician had taught him respect for the pure sciences. His critiques of the poverty of the university system are not merely forceful, but vehemently nationalistic, a sentiment which would come to define Ledesma’s writings and actions as the years progressed. There is more than a mere “tinge” of nationalism in, for example, the interview with Rey Pastor, in which Ledesma speaks of an “España renacida,” readying itself for competition with the rest of the world, scientifically.

Toda la joven España, la nuestra, la que dispone de medidas legítimas de Apreciación, Valoración y Estimación, vibra hoy con alborozo ante la figura de este hombre insigne, que es y representa para nosotros tantas cosas admirables. Una de ellas, su gesto magnífico –que advertimos también en el filósofo Ortega y Gasset, en el físico Cabrera– al remontarse en vuelos amplios sobre las llanuras desoladas y sembrar aquí el germen de las inquietudes superiores. Porque usted, Rey Pastor, es uno de los pocos – ¿tres, cuatro?– impulsores geniales de la España renacida, y por usted, y gracias a usted –con esos tres o cuatro– existe y se afirma hoy una juventud dispuesta a los actos heroicos del Competir (Competir es llegar, por lo menos, hasta donde otro llegue; es la disputa de primacías, y para esto lo urgente es situarse en las vanguardias, pues los gestos bélicos, cuando no se hacen con enemigo a la vista, resultan infecundos). (Ledesma Ramos “Transeunte Eximio” 1)

The only way to compete with other nations would be to produce a crop of intellectuals, at the time numbering (according to Ledesma), a mere three or four competent scholars, who would facilitate this entrance into the race for knowledge. As if to speed this on, Ledesma consistently draws attention to the shortcomings to be found in the university system. Here, a selection of his critiques:

From an article on the creation of the Instituto Sáenz del Río:

Todos sabemos la [laxitud] con que la Universidad española se da cuenta de sus deberes superiores. Y la gran labor que desarrollan esos otros centros un poco provisionales— ¿no?—y extrauniversitarios, que se llaman Centro de Estudios Históricos, Laboratorio de Investigaciones Físicas, Seminario matemático, etc. etc. (“Actualidad: Filosofía, Ciencia: Un instituto de Sáenz del Río” 2)

....

From an essay titled “El curso universitario”:

Va unida a la Universidad en todos los países la estructuración de la cultura superior. Cuando en España, hace dos o tres décadas, una docena de hombres insinuaron aquí la posibilidad de referirse a este concepto de cultura superior, hasta entonces proscrito, su labor tuvo que realizarse en organismos o instituciones extrauniversitarias, casi enemigas de la Universidad, porque en estos tradicionales recintos resultaba imposible injertar la nueva cosa. Es, pues, evidente que la universidad española permaneció alejada de su función estricta, y si hoy con un poco de optimismo en el mirar advertimos en ella un afán de dirección responsable de la alta cultura, bueno es fijar dos afirmaciones, de autenticidad histórica fuera de toda duda: 1ª. Que la inquietud de los valores culturales supremos penetró paradójicamente en nuestra Universidad por vía exógena. 2ª. Que la opinión ingenua y difusa, hecha a base de interrogaciones, de las nuevas juventudes, ha reclamado de la Universidad esos valores. (4)

The main criticism as we can see in these two passages is that the university system had become so weak that it required the creation of outside institutions, such as the *Junta para Ampliación de Estudios*, in order to effect scientific progress in Spain. Ledesma appears to resent the “vía exógena” by which new knowledge was arriving and being produced in Spain, and this we can attribute directly to his belief in modernization, and his extreme desires for a strong and unified nation. Ledesma’s nationalism was not geared solely towards the betterment of scientific and philosophical education—this aspect is the only one we see overtly manifested in *La Gaceta Literaria*. Considering Ledesma’s importance to the overall project of *La Gaceta Literaria*, it would be wise to investigate other forms of nationalism as they appeared in the *Gaceta* as well, beginning with an unusual phenomenon: the scientist as national hero.

Science as National Identity: Lionizing the Masters

We have spoken repeatedly of Dr. Gregorio Marañón and of Rey Pastor in the present chapter, and Blas Cabrera in Chapter Two. These men of medicine, mathematics and science were the lynchpins in a rapidly developing renovation of scientific research in Spain that began with the founding of the JAE in 1907. Rey Pastor and Blas Cabrera were present from its founding, as researchers and later as part of its administration (Sánchez Ron *Cinzel, martillo y piedra* 178). Marañón, of course, was his own phenomenon, as previously mentioned; in the field of medicine, he was unrivaled. The only two candidates who approximated the level of respect garnered by Dr. Marañón were Dr. Sebastián Recaséns, dean of the *Facultad de Medicina* in Madrid, also featured in the *Gaceta Literaria*, and Gustavo Pittaluga, who appears on more than one occasion as well. We have already discussed how these physicians were viewed by the *Gaceta* as being examples of the proverbial “Renaissance man,” whose literary tastes were of as much interest as their medical achievements. It is important to examine, however, in addition to the way they were presented as figures of cultural acuity, the manner in which the *Gaceta* tended to glorify their work and their status as symbols of national progress and national pride; in sum,

the way *La Gaceta Literaria* used these men of science to create a discourse of nationalism around their contributions to science—Spanish science, in particular. The objective of this portion of the chapter is not to give a biographical account of the existence of these figures, but rather to reconstruct the discursive practices that aggrandized them and made legends of the men themselves. The two men who receive the most attention are Gregorio Marañón and Julio Rey Pastor; we will focus our attention on the construction of their lionization by the contributors to *La Gaceta Literaria*.

Dr. Gregorio Marañón

Dr. Gregorio Marañón required no introduction by the time the *Gaceta* appeared for the first time on the first of January, 1927. At the point when it ceased publication in 1932, Marañón had become the epitome of the Spanish scholar, as an introduction to his 1926 work *Tres ensayos sobre la vida sexual* by Ramón Pérez de Ayala attests, when the latter describes the former as defining the standard of what Ayala calls “*hombredad*”:

En el friso de la vida española, en pleno aire, la figura de Gregorio Marañón destaca en relieve exento, de singular magnitud y dinamismo. Su personalidad extraordinaria asume en sí armoniosamente todas las manifestaciones activas que la cultura clásica juzgó indefectibles, a fin de realizar el canon del hombre integral: esposo, padre, amigo, ciudadano, artista y sabio. La nombradía dilatadísima de que goza se originó señaladamente de su aventajamiento en el arte y la ciencia hipocráticos. En él parecen revivir las virtudes mágicas, diagnósticas y terapéuticas, de los fabulosos Asclepiades. Sus obras de carácter científico están reputadas fuera de España como “standard books”, obras fundamentales en el asunto de que tratan. Estos excepcionales logros de la inteligencia y la diligencia no cierran el perímetro de la personalidad de Marañón. Un profesional, aunque al alcance a ser el primero de su profesión, si no es más que un profesional, es bien poca cosa. Lo que ante todo define al hombre, ¿hará falta decirlo? Es la *hombredad*. (Pérez de Ayala and Marañón 7)

It would be fair to say that the “*hombredad*” here attributed to Gregorio Marañón was in part accrued through the generous amount of publicity (both positive and negative) granted to him by the press, as well as his chosen topic of investigation—sexuality. *La Gaceta Literaria* accounted for a large part of this attention to Marañón’s work during its run. The *Gaceta* chose its words carefully and occasionally published dissenting opinions from the great Dr. Marañón. But to say that the *Gaceta* actually offered a critique of the man’s work would be to overstate the case, even though Miguel Pérez Ferrero does precisely that in an introduction to a review of *Los estados intersexuales de la especie humana* (1929):

Bastantes veces se ha asomado a estas páginas la figura del doctor Marañón, y siempre con el motivo justificado de la publicación de sus obras, del reseñamiento de sus conferencias, o de alguna intervención directa, requerida. En una ocasión se asomó para

charlar conmigo largamente. La figura del doctor, familiar, por su fama, para todo el mundo, debe ser familiarísima para los lectores de LA GACETA LITERARIA, por el conocimiento de los comentarios de aquí sobre el de sus libros y sobre el de otras opiniones más ajenas. Y conste que no hablo a los pacientes agradecidos. Quiero decir que el doctor ha pasado en este periódico por toda clase de críticas, desde la estrictamente científica o literaria de los de otra acera--pero crítica reconocedora, por justa, del mérito [de su obra]. (“Declaraciones de Marañón” 1)

Pérez Ferrero wrote several articles about Marañón, his work, and in one instance, interviewed the doctor, beginning with the question: “¿Quiere usted que hablemos de su obra, que tanto ha influido y, por fortuna, influye, y tan honda huella viene dejando en los espíritus de selección de la España contemporánea?” (“Declaraciones de Marañón” 1). The vocabulary used in these two citations is at the very least respectful, if not bordering on sycophantic; but Pérez Ferrero is right to acknowledge the omnipresence of Marañón in the pages of the *Gaceta*. Considering the financial contribution of Marañón to the founding of the magazine, this phenomenon is easy to explain, and one could easily cite at length the nearly two dozen articles that reference Marañón in some way. Perhaps it is enough, however, to remind the reader that it was in the last issue of the magazine when the Gregorio Marañón Prize for writings in the life sciences was awarded to Juan López Ibor. Ernesto Giménez Caballero, as editor of the magazine, and in spite of the liberal leanings of Marañón that were in contradiction of his own, went forward with the prize, honoring Marañón to the end.

Julio Rey Pastor

In March of 1926, the North American journal *Hispania* published an article titled “Spanish Scholarship and Science”. “Spanish scholarship and science are popularly rated low; and Spain is one of the poorest self-advertising nations in the world... There are many tireless, original, brilliant, modest scholars... in the history of Spanish scholarship” (Warshaw 70). The final mention among the list of scholars—Ramón y Cajal, Menéndez y Pelayo, Menéndez Pidal—is Rey Pastor. True, Julio Rey Pastor had left Spain for Argentina in 1920, and was a pillar of the community at the University of Buenos Aires; but Spain never ceased to revere Rey Pastor as one of her own, and the language used in *La Gaceta Literaria* to describe him attests to this. J. Varela Gil says of Rey Pastor that he “alcanzó la altura que tiene en España y en la Argentina, por ser un verdadero maestro” (6). While Rey Pastor does not have the ubiquitous presence of Dr. Gregorio Marañón, he certainly garners the same language when referring to his work, which was recognized worldwide as first-class scholarship.

But is it an international pride in Rey Pastor that the *Gaceta* sought to emphasize? Earlier in the chapter we discussed the effusive introduction given to Rey Pastor in his interview with Ramiro Ledesma Ramos; the conclusion of the interview is no less laudatory in nature, and is heavy with Ledesma’s fervent nationalism:

Aquí, ahora, vosotros, gente de la España nueva y renacida, todos en fila, con los sombreros en alto, como gigantescos signos de admiración. Hoy suenan los timbales de *La Gaceta Literaria* en loor de este grande hombre. Mañana sean otros, y luego otros, y alguien siempre.

Mientras tanto, yo, que estoy en el secreto, pido un millón de pesetas de subvención estatal para ese seminario matemático que Rey Pastor ha fundado entre nosotros.
("Transeunte Eximio" 1)

This is not the tone of modest recognition of talent, nor is it a means of expression that would have Spain taking its place with equal footing on an international intellectual map. Rather, these words of Ledesma Ramos (and, to a lesser degree, the earlier praises of Marañón by Resa and Pérez Ferrero) are forceful cries for the recognition within Spain of the natural talents that could indeed allow for a surge in Spain's global significance, scientific and otherwise, employing a paradoxically nationalist discourse in pursuit of an internationalist objective. It is precisely this nationalist sentiment that makes *La Gaceta Literaria* so remarkable as an artifact of its time, as both symptom of the rise of nationalist fervor, and proponent of the nationalist message itself. The need for heroes—for heroes of science in particular—is, in actuality, a call to see Spain, to use Ledesma's terms, as "renacida".

In the broadest of terms, we can summarize the *Gaceta's* scientific content as lending itself to Giménez Caballero's nationalist, and later, fascist, agenda. Through a variety of tactics—the near hagiographic presentation of men of science, their formulation as an intrinsic part of Spain's project of both technical and cultural modernization, and the vehement denunciation of a fossilized, incompetent, and non-competitive university system—*La Gaceta Literaria* managed to draw attention to aspects both positive and negative that were shaping Spain's actuality. The actuality that Giménez Caballero and Ledesma Ramos perceived was one of great potential, and also of great stagnation. In this sense, science served as one of the many sabers that were rattled in a gigantic call to arms that brought about the revolutionary politics—both republican and fascist—of the 1930s. Unlike the *Revista de Occidente*, in which science was presented as politically neutral and, in the majority, imported from other Western nations, *La Gaceta Literaria* kept its science close to home in the very hopes of awakening its readers to the enormous wealth that Spain possessed intellectually, wanting to stir up nationalist pride by showing that theirs need not be an incomplete or backwards nation, if the tremendous potential, were channeled in the right direction.

Conclusion: *La Gaceta Literaria* and the *Revista de Occidente*—Science as Cultural Discourse

Over the course of the last two chapters, through the close examination of two fundamental periodicals from the *Edad de Plata*, I have attempted to illustrate the manner in which scientific discourse came into close contact with literary culture, and how these forums

consequently came to construe science as an active component of the actual cultural matrix. Though both the *Revista de Occidente* and *La Gaceta Literaria* dealt with science on a regular basis (albeit, with the *Revista* giving a significantly larger space to scientific concerns than the *Gaceta's* physical space would allow), their reasons for doing so were pointedly different. For the *Revista de Occidente*, science was one of the main avenues by which Spain could integrate itself with the rest of Western civilization, thereby allowing it to participate in an international forum that would allow it to effectively modernize and integrate into the European mainstream. The *Revista* also presented science as a part of a larger world of ideas that, through contextual juxtaposition, could interact with the dialogues of other disciplines. It was not corralled into its own sub-section, as it was in the *Gaceta*. Also, the *Revista* published translations of essays by major thinkers from other (principally European) nations, so as to present to the reader a wider vision of the active cultural forces at work beyond Spain's borders. The inclusion of articles without significant commentary by editors or reviewers allowed for the content to stand on its own, free of any politicization, to be judged by the readership on its own terms; however, we still must acknowledge the outlook of the director, José Ortega y Gasset, as a significant filter that affected the overall complexion of the *Revista de Occidente* that affected the choice of materials.

In contrast, *La Gaceta Literaria* did not in the slightest way attempt to present scientific issues as politically or culturally neutral topics. The *Gaceta* did not translate from foreign sources; rather, it presented science by way of the various perspectives of its reviewers, whose opinions about the matters often colored the presentation of the topic in question. The *Gaceta* was not interested in promoting a new internationalism in which Spain would be included in European concerns. To the contrary, its director, Ernesto Giménez Caballero, based the magazine on a platform of nationalist resurgence, whose indirect consequence would be the reentrance of Spain into the European milieu, but whose primary objective was to unify, vivify, and generally strengthen Spain's sense of self. In the case of science, *La Gaceta Literaria* chose to focus on native Spanish talent and the problem of science in the homeland, rather than import foreign knowledge. Through the lionization of science's masters, *La Gaceta Literaria* drew a dual attention to Spain's preexisting talent and also to the need for further attention to the continuing weakness of the educational infrastructure that was debilitating to Spain's progress.

Thus, the two periodicals were engaged in the promotion of science for the purpose of cultural renewal, but each to a different end. The most significant byproduct of this placement of science within the framework of culture was that it brought otherwise distant topics into direct contact with the aesthetic preoccupations of the time. That is, science became contextually relevant to the developing vanguard movements of the 1920s and '30s. My hypothesis, therefore, that I will explore over the next two chapters is that this coming-together of science and art had significant effects on literary production and the prevailing cultural attitudes at that moment. By placing science within the philosophical and artistic milieu, the intelligentsia opened the door to a new and often astonishing play of ideas and innovation in both form and language. In Chapters Four and Five, I will examine how this new inclusion of science was both embraced and critiqued from within the Spanish *vanguardia*, and how in viewing literature through the lens of science, we can obtain a much more thorough understanding of the aesthetic makeup and overall aims of Modernism in its Spanish configuration.

Chapter Four: Literature as Investigation and Discovery—The Spanish Vanguard and the Scientific Paradigm

Introduction: Climates of Opinion, Cultural Matrices

Over the course of the previous three chapters, I have discussed the history of science in Spain from the Enlightenment to the Spanish Civil War, as well as the manner and means by which science became integrated with a larger discourse that allowed it to transgress and/or transcend its disciplinary boundaries and enter the cultural mainstream. As public awareness grew of the power of science to affect the nature and quality of daily life through a veritable embarrassment of new technologies, it ceased its academic isolation and became a dynamic component of culture and society. The transformation in popular thought was manifested either abstractly in the sense of a revised *Weltanschauung*, or more concretely through the observable tension between an alternating enthusiasm and suspicion regarding the growing dominance of technology in the overt shaping of a new way of life for the 20th century. Scientific discoveries, in particular the theory of relativity, captured the public's imagination with their radical restructuring of traditional concepts of time and space, causing many to reassess commonly-held ideas about an absolute and objective reality. The advent of the quantum theory in the mid 1920s had similar philosophical repercussions in that it emphasized the centrality of the observer's perception of natural phenomena. This encouraged a reevaluation and reconfiguration of the importance of subjectivity and perspective within a rapidly changing society that was committed to modernization and the overarching, if abstract, desire for "modernity." Therefore it is possible to see how science and its associated imagery, not to mention its applications, existed during these years as an active entity within the dominant cultural matrix, an outline of which has been established in the preceding chapters. As such, it stands as a viable and potent synecdoche for the process of modernity and modernization that Spain experienced in an accelerated and condensed form between the watershed years of 1898 and 1936.

What does it mean to say that science was vitally entwined in the "cultural matrix" of early 20th-century Spanish society? From whence does this term proceed, and how is it to be used in this study? The idea of the cultural matrix has its roots in the work of one of the better-known scientists-*cum*-philosophers of the time period in question. While we do not find the words "cultural matrix" directly present in his 1925 book, *Science and the Modern World*, Alfred North Whitehead did cite the presence of a "climate of opinion" that was "colouring [the] ways of thought" pertaining to the public's understanding of the workings of the universe.¹ The idea of a cultural matrix, or a field model for cultural history, is based on A.N. Whitehead's ideas of the ways in which, during certain historical periods, the intelligentsia experience a certain

¹The aforementioned "cultural matrix," referred to in both N. Katherine Hayles' study *The Cosmic Web* and referenced in Vargish and Mook's *Inside Modernism: Relativity Theory, Cubism, Narrative* is one possible way of understanding how this mingling of disciplines is brought about. Alfred North Whitehead, *Science and the Modern World* (New York: The Free Press, 1925) 3.

congruence of critical thought that makes possible a cross-fertilization between disparate areas of study or cultural production, one “that makes some questions interesting to pursue and renders others uninteresting or irrelevant” (Hayles 22). If we take this statement of “irrelevance” and hold it alongside theories of the development of the avant-garde, we can see that Whitehead’s assessment is only part of the picture. What is “irrelevant” is actually most pertinent, especially when these “irrelevant” ideas are those of a passing tradition, another distinct climate of opinion of an earlier time, against which the present moment is rebelling. The idea of rebellion as a fundamental motivation for the development of the avant-garde is highly present in the works of Renato Poggioli, Richard Murphy,² and, of course Ortega y Gasset. The setting of the present against the past actually makes these outmoded ideas highly relevant, in the sense that they define what is perceived as normative, acceptable to bourgeois attitudes, and, indeed marketable to such an audience. The avant-garde sets itself against such things and finds its definition at first in negative terms—what it is not, rather than what it is—and then gradually grows into an independent identity. However, it must be added that, in the case of Modernism, no such identity—singular, unmistakable, uniform—was ever firmly put in place or obeyed, as would be the case, for the sake of argument, of a unified Modernist manifesto. With the proliferation of “-isms,” each declaring its own *raison d’être*, it is difficult to arrive at a homogeneous and monolithic theory of Modernism—thus the continued proliferation of studies that attempt to define the movement.³ One such attempt came during the twilight of the *vanguardia*, in the pages of *La Gaceta Literaria*, in 1930. Among the many members of the intelligentsia whom the editors interviewed, it was Melchor Fernández Almagro who, when asked how he understood the *vanguardia*, described the avant-garde in negative terms:

la vanguardia no es precisamente una dogma, un orden cerrado de soluciones. No es una Estética, ni un Moral, ni—¡qué poca cosa!—una escuela literaria. Es, pura y simplemente, una disposición de ánimo, una actitud. Tal vez una sencilla proyección de nuestra mirada, claro está: sobre el futuro sin pestañear. (1)

The future to which Fernández Almagro refers reflects the characteristic processes within the *vanguardia*—and therefore also within Modernism and the Avant-garde as a literary phenomenon—to use their art to process their experiences of a changing world in which the future appeared both complex and desirable, due largely to the advances in science and technology that were making marvels out of the mundane.

² See Richard Murphy’s *Theorizing the Avant-garde*, specifically the section titled “The Reaction Against Realism: Counter-discourse and the Avant-garde” (pp. 43 – 48) which addresses this phenomenon in the context of German Expressionism. Regardless of the geographic discrepancy, his assessment of modernism’s distinction from realism remains true across cultures. He writes: “In place of realism’s claim to present an abiding truth, modernism and the historical avant-garde both offer mere perspectives, conjectures and provisional meanings which are foregrounded as ambiguous, unstable, and open to doubt. It is this ‘epistemological uncertainty’ and anomic doubt that characterize the modernist period as a whole and set it off from the nineteenth century.” Richard Murphy, *Theorizing the Avant-garde: Modernism, Expressionism, and the Problem of Postmodernity*, Literature, Culture, Theory (Cambridge, UK; New York, NY: Cambridge University Press, 1999) 44.

³ It is precisely here in the elusive definition of Modernism that we find our first instance of (dis)continuity, a term that I will be using with some frequency, and will be explained in the following pages.

In this chapter I will show that Spanish Modernism took many of its cues from a cultural matrix that was saturated with an influx of knowledge from extra-literary sources.⁴ While it is true that other disciplines such as sociology and psychoanalysis also played large roles in the development of the avant-garde in Spain, here I will be studying the way in which science—to be more precise, the advances in twentieth-century physics—penetrated the literary imagination. Science manifested itself in image, form, and theme within the *vanguardia*, sometimes overtly and at other times with a subtlety that can result in the surprise of discovery when one alters, to use Einstein’s words, one’s “coordinate system” or “frame of reference” to see this well-studied literature from a different perspective. It is the abstract lens of mathematical physics that I will be employing here—that of Einstein, Heisenberg, and many others (some of whom we have already met in Chapter Two) who contributed to the scientific developments that would significantly alter the ways in which many people saw the world. During the course of the chapter, I will outline the major changes in the physical understanding of the world, and translate these concepts into a viable analytical framework by which to view several representative works of the *vanguardia*: Pedro Salinas’ masterpiece of avant-garde prose *Víspera del gozo* (1927); Federico García Lorca’s challenging theatrical work *Así que pasen cinco años* (1931); and Jorge Guillén’s magnum opus *Cántico* (1928-1936), as seen from two distinct (but related) angles: the theory of relativity and quantum physics. I have chosen these works based on the challenges they present to the reader—challenges that derive in part from their employment of new modes of thought and creative expression that align naturally with developments in relativity theory and quantum physics. These affinities and tensions will be explored through the representation of time and space, energy and mass, acceleration and velocity, observer and observed, simultaneity and perspective, and finally the uneasy implications of Heisenberg’s Uncertainty Principle. We start now with a brief cultural analysis of the years in question, the *Edad de Plata* of the 1920s and 30s.

A Silver Age of Parallel Purities: Literature as Investigation and Discovery

In the early 20th century we often speak of an *Edad de Plata* in Spain that was widespread across many areas of knowledge. The areas that concerns us are science—with institutions such as the *Junta para Ampliación de Estudios* dedicated to bringing advancements in science across the border by sending Spain’s talented youth out to study in the major centers of learning throughout Europe—and literature, with its development of a unique aesthetic program, beginning with Ultraísmo and passing through the various “ismos” into the multi-faceted and diverse movement of the authors of the so-called (and oft-debated) *Generación del '27*. The discussion provided in the three preceding chapters should make it clear to the reader that the

⁴Peter Childs also acknowledges this cross-fertilization between disciplines in his work on Modernism, writing that “[Modernism’s] artistic expansion seemed to follow on from other kinds of growth: scientific, imperial and social.” We will only be examining the scientific aspect in this case; however, the vague language of the above quote (“seemed to follow on”) suggests the major problems posed by analyses based on principles of causality and influence between differing fields of inquiry. The questions that Childs’ language raises about the nature of the interdisciplinary borrowing that is characteristic of Modernism will be addressed presently. Peter Childs, *Modernism, The New Critical Idiom*, 2nd ed. (London: Routledge, 2007) 19.

arrival at an *Edad de plata* in both the sciences and the arts was hard-won in Spain.⁵ Fighting against traditionalism, authoritarianism, an existential (and national(ist)) crisis in the wake of the loss of empire in 1898, the resulting *abulia*, and inertia regarding “progress”—a concept viewed with much skepticism by both left and right—, the successes of the first third of the 20th century are all the more noteworthy due to their very struggle for existence and eventual triumph, as well their short duration, as they were brutally curtailed by Franco’s victory in the Spanish Civil War. The “revolutions” in science and scientific education, as well as in the burgeoning avant-garde movements, pointed toward a need for change after a century of a weakened academy, the overblown emotions of Romanticism, and the narrow-minded hard “facts” of a positivist approach to both science and literature.

José Ortega y Gasset makes the case for a toxic nineteenth century that poisoned society with its need for empiricism, rationalization, and realism. It was positivism that needed to be overcome, if not banished—a specific type of *progresismo* from the previous century that imposed its will towards a determined, invariant future. Ortega’s essay “Nada moderno y muy siglo XX” defines “modernity” as an obsession of nineteenth-century culture, and that the twentieth-century must shrug it off in pursuit of a spirit of genuine innovation and, more to the point, mutability (“Nada 'moderno' y 'muy siglo XX'” 22-24). This single-minded and tunnel-like vision of only a certain kind of progress had, according to Ortega, resulted in Spain’s near collapse; only through the recognition of the incredible variety and multiplicities of a twentieth-century existence would Spain (and the rest of the world) truly actualize any vision of a future society. In that sense, he is “not at all *modern*” but “very twentieth-century.”

Ortega appears in this essay to be lacking a word that would describe his own vision of “post-modernity.” He wasn’t alone. Indeed his struggle to articulate the nature of the new realities of the twentieth century is characteristic of multiple discourses, precisely within the fields of literature and science. As we saw in Chapter Two, Blas Cabrera also struggled with issues of language, especially the need for a larger, more precise, or even an entirely new vocabulary to express the facets of the recent discoveries in science. Likewise, Werner Heisenberg, the man behind the Uncertainty Principle, clashed with his mentor Niels Bohr over the way in which language would be used to describe quantum phenomena; this problem also applied to the theory of relativity where words like “simultaneity” had taken on a specific meaning different from what Heisenberg calls “natural language.” Of this problem, Heisenberg writes:

In quantum theory the physicists had to learn rather early that the terms of classical physics describe nature only inaccurately, that their application is limited by the quantum laws and that one therefore should be cautious in their use. In the theory of relativity the physicists have tried to change the meaning of the words of classical physics, to make the

⁵ For a fine discussion of the greater dynamic of Spain’s resurgence in the arts, regarding visual art (Picasso, Juan Gris, Salvador Dalí, Maruja Mallo), music (Manuel de Falla, Adolfo Salazar, etc.) and literature, see John Crispin, *La estética de las generaciones de 1925* (Valencia: Pre-Textos, 2002).

terms more precise in such a way that they fit the new situation in nature. (Heisenberg *Physics and Philosophy* 90-91)⁶

In other words, scientists were lacking a vocabulary that was untainted by past associations—a pure language with which to express the newness of their discoveries. Generally speaking, “purity” in any discipline connotes a certain attention to form over function, to process rather than product, or, to be more precise, it does not concern itself with the application of said product to quotidian realities (i.e., the technological extension of “pure” scientific discoveries). “Purity” can also refer to the need for specificity in terms of the sign—signifier, signified, and referent—and in this field, in a world rife with discovery and change, language had certainly lost its stability as it had to flex in ways that would allow for multiple meanings that depended on context. Ambiguity, uncertainty, “slippage” in the linguistic system: these are issues in the formal expression of the realities of the New Physics that also characterized the moment of Modernism in the arts.

In October of 1935, the editors of the magazine *Nueva Poesía* declared themselves still in favor of *la poesía pura*, even though its influence was passing by that time, if not already passed. If we examine the vocabulary of their “Manifiesto: Hacia lo puro de la poesía”, the sense of “purity” falls in line precisely with the terms as defined above: “Rechazamos lo impuro, en el sentido de confuso, caótico. A todo esto oponemos una gran palabra: PRECISIÓN. Nuestra poesía ha de serlo...” (Cited in Cano Ballesta *La poesía española entre pureza y revolución* 180). The need to define abstract concepts beyond the frontiers of language in physics, the desire for a precise means of description—is this not also a question of poetry? The “purity” in both disciplines—pure research and the language of Pure Poetry—is worth examining here, as it will provide a foundation for this analysis of vanguard literature which, like research in physics or chemistry, was a process of investigation and discovery.

The question arises: how does literature do this? How does it “investigate”, how does it “discover”? Perhaps the phrase is not to be taken so much literally, but rather as an analogy that has a variety of extensions. For example: the investigation of the limits of form, and the discovery of new forms or forms within the formless; investigation of language, and the discovery of new words; investigation into the new realities brought about through the developments in science and other branches of human knowledge, and the discovery of new ways of seeing the world. These are the processes—the “pure” processes—that I perceive as

⁶ This idea is also explained in the introduction to Heisenberg’s book by author David Lindley, and is worth noting. “At the heart of the matter, as Heisenberg repeatedly says, is a question of translation. The conventional language of physics is fashioned according to the world we experience... while waves form a wholly distinct class of entities described in quite different terms. Underneath all this, however, lies the world of quantum phenomena, which delivers the perceived world to us through countless acts of measurement and observation. Naturally, we would like to be able to better describe the quantum world in our familiar classical language, but that is exactly when the difficulty arises. The Copenhagen strategy for dealing with this impasse is to continue using the old language—waves and particles, positions and velocities—but on the strict understanding that the concepts embodied in these words are no longer primary, but come to us only through agency of observation and measurement. Thus arises the popularly stated notion that in quantum mechanics, the act of measurement defines the thing being measured, or that the thing measured and the thing doing the measuring are inextricably intertwined.” David Lindley, “Introduction,” *Physics and Philosophy* (New York: HarperCollins, 2007) xii-xiii.

forming the backbone of the *vanguardia*, albeit a particular branch of the *vanguardia* that was particularly concerned with experiment (another scientific word) in form and language.⁷

Fernando Vela discusses *la poesía pura* in an article of the same title that appeared in the *Revista de Occidente* in 1926. He writes about how poets “depuran y condensan la canción del pueblo para encerrar en breve como su quintaesencia más volátil” (Vela “La poesía pura” 220). The language of “decanting” and “condensing” is subtly scientific. He is even more explicit in his scientific language when describing pure poetry at other points in the same article: “Las diversas escuelas son laboratorios que practican, simultánea o sucesivamente, la destilación fraccionada de aquel producto bruto que antes se llamaba poesía” (219). Here the metaphor is the laboratory, where the poet “distills” his/her poetry. To complete the image, Vela later states that contemporary poets currently operate “como si fueran químicos” because of their analytic tendencies. (220). One may thus speak of “the chemical poet”, a concept that I derive from Vela’s article when he quotes one of Guillén’s better-known pronouncements regarding pure poetry: “Pura es igual a simple, *químicamente*. Lo cual implica, pues, una definición esencial” (237).⁸

The poet in his/her laboratory, the scientists in theirs, unlocking the secrets of the universe each in their own way, discovering the problems that language obscures when it is tainted by the everyday—in these ways the scientist and the author find common ground in their search for a “pure” discipline and a language suited to their task. Vela’s article and Heisenberg’s problems with the Copenhagen interpretation of quantum physics demonstrate a similar uneasiness: there must exist an uncontaminated medium. If not, then it is the duty of the poet/scientist to create one for the present that rids itself of the past. Hence Vela’s most important query, besides that of “what is pure poetry?”: “¿cómo es posible una poesía en nuestra época?” (221). And what is peculiar about the “época” that he mentions is that it is filled with change—in the collective worldview and in the daily lives of the people—altered by new knowledge and new technologies. A time of flux, a time of uncertainty; surely the depuration of language would remove some of this instability by allowing (poetic) language to return to basic, essential elements. Purity and precision in language would be most reassuring in a volatile time in which the world had been stood on its ear in a way that caused, to use the term of Thomas Vargish and Delo E. Mook, “epistemic trauma”: the psychologically complex and often devastating effect of having common assumptions about the universe and the world at large

⁷ An intrinsic component of the search for new forms is often the rejection of those older forms that are deemed no longer worthy of imitation or perpetuation. This rebellion against the past was most visible in the *ultraísta* movement of the first *postguerra*, from 1918 to about 1923. Though Ortega y Gasset in 1916 had already noted the responsibility of the new generations to “sacudir de nuestra conciencia el polvo de las ideas viejas, carbonizadas ya, y hacer que en ellas se afirme lo nuevo,” it was the Ultraístas that issued the true call to arms. In “Arte Nuevo,” (*España*, 16 Oct 1920) Antonio Espina García writes of the “ismos” emerging after the First World War, that they were “tendencias gemelas que significan el mismo fin: la superación real. El mismo medio: la renovación técnica. El mismo principio: la rebelión hacia lo viejo.” From this perceived need to overturn the past, in particular the musty sentimentalism of *Modernismo*, would come the impulse towards the creation of a pure language for poetry, devoid of all the stylistic markers of post-romanticism, symbolism, and *modernismo*. See Ortega y Gasset, “Nada ‘moderno’ y ‘muy siglo XX’,” 22. See also Antonio Espina García, “Arte Nuevo,” *España*.285 (1920): 12.

⁸ Emphasis mine.

damaged if not undone completely by advances in human knowledge.⁹ In the next section, I will examine one aspect of said epistemic trauma in terms of the discourses of continuity and discontinuity, both in the physical sciences and in literature.

The Principles of (Dis)Continuity in Science and Literature

To begin our discussion of (dis)continuity, I would like to pose the following questions: What does “discontinuity” mean in the physical-mathematical sense? Where does it apply, and what logical consequences and philosophical extensions does it have? In turn, what are the narratological and literary uses of the term “discontinuity” in this context? Following these clarifications of the term, I will discuss the way in which the historical context of the phenomenon/phenomena of discontinuity calls for a reading that acknowledges, if not an interdependence among the various usages of the term, then at least an uncanny, transdisciplinary similarity. I spoke of a common epistemological base for relativity and quantum theory above; I believe we can also discuss such a common epistemological base for the discontinuities discovered/uncovered in both the scientific and literary movements of the 1920s and 1930s.

History provides us with the context that allows us to make these assertions with some authority; to be sure, I am not the first to discuss the parallels and points of contact that will be described here.^{10, 11} In the following pages, there will be much discussion of the continuous and the discontinuous, which, for the sake of brevity I will refer to as (dis)continuity.¹² How can we

⁹ See Chapter Two, “Epistemic Trauma” of Thomas Vargish and Delo E. Mook, *Inside Modernism: Relativity Theory, Cubism, Narrative* (New Haven, CT: Yale UP, 1999) 14-50.

¹⁰ In this arena, I am indebted to previous critics such as Stephen Kern and his *The Culture of Time and Space (1880 – 1918)*, Vargish and Mook’s *Inside Modernism: Relativity Theory, Cubism, Narrative*, and N. Katherine Hayles’s *The Cosmic Web*, whose studies all posit the existence of a tangible connection between the scientific advances of the 20th century with those of Modernist/Expressionist art of the same time period.

¹¹ It is important to note at this point that the specific causal nature of this “connection” is entirely speculative in nature. In the words of Vargish and Mook, with whom I agree, “Causal linkages, where they actually exist, are to us less interesting and more superficial than the common values that find contemporaneous expression in disparate fields. It is our belief that by studying examples of simultaneous efflorescence of these values in different modes of expression we will hone tools to use in defining cultural identity and in understanding its changes.” Vargish and Mook, *Inside Modernism: Relativity Theory, Cubism, Narrative* 5.

¹² The term (dis)continuity as I am constructing it here is not analogous to the way it has been used in the writings of postmodern theory, especially with regard to Foucault. For these theorists, the sometime-dialectic between continuity and discontinuity pertains to the historical, particularly the rupture between the modern and the postmodern. While I am not unconcerned with the historical element in these chapters, the postmodern discourse about historical continuities/discontinuities proves to be tangential at best, and for that reason, while I will use the same word, I wish to be clear that I am using it in a way that is divorced from the postmodernist meaning assigned to it. Accordingly, when I speak of continuity and discontinuity in the context of my own work, I will write it as above—(dis)continuity—to distinguish it from the aforementioned established terminology. By including the prefix “dis” as a parenthetical, I hope to show in typographic form that the terms “continuity” and “discontinuity” actually act along a continuum of varying tensions, contrasts, and contradictions, but that they cannot be defined independently of each other.

understand (dis)continuity in this interactive space where science and literature intermingle? Through the paradigm of (dis)continuity, I will show that the advances in science of the early 20th century—quanta and quantum mechanics, special and general relativity, the uncertainty principle—can be understood as specific articulations of a broader inquiry into the nature of the universe. I am not looking to bring the discoveries of relativity in line with quantum physics, but rather trying to convey these scientific principles as sharing a common epistemological base. In effect, I am not talking about physics itself but rather the way we interpret physics and its phenomena. This interpretative mechanism will then be extended to the literary works mentioned in the introduction to the chapter, which will be analyzed according to the construct of (dis)continuity and its various manifestations, primarily in Einsteinian and quantum physics.

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In one of its formulations, “discontinuity” is a mathematical term. It applies to mathematical functions, which, in a two-dimensional graphic representation, usually form a line or a curve. The function is considered discontinuous when at a certain point in the function there appears a break in the line or curve, a “jump,” if you will, from one value to another without any connection between them. There are several varieties of this type of mathematical discontinuity, but their specifics do not concern this study at present. Discontinuity in physics is a concept based on the existence of discrete units of a phenomenon, be it matter, energy, or light: thus the atom, the electron, the photon, respectively. The existence of the atom and the knowledge that matter is discontinuous dates back to Democritus who, in the fifth century B.C.E., proposed that all matter is composed, on an unimaginably small scale, of discrete, indestructible units. By the early twentieth century, having passed through various models of atomic structure (the J.J. Thomson “plum pudding” model [1897], the Rutherford “planetary” model [1911], and the Bohr model [1913]) all of which refined the understanding of form and function on the atomic scale—as did the invention of the periodic table of the elements by Mendeleev in 1869—atomic theory had very little to do with the Ancient Greek “elements” of fire, water, air, and earth. Significantly, however, the classical concept of the atom began not as a physical quandary, but as a philosophical one about the nature of matter, creating the basis for the continued, and often quite fraught, relationship between physics and philosophy. This debate can be rightly extended to our discussion of the relationship between science and literature.

The beginning of the modern discussion of discontinuity in physics emerges with the publication of Max Planck’s theory of the quantum of energy in 1900, though it was not until the 1920s that the wider implications of quantum theory were thoroughly explored, definitively taking hold of the establishment, and the public imagination. In the meantime, between 1905 and 1915, Albert Einstein was developing his theories of relativity, the revolutionary potential of which has been previously discussed. Of these two theories, Alfred North Whitehead writes in his book *Science and the Modern World* (1925):

The theory of relativity has justly excited a great amount of public attention. But, for all its importance, it has not been the topic which has chiefly absorbed the recent interest of

physicists. Without question that is held by the quantum theory. The point of interest in this theory is that, according to it, some effects which appear essentially capable of gradual increase or gradual diminution are in reality to be increased only by certain definite jumps. It's as though you could walk at three miles per hour or at four miles per hour, but not at three and a half miles per hour. (129)¹³

These two theories—relativity and quantum physics—which constitute the very foundation of contemporary physics are, essentially, incompatible theories that nonetheless, so far, have proven to be correct, and thus are not mutually exclusive. I will not pause here with any detailed explanation of their incompatibility; suffice it to say that it exists largely as a matter of scale. Relativity theory explains quite handily phenomena on a cosmic scale but does not function on what is known as the “Planck scale”—the quantum level, which is infinitesimally small. Whereas the limit of relativity theory is the speed of light, which defines the impossibly large, the limit of the quantum scale is known as Planck’s constant, which defines the impossibly small. Between the two extremes is the Newtonian universe, the one we can see and understand directly, that is filled with causal relations, is mechanistic and deterministic, and which dominated Western thought for several centuries. As the discussion proceeds below, I would ask the reader to bear in mind the following: that both relativity and quantum mechanics had a definitive impact on science and society; that each involved a drastic change in the perception of “reality;” and that each, while incompatible in a scientific sense, complements the other when we broaden the scope of their implications to include a theoretical/philosophical approach, such as with the formulation of a theory of (dis)continuity.

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In the 1938 book *The Evolution of Physics: The Growth of Ideas from Early Concepts to Relativity and Quanta*, a collaborative effort between Albert Einstein and Leopold Infeld, the authors give an accomplished summary of Newtonian and post-Newtonian physics, as the title would suggest. Of all the theories discussed in the book—Newtonian mechanics, Einsteinian relativity, and quantum theory—it is perhaps what is written in the interstices of the descriptions of the major concepts of physical theories that carries the most weight for the definition of (dis)continuity that I am constructing. During the discussion of quantum theory, Einstein and Infeld describe its basis in very general terms, that here will be quite useful. They write: “If we had to characterize the principal idea of the quantum theory in one sentence, we could say: *it must be assumed that some physical quantities so far regarded as continuous are composed of elementary quanta*” (Einstein and Infeld 251).¹⁴ The significance of this quote cannot be underestimated. The key phrase here is that which says “so far regarded as continuous,” because in it we find a confirmation of the theorized shift, in this case, in ideas about the physical properties of various phenomena in nature and in the universe as a whole. Beginning with

¹³ Whitehead’s succinct metaphor for the basis of the quantum theory is very useful, if simplistic. I include it here because it is the most efficient explanation I could find among the many encountered in my research.

¹⁴ Emphasis in the original text.

Planck's quanta and Einstein's "coordinate systems," Heisenberg's Uncertainty Principle and the thought-experiment of Schrödinger's cat, what develops over these decades is essentially a reversal of the Newtonian paradigm. What had been continuous—energy, light—dissolved into particles, became corpuscular, exhibiting the traits of discontinuity, as shown in experiments such as Planck's Black-Body Radiation experiment, which showed that energy is released in discrete units, and Einstein's work with what became known as the photoelectric effect, which confirmed the existence of the photon, a unit measurement of light.¹⁵ Alternately, what had been assumed to be discontinuous, or at least separate phenomena, was shown by relativity theory to be continuous, or rather, a continuum—time and space melded together to form a whole in which each "event" was given not only a spatial localization, but a temporal coordinate as well. In general, from these discoveries, the bases for "reality" shifted in a variety of ways. Philosophically, what is most salient are the following: Firstly, from relativity theory we glean that absolute space and absolute time do not exist, but rather are part of a continuum that is contained within a specific "coordinate system." As coordinate systems move relative to each other, the possibility for "simultaneity" becomes untenable, as the phenomenon observed will be dependent upon the position of the observer. Secondly, from quantum theory, we also learn that there is no absolute reality, due to the fact that the presence of an observer performing an experiment with a certain objective "alters" the phenomenon observed through his/her mere presence. The only knowable reality is an observed reality.

What did these important, if abstract, conclusions mean for the collective worldview in the first third of the 20th century? Above all these theories eliminate all conjectures of an absolute, independent reality that exists beyond the individual subject, thus granting subjectivity itself an increased modicum of authority within the world. The increased power of the subject that these theories of physics rather unwittingly encouraged was felt in the decline in prestige and power of institutions such as the Church and the Monarchy, politically speaking. In philosophy, it meant the diminishment of the empiricism and determinism encouraged by positivism. In the arts, it opened up the possibility of multiple and shifting perspectives, warped or non-linear constructions of space and time, and a change in subject-object relationships—to wit, Modernism's more characteristic traits. Thus (dis)continuity is, in this study, the sum of these changes listed above. At its heart is the need to both accept the continuum, as in space-time, and reject it, as in the existence of quanta. In so doing, (dis)continuity reflects the paradoxes that lie at the heart of both physics and Modernist literature. On the one hand, in literature, we see the "continuous" side of the paradox in the sense of there being a sustained pursuit and persistence of form and a return to classic constructions (especially in poetry), as well as frequent meditations and reveries involving the relationship between time and space; alternately, the "discontinuous" element is reflected in the denial of the absolute and the acceptance of mutability and multiplicity, the renunciation of mechanical determinism in favor of subjectivist indeterminacy, and the acceptance of the probabilistic flux of modernity. Yet all in all, not at all modern—meaning Newton; but *very* twentieth century—meaning Planck, Einstein,

¹⁵ It should be acknowledged at this point that with regard to light, it was not discovered to be entirely discontinuous—thus the Wave/Particle Duality. The Wave/Particle Duality states that depending on the experiment performed, light will behave either as a wave or a particle, while still retaining the characteristics of both wave and particle. The observer, in this case, determines which characteristics will be observed.

Heisenberg: a new cadre of philosopher-scientists ready to reformulate our understanding of existence, from the smallest photon to the shape of the universe itself.

Finding the Continuum: Pedro Salinas and the Chronotope

Having already established that the theory of relativity did irreparable damage to concepts of absolute time and space, let us now explore in more depth what “time” and “space” came to mean in the Einsteinian vision of the universe. To restate:

In classical physics, we had one clock, one time flow, for all observers in all [coordinate systems]. Time, and therefore such words as “simultaneously,” “sooner,” “later,” had an absolute meaning independent of any [coordinate system]. Two events happening at the same time in one CS happened necessarily simultaneously in all other [coordinate systems]. (Einstein and Infeld 179)

This was overturned by relativity, in which coordinate systems move relative to each other, and, most importantly, time itself is a coordinate within coordinate systems. Thus each event will have not just a designation in space, but a temporal one as well. These are the four dimensions of the time-space continuum, or spacetime.¹⁶ Measurements of an event made within one coordinate system are consistent with regard to that coordinate system; from the perspective of another coordinate system, a measurement of the same phenomenon could give different results. Unlike the eerie world of quantum mechanics where phenomena are probabilistic functions rather than actual events occurring within the time-space continuum, in the Einsteinian universe, events are still “real”—that is, they are observable and measurable; they are not elusive.¹⁷

Contrast the “hard realism” of this construction of time as a measurable entity—a coordinate—with the subjective explorations of the experience of time and its significance by philosophers and psychoanalysts, particularly Henri Bergson and Sigmund Freud, respectively. Bergson discussed time as “duration,” subjective and immeasurable in its fluidity—any attempted measurement would be negated by the continuous fluidity of time, the moment escaping before it can be captured by humankind’s devices. For Bergson “[t]he experience of time is characterized not only by successive moments and multiple changes but also by something which endures within succession and change... [T]his quality of continuous flow or

¹⁶ Spacetime is composed of the three spatial coordinates along axes x , y , and z , plus the temporal coordinate, t .

¹⁷ David Lindley writes of the consequences for time and space in the theory of relativity that “[f]or some physicists in the early twentieth century, this destruction of an old ‘common sense’ view of space and time was too much to bear, and relativity came under fierce attack. But the crisis passed fairly quickly. The changes demanded by relativity were not so dramatic and unpalatable as they had first seemed—chiefly because relativity did not deny the validity of ‘hard realism,’ as Heisenberg calls it. Two observers may see some sequence of events in a different order, for example, but there is no denying that the events really occurred, and the point of relativity is precisely that it provides a rational way for these observers to understand why they have not seen the same chronology.” Lindley, “Introduction,” xvi.

duration does not find an adequate correlate in the physical concept of time” (Meyerhoff 14-15). Freud’s view of time is even more oriented towards the interiority of the subject. He speaks of time in his essay “Creative Writers and Day-Dreaming” (1908) when discussing the temporal element involved in fantasy. He writes:

The relation of a phantasy to time is in general very important. We may say that it hovers, as it were, between three times—the three moments of time which our ideation involves. Mental work is linked to some current impression, some provoking occasion in the present which has been able to arouse one of the subject’s major wishes. From there it harks back to a memory of an earlier experience... in which this wish was fulfilled; and now it creates a situation relating to the future which represents a fulfillment of the wish. What it thus creates is a day-dream or phantasy, which carries about it traces of its origin from the occasion which provoked it and from the memory. Thus past, present and future are strung together, as it were, on the thread of the wish that runs through them. (439)

Therefore, for Freud, time is also fluid within the consciousness of the subject, and consequently is again immeasurable, excepting the fact that memories are the residue of concrete events that at one point had a very real existence.

Contrary to these postures, Einstein’s universe, Vargish and Mook remind us, has nothing to do with these subjective experiences of time.¹⁸ While still not absolute, time in Relativity Theory remains a measurable aspect of an event that is consistent within a coordinate system. “Subjective time” or “psychological time” is also relative, but only in the sense that such time pertains to an individual consciousness, whose perception of its motion is in flux, moving forward and backward within the present. To restate: this is the experience of time, not an objective construction of time.

In literature, subjective time is often associated—and rightly so—with the works of Marcel Proust, whose influence and popularity among Modernist writers was undeniable. Therefore it proves to be quite interesting to this study that Pedro Salinas’ work *Víspera del gozo* was accused of being not merely Proustian, but a pastiche of Proust’s work—highly imitative

¹⁸ From the chapter “From Reality to Observation”: “...it is important to remember that none of the various measurements or observations that Relativity Theory describes has any direct application to what are sometimes called ‘psychological’ or ‘subjective’ phenomena: objects and events that exist only within an individual human mind. Relativity Theory describes a relationship, what Werner Heisenberg called an ‘argument with nature.’ In Relativity Theory, a measurement is neither a subjective impression (a unique event in a single mind that cannot be fully communicated) nor a constant necessary description of an independent external object or event. A measurement in Relativity Theory may be seen as a kind of middle ground—literally a mediation—between the observer and the observed phenomenon. In postmodern critical terminology, observation is the text of Modernism. And this middle ground, we believe, is the characteristic epistemological location of Modernism... This middle ground is neither subjective nor objective, but a human observation of a reality assumed to be external to the observer. With respect to subjectivity and subjective phenomena, Relativity Theory has nothing to say. With respect to objectivity and objective reality, Relativity Theory premises its existence and deals with measurements of it that necessarily vary. In Relativity Measurement is what we have of reality.” Vargish and Mook, *Inside Modernism: Relativity Theory, Cubism, Narrative* 80-81.

and unoriginal.¹⁹ This is what Fernando Vela implies in his review of *Víspera del gozo* that appeared in the *Revista de Occidente* in 1926: “Para hablar de Pedro Salinas hay que hablar de Proust,” he asserts, continuing:

Cinco artículos de Díez-Canedo, Giménez Caballero, Azorín, d’Ors y Gómez de Baquero han impuesto esta rutina, contra la cual no soy bastante fuerte para resistir. Desde luego, no traduciré diez líneas de Salinas para ver si se asemeja a Proust. El crítico prueba sin aparatos. Si el libro de Salinas fuera un pastiche de Proust, para demostrarlo no habría que traducir al francés una sola frase o habría que traducirlas todas. Diez líneas convencen a un lector de periódico, prueban demasiado; por tanto, no prueban nada. (Vela “Notas: PEDRO SALINAS” 124-25)²⁰

According to Vela, Proust and Salinas have actually very little in common with the exception of their meditations on time, which are constructed quite differently. Vela instead sees *Víspera del gozo* as pertaining directly to the new trend of “[el] arte deshumanizado del presente.” He goes on to describe this art in contrast to its artistic ancestors, which includes the works of Proust for Vela:

El arte ha creado sus procedimientos propios, artísticos, mecanismos, juegos, incluso trampas y trucos. El arte pretérito *se servía* de ellos como medio, instrumento *para* la copia o la ficción de realidades humanas. El arte actual les confiere una vida independiente, en abstracto. El color no es un color *de*, sino simplemente color, pura calidad cromática; asimismo el poeta se deleita en su metáfora como el matemático en la invención de una integral inaplicable... Los elementos artísticos, antes subordinados, constituyen la única finalidad, el único protagonista del arte joven. (“Notas: PEDRO SALINAS” 127)

Gustavo Pérez Firmat, in *Idle Fictions*, spends a chapter debating whether *Víspera del gozo* can truly be considered exemplary of the “new art.” He analyzes the first story of the collection, “Mundo cerrado,” concluding that it can be read on two levels: either as “transcendent” (to use the Ortegian terminology)—that is, “one that appropriates to art some of the qualities of life”—or is “intranscendent”—having the characteristics that Vela discusses in his article, and that Ortega outlines in *La deshumanización del arte* (Pérez Firmat 74). According to Pérez Firmat, Salinas gives no clear indication as to which reading would be the appropriate one. Robert Spires, in *Transparent Simulacra*, takes Pérez Firmat’s analysis one step further saying that the ambiguity in Salinas’ work is part of the argumentation of the work, that it is the *self-reflexivity* of the work that we are seeing, wherein the author uses the art of the present to reflect on, comment upon, and eventually incorporate, elements of the art of the past. He writes

¹⁹ The accusation likely arose from the fact that Salinas was one of the major translators of Proust’s *À la recherche du temps perdu* into Spanish. The first volume of the series, written in collaboration with José María Quiroga Pla, appeared in 1920, with subsequent volumes in 1922 and 1931.

²⁰ See also the discussion of the reception of *Víspera del gozo* and its Proustian traits in Gustavo Pérez Firmat, *Idle Fictions: The Hispanic Vanguard Novel, 1926 - 1934* (Durham, NC: Duke University Press, 1982) 8-9.

that in *Víspera del gozo*, “[c]ounterbalancing the new orientation toward art itself is a shift back to a more conventional mode in the second part of virtually each work. In short, Salinas’s version of the new art includes an accommodation with the old” (Spires 131). These major analyses and critiques of *Víspera del gozo*, and “Mundo cerrado” in particular, focus mainly on the artistic qualities of the work, rather than on its meditative or philosophical aspect, least of all its relationship with the scientific advancements of the day.²¹ Considering Salinas’ preoccupation with the passage of time, it would be wise to address this aspect of the work from a scientific perspective, as well as a literary one.

Salinas’ conjectures about time have as much to do with constructions of subjective or interior time, as in Freud or Bergson; thus, studies such as Maria T. Pao’s “Making Time with Pedro Salinas: *Víspera del Gozo* (1926)” are able to confront the problem of time in the work from both angles—the Proustian and the Einsteinian. Pao’s article, in which she deconstructs selected stories from *Víspera del gozo* (in particular “Cita de los tres” and “Livia Schubert, incompleta”) avails itself of Einsteinian notions of time in order to explain Salinas’ apparent preoccupation with the pace of modern existence. She then complements her Einsteinian analysis with a Proustian one, arriving at the notion of “the expanded hour” as a means of reconciling the subjective nature of the experience of time with Einstein’s system of coordinates (Pao 458). Pao’s work and the object of the present study are in agreement with each other, with the exception of the fact that while Pao takes into account the importance of Einstein and his presence within the Spanish cultural matrix of the period, she only analyzes the stories from the standpoint of time alone. She does not enter into the polemic of the continuum: spacetime, or, in Bakhtinian terms, the *chronotope*.²² I would like to take this opportunity to extend the implications of Pao’s study to include the spatial-temporal unity in *Víspera del gozo*, especially with regard to the short stories “Mundo cerrado” and “Cita de los tres.”

“Mundo cerrado”: Spacetime in Motion

In “Mundo cerrado,” the first vignette in *Víspera del gozo*, we encounter Andrés, seated on a train hurtling towards the fictitious city of Icosia, where he will be meeting with his former friend, Alice Chesterfield, now married and known as Lady Gurney. The train ride, and the voyage back in memory as Andrés “consider[s] the meaning of the time that has passed since he last saw Lady Gurney and his upcoming encounter with her” serve as our only shade of what we would ordinarily call “plot,” which unfolds slowly within an ample cushion of narrative drift

²¹ Only one major critic really takes on the philosophical dimension of the work, and at that only briefly (and superficially). See the discussion in Roberta Johnson, *Crossfire: Philosophy and the Novel in Spain 1900-1934* (Lexington, KY: University Press of Kentucky, 1993) 174-77.

²² I find Bakhtin’s literary-historical taxonomy of varying forms of the chronotope useful for this analysis. To what degree Bakhtin’s knowledge of Einstein and relativity theory was impressionistic or thorough remains unclear. However, his analysis of ways in which spacetime manifest in narrative will prove complementary to this present analysis. For further elaboration of Bakhtin’s theory of the chronotope, see “Forms of Time and Chronotope in the Novel” in Mikhail M. Bakhtin, *The Dialogic Imagination*, trans. Caryl Emerson and Michael Holquist, ed. Michael Holquist (Austin: University of Texas Press, 1981) 84-258.

(Johnson 177). Gustavo Pérez Firmat in his study of the work in *Idle Fictions* calls the story itself a “nonevent,” but then goes on to say that the weak plot structure in which “nothing happens,” is actually an affirmation of both exterior and interior whorls of the narration: “nothing *does* happen, it *happens* all the time” (68). Amid this drift of meditations on his surroundings, on the book that remains unopened on the seat next to him,²³ the reader begins to discern small clues that point to the emotional entanglement that is provoking the journey to Icosia, and we travel along with Andrés as the narrator seems to bring in at the most arbitrary moments the plot points that orient us within the narration.

One possible way to read the story is in the aforementioned Proustian fashion, in which we, as readers, are subject to the state of fluid, subjective time that exists within Andrés, in whom past, present, and future merge. I do not deny the legitimacy of such an argument, but here I would like to suggest another sort of reading in which the story pits one coordinate system—that of Andrés and his reverie in the speeding train, a system in motion—against another, which is that of Lady Gurney, waiting stationary in Icosia—or so we assume. As we come to find at the end of the vignette, Lady Gurney—Alicia— “ha muerto anteayer” and “Icosia, al primer contacto con los labios, apenas mordida le daba el sabor más amargo de todos, sabor a tierra mortal” (69). The death of Lady Gurney, as Carlos Feal and Pérez Firmat both suggest, does in effect close a world to Andrés, as we would also glean from the title of the story, and above all it gestures towards the inevitable triumph of death over desire—although this human element can be regarded as secondary to issues of form and content. My interpretation does not challenge the previous readings of Pérez Firmat or Feal, but rather looks at the vignette through the mechanisms of Einsteinian physics that focus on relative motion within the story, and on how spacetime is constructed in this “closed world.”

“Mundo cerrado” is composed of a series of experiential frames,²⁴ which demonstrate the continuity between space and time within their individual boundaries. Beyond those boundaries the frames remain separated—passing, but never meeting—until the close of the story, when the frames collapse into one closed and heart-stopping system, the nature of and reasons for which will be explained momentarily. We begin with Andrés on the speeding train—this is our first frame—in which he reads the passing landscape as if it were a text (“Pasó dos horas leyendo,” the story begins, immediately informing us of the importance of time), and the book he brought for entertainment on the voyage remains “abandonado, desoído el grito amarillo y pertinaz de su cubierta, como una virgin desdeñada, sobre los almohadones” (65). Instead Andrés has spent two hours reading the passing landscape—our second frame—giving us two spacetime coordinates: those exterior to the train and those within the train itself. The image of the train is significant in a variety of ways, the first being of course the train as symbol of the capacity for rapid motion—

²³ The readings of Carlos Feal and Gustavo Pérez Firmat are similar in that each finds in the unopened book a “key” to understanding the “closed worlds” within it. Feal sees the closed book as the first of three closed worlds—book, landscape, arrival in Icosia. While Pérez Firmat does not use those precise categories, saying instead “*mundo cerrado*, *libro cerrado*, and now... *carta cerrada*,” their readings coincide in their tripartite vision of the significance of both the book, the importance of reading, and the title of the story. See Carlos Feal, “Lo real, lo imaginario y lo simbólico en *Víspera del gozo* de Pedro Salinas,” *MLN* 106.2, Hispanic Issue (1991): 315-18. See also Chapter 3: “Closed World” in Pérez Firmat, *Idle Fictions: The Hispanic Vanguard Novel, 1926 - 1934* 69-80.

²⁴ I will use the word “frame” instead of “coordinate system” as the previous term carries both literary and scientific connotations, and allows for a more concise analysis of the text.

and thus the compression of space and time—as brought about by modernization; the train serves as a metaphor for modernity itself, with its accelerated pace, its constant motion forward, and also its connotations of a new cosmopolitanism.²⁵

However, in addition to the literary and historical connotations of the railroad, Einstein's work also employed the railway as an illustration of the phenomenon of uniform motion—a system of determined velocity moving relative to another (arguably) stationary frame of reference. Einstein employed the image of the speeding railway car in his popularization of the theory of relativity that was widely translated after its original publication in 1916, titled *Relativity: The Special and General Theory*. Einstein's use of the railway car is ingenious—flexible, dynamic, ideally suited for the basic ideas of physics that he is attempting to illustrate in plain language. He evokes the train as exemplary of systems in relative motion in the third chapter of *Relativity*, titled “Space and Time in Classical Mechanics.” To give an idea of Einstein's language and humor, albeit in translation, I will briefly cite a passage from this chapter. He writes:

The purpose of [Newtonian] mechanics is to describe how bodies change their position in space with “time.” I should load my conscience with grave sins against the sacred spirit of lucidity were I to formulate the aims of mechanics in this way, without serious reflection and detailed explanations. Let us proceed to disclose these sins.

It is not clear what is to be understood here by “position” and “space.” I stand at the window of a railway carriage which is travelling uniformly, and drop a stone on the embankment, without throwing it. Then, disregarding the influence of the air resistance, I see the stone descend in a straight line. A pedestrian who observes the misdeed from the footpath notices that the stone falls to earth in a parabolic curve. I now ask: Do the “positions” traversed by the stone lie “in reality” on a straight line or on a parabola? Moreover, what is meant here by motion “in space”? (*Relativity* 10)

The passage from *Relativity* later develops into a discussion of what can be considered “absolute” in space and time. Einstein's conclusion is that, when systems are in motion relative to each other, there can be no absolute “reality” due to the fact that it is the perspective of the observer relative to the action that determines the observed reality, rather than reality itself. Thus the straight line and the parabola: both are true, but neither is absolutely “real,” in the Newtonian sense.

How does the Einsteinian rejection of absolute space and time operate in “Mundo cerrado”? Let us return to the idea of frames of reference. We already have our first frame: the moving railway car, carrying Andrés to Icosia. The “embankment” of Einstein's description is here the landscape, which appears to Andrés to be rushing past him as he “reads” it. Although the frame of the landscape is objectively stationary, and Andrés the one in motion, in the text, the narrator emphasizes the inverse:

²⁵ See Cano Ballesta's analysis of *Víspera del gozo*, and “Mundo cerrado,” in *Literatura y tecnología: Las letras españolas ante la Revolución industrial (1890-1940)* (Valencia: Pre-Textos, 1999) 225-28.

Andrés leía un paisaje nuevo, una nación desconocida. Cierto que la lectura no se hacía a su grado y voluntad, porque él no podía pasar las hojas, y esta misión era ejercida, con velocidades toscamente desiguales, por el maquinista, el cual, sin duda por ser nuevo en la línea, ignoraba la profunda belleza de lo que iba revelando con torpísimo ritmo. Llegaba, por ejemplo, una página tierna, conmovedora, tan clásica en su sencillez cual la despedida homérica... y el tren la volvía rápidamente, a noventa kilómetros, sin tiempo apenas para leerla completa... (65)

Ultimately, our final frame of reference is Icosia itself: as destination, it represents the unknown future, a point in spacetime that remains to be observed—an experiment whose outcome Andrés is already projecting, hypothesizing, and idealizing. The abrupt ending of the story—Andrés emerges from the speeding train only to receive a letter that tells him of Alicia’s (Lady Gurney’s) death—has the effect of uniting all the various frames as one closed and devastating system. Once eliminated the element of velocity and relative motion, and once the spacetime coordinate of the projected Icosia has become reality, there is a violent collapsing of frames as Andrés’ interior reverie is shocked into corporal awareness and, essentially, the stoppage of time: thus we have Andrés’ subjective sensory perception (“sabor a tierra mortal”) that merges with an event that occurs in Icosia’s no-longer-anticipated spacetime (the action of opening the letter), and whose progression into the future is immediately curtailed by Alicia’s death. Andrés at that moment realizes his travel has been in vain in terms of his desire, a desire which had provoked the earlier state of daydreaming when we first encounter him on his journey. In other words, when viewed from the perspective of Andrés in the train, Icosia represents the chronotope of the *idyll*, as described by Bakhtin, although only an imagined idyll; projected backward from his location in the actual Icosia, Andrés’ journey is one of futility—a frustrated *meeting* that will never happen.²⁶ Andrés’ location in space and time changes the nature of the chronotope with which we are dealing, and also our ways of interpreting the nature of this quintessential example of vanguardist narrative.

Therefore, as all of the spatiotemporal systems are in motion relative to each other, meaning that there cannot exist a singular way of interpreting the action, the ability to arrive at an absolute reality eludes the reader, and our “closed world” is actually quite open to interpretation. Let us, then, trade in the idea of “Mundo cerrado” as a narration of subjective interiority and reverie, and instead approach the story as an expression of Modernist narrative, a

²⁶ Both the “idyll” and the “meeting” are two forms of the chronotope described by Bakhtin. The “love idyll” has the characteristic of fusing time and space into a world that is “limited and sufficient unto itself, not linked in any intrinsic way with other places, with the rest of the world” and where “[t]he unity of place brings together and even fuses the cradle and the grave.” Bakhtin, *The Dialogic Imagination* 225. The “meeting” is “inseparable from the spatial marker... [I]t enters adventure-time and a foreign (but not alien) country... Quite frequently in literature the chronotope of meeting fulfills architectonic functions: it can serve as an opening, sometimes as a culmination, even as a denouement (a finale) of the plot... Of special importance is the close link between the motif of meeting and such motifs as *parting, escape, acquisition, loss, marriage* and so forth, which are similar to the motif of meeting in their unity of space and time markers. Of special importance between the motif of meeting and the chronotope of the road...” (The road, of course, in Salinas’ work, has—significantly—become the train.) Bakhtin, *The Dialogic Imagination* 97-98.

form in which the radically shifting perspectivism of the narrator is free to move between various frames of reference at any given time. This type of narrator takes an aggressive stance against the “objective” realist narrator which normally is a stylistic embodiment of the Newtonian absolute. From this position, we can see that the technique of the narration and the object of that same narration are symmetrical, meaning that the stylistic and formal traits of the work—altered perspectives, shifting points of reference, the evasion of a defined “reality” on the part of the narrator—find their analogue in the content or action of the story, in which Andrés moves with liquid grace between frames of reference. As readers, we are subject to shifts both in the manner of narration and in what is being narrated that continuously realign our understanding of the chronotope(s) in which Andrés is operating. This creates in turn a doubling effect in which form and content are fused, reflecting a similar fusion of time and space within the story’s various moving frames.²⁷

The Einsteinian analysis that I propose essentially accepts the Ortegian apparatus that juxtaposes art and life, but not from the position of transcendent vs. intranscendent art which has as its basis either the acceptance or denial of the human. Rather than find the locus for abstraction in the story’s plot (or lack of it), the Einsteinian analysis accepts as its grounding the preeminence of perspectivism as the principle which informs the way we as readers ascertain the “content” of the story—be it in its argument, or in its aesthetic formulation, which, as it turns out in “Mundo cerrado”, are aligned in a perfect symmetry, and produce not two readings that are mutually exclusive, but rather a unified, and perhaps more flexible, reading.²⁸ I must agree, therefore, with Robert C. Spires’ assessment of “Mundo cerrado” as being “the key to *Víspera del gozo...*”—only that in this formulation, the primer with which it provides us is one that allows us to read the rest of the work in the key of Einstein, rather than Ortega alone. The fact that Ortega’s work drew so heavily on Einstein’s theories only aids in establishing the use of physics as a legitimate platform for analysis in the case of Salinas’ fiction and, as we shall explore, for continuing beyond the boundaries of the Ortegian category of art’s principles of “dehumanization” (Spires 130).

²⁷ Regarding the symmetry of form (art) and content (life), the opposite has been claimed by Pérez Firmat, who puts his analysis in Ortegian terms and extends his analysis to a greater diagnosis of the characteristics of Hispanic vanguard fiction. He states that “Mundo cerrado” “can be read on two different levels. On one level the subject is Andrés’ foiled expectations, his disillusionment and frustration upon being told of Alicia’s death. On the other level the focus shifts from Andrés to certain details in the composition of the narration. The fundamental difference between these two levels of analysis is that, in the first instance, the story appears to deal with questions of human concern, whereas, in the second, its subject is nothing other than the work’s status as a fictional construct and its relationship to other such objects. Returning to Ortega’s categories, one can say that the first reading presupposes a “transcendent” text, one that appropriates to art some of the qualities of life (in this instance the problematic of desire and its frustration). The second reading strips the text of its lifelikeness by revealing that the story deals not with “human” but with “artistic” questions; this reading turns “Mundo cerrado” into an example of “intranscendent” art.” Pérez Firmat, *Idle Fictions: The Hispanic Vanguard Novel, 1926 - 1934* 74.

²⁸ The flexibility of interpretation lies in how we perceive the chronotope, whether it is the “idyll” that dominates in the train—a false idyll, I might add, in the sense that it is a fantasy, but still an idyll in that it is unmoored in space—and is undone by the ugly reality that awaits him specifically in Icosia; or rather that the “meeting” is the reality that transpires on the train, within Andrés’ mind and emotions, even though Alicia is dead. With either reading, the power of death (and absolute time) is mitigated by the refusal to adhere to a singular coordinate system—the two coordinate systems give us different views of reality, and different ways to understand the text.

Absolute Time, the Idyllic Chronotope, and Simultaneity in “Cita de los tres”

The theme of absolute time, or rather its nonexistence, reappears in the third short story of *Víspera del gozo*, titled “Cita de los tres.” As Roberta Johnson notes, the story begins as a “meditation on time, inspired by the sound of the church bells ringing out six o’clock” (177). The first paragraph of the vignette gives the impression that the story will indeed spend its several pages in a contemplation of the mediation of time.

Cuando Ángel entró en la iglesia no eran más que las seis menos cuarto, pero ya empezaban a dar las seis. Porque la ciudad tenía y ese era su más secreto encanto, la razón de que la vida fuese aquí tan holgada y generosa, un modo descuidado y señoril de contar el tiempo. Estaba Jorge avezado a vivir en lugares donde esa riqueza inagotable y fugitiva, perfectamente acuñada en diversos tipos de moneda, horas, minutos y segundos, era escrupulosamente medida y administrada, pieza a pieza, por los relojes y por el tráfico, por las faenas humanas y por el alumbrado municipal, de suerte que nunca podía haber error en la cuenta y toda criatura recibía su porción exacta, los sesenta minutos, odiosamente iguales de la hora, a cada hora. Sin comprender que había gente, todos los seres venturosos, que necesitaban mucho más, porque al vivir con el ritmo pródigo y acelerado de la felicidad, libertos de las servidumbres del cómo y del cuánto, se gastaban la hora alegremente, en cualquier cosa, en caprichos, besos o pereza, despilfarrándola en unos minutos, para quedarse en seguida con las manos vacías sin nada... (75)

However, just as it takes up the issue of authority in the production of time—that is, the regulation of time by the tolling of church bells, a symbol of the continuing dominance of both church and state²⁹ in the daily lives of its citizens whereupon time itself is a regulated commodity³⁰—“Cita de los tres” establishes a complicated romantic scenario whose fulfillment depends upon the tolling of the hour, as Ángel waits for his beloved to arrive at the church, apparently at six o’clock:

²⁹ Robert C. Spires advances this vision of the tolling bells as “the consummate symbol of temporal authority.” Robert C. Spires, *Transparent Simulacra: Spanish Fiction 1902-1926* (Columbia: University of Missouri Press, 1988) 136-40. The importance of standardized time in theoretical constructions of modernity is also noted in Chapter One “The Nature of Time” in Stephen Kern, *The Culture of Time and Space (1880 - 1918): With a New Preface* (Cambridge, MA: Harvard U P, 2003) 10-35.

³⁰ “Por fin llegaban las seis, las seis auténticas, justas, legítimas hijas del meridiano. Pero ellas, que se habían anunciado por el previo envío de tantas hermanas bastardas y parecidas, todas muy alborotadoras, llegaban ahora envueltas en la más augusta dignidad de personas reales, sin duda para distinguirse de ellas, en silencio. Porque las seis en punto no sonaban, no daban en ningún reloj; las marcaba con sus agujas el único que vivía puntualmente, sin equivocarse nunca, el de la Audiencia, reloj mudo y sin campana, dechado perfecto de una justicia, casi divina, que no yerra nunca y se cumple en secreto.” Pedro Salinas, *Prelude to Pleasure: A Bilingual Edition of Víspera del gozo*, trans. Noël Valis (Lewisburg: Bucknell University Press, 1993) 77.

“Apenas si son las seis, decía, aún puede venir”. Aunque él sabía que las seis estaban allí hacía diez minutos, como está la muerte, sorda y segura, a nuestro lado los quince últimos días de la vida, y nosotros inocentes, disimulando, haciéndonos los distraídos, animados y hervidores de proyectos como si así pudiéramos escaparla. Pero esa afirmación tácita y suya no podía bastarle; se comprendía bien que era un engaño, y era menester que se lo dijeran, que alguien y no él le confirmara la esperanza. Desgraciadamente estaba solo. (77-78)

As in the previous story, this vignette's form and content are linked through the construction and subversion of structures of time—there is the apparent time, and then there is “real” time, neither of which is actually authentically heeded by the populace, as we see from Ángel's ability to extend the moment of six o'clock across at least fifteen minutes, from the first bell to the silent acknowledgment of the Audiencia. The reader waits with Ángel for the action to begin, in a veritable “*víspera del gozo*.” Though these subversions of temporal authority subtly link “Mundo cerrado” and “Cita de los tres,” the principal difference between the two stories is the lack of motion in the second, and so our original Einsteinian lens cannot be applied here in the same way, as it was motion itself that was the basis for our previous analysis. In the case of “Cita de los tres” there is no motion, and all action takes place within one stationary frame which is the church. However, the multiple instances and fracturing of the hour six o'clock give nearly the same impression as the multiple frames of reference that dominated “Mundo cerrado” in that they never appear to completely resolve the question of what time it actually is—if we can even speak of such a phenomenon. Six o'clock comes before its time, according to Ángel's judgment. But again we are confronted with the issue of perspective and the question of the “real.” The clock tower and the various wristwatches and table clocks set to the rhythm of the city is, for the majority of the populace, the accepted hour, but because we are subject to Ángel's point of view, we are also subject to his sense of a prolonged six o'clock, whereupon each moment, each chime, carries its own authority, and only the unmarked hour in the church is the closest to “absolute,” a fact that says much about the cultural medium in which the protagonist finds himself.

Maria T. Pao notes that:

time measured by *Víspera's* clocks, some faster, some slower, has become expansive, exceeding itself so that each hour blossoms into many...Its single sequence of peals, sounded by clocks different in varying increments, lengthens into a chain of “*improvisadas variaciones sobre un tema conocido y popular*” (55). This more elastic, modernist incarnation of time accounts for differences of place and temperament: one city, “*holgada y generosa,*” has a “*modo descuidado y señorial de contar el tiempo*” (49), while elsewhere each minute is scrupulously allocated. (442)

Here, Pao essentially begins an argument for the existence of a unified chronotope within “Cita de los tres,” but leaves off to continue her discussion of time and the Newtonian absolute represented by the Audiencia. She closes her argument by saying that

Like Einstein, who did not dispute the existence of time and reality, but pointed to the variability of their measurement as apprehended by human beings with shifting frames of reference, Salinas proposes that objective time only materializes itself as necessarily disparate calibrations with a silence between them... (443)

I agree that “Cita de los tres” does its best to make the reader question the ways in which time is measured: “Las horas tenían exquisitas dilataciones imprevistas, llegaban antes de llegar igual que llega la persona que esperamos mucho antes de que esté aquí...” (75). In the story there is clearly “official” time and there is the time of Ángel who waits to meet the woman he desires, and whose anxious waiting provokes a perception of time that is in conflict with that authored by the powerful institutions surrounding him.³¹ For the most part, though, it appears that time in this case is intrinsically linked to the space in which it is being measured—the city in which Ángel lives, the *idyll* in which generations have lived and acclimated to this peculiar way of measuring time and living by unregulated clocks. It is a place in which time flows differently, and from this unity of space and time, Salinas constructs a loose plot that revolves around this unique configuration of the chronotope.

Six o'clock comes and goes, returns again and pauses in a way that suggests a perpetuation of an eternal moment of desire—the “expanded hour,” in Pao’s words, as previously mentioned. Pao’s study agrees that there are at least two ways to read this with regard to time: the subjective inner time flow that, in this case, is mediated by the emotion and expectations of the protagonist; or alternately, as a challenge to Newtonian absolutism in which there is but one hour in one space in which all action occurs. With the Einsteinian lens, however, we can also read the text as a discussion of the ways in which the same moment is perceived from a variety of angles to undo the illusion of simultaneity. Though we have not previously discussed it, the issue of simultaneity is one of great importance with regard to modern physics. Einstein’s work refuted the very notion of simultaneous action, due again to the way in which frames of reference, coordinate systems, and perspective all influence the perception of the sequence of events in time and space.

In Section Nine of the previously mentioned work, *Relativity*, Einstein writes about the problem of simultaneity outside of the Newtonian universe:

Events which are simultaneous with reference to the embankment are not simultaneous with respect to the train, and *vice versa* (relativity of simultaneity). Every reference-body (co-ordinate system) has its own particular time; unless we are told the reference-body to

³¹ Carlos Feal notes that “Las fantasías de Ángel, compartidas por el narrador, chocan—claro está—con la dimensión inexorable del tiempo real, marcado en silencio por el reloj de la Audiencia... Le ley (ley del padre) afirma, pues, su presencia frente a los otros relojes de la ciudad, deliciosamente equivocados, audaces infractores de las reglas. Feal, “Lo real, lo imaginario y lo simbólico en *Vispera del gozo* de Pedro Salinas,” 320. N.B.: I agree with Feal’s assessment of the “Rule of the Father,” but I take issue with the idea of this being “real” time, as should be clear by this point in the argument. This would be a good time to take up the issue of the “real” and/or issues of authority in science vs. religion, but unfortunately the scope of this project excludes such a discussion. Suffice it to say that the presence of conflict between science and religion is duly noted here, but cannot be expanded upon at the moment.

which the statement of time referrers, there is no meaning in a statement of the time of an event.... Now before the advent of the theory of relativity it had always tacitly been assumed in physics that the statement of time had an absolute significance, i.e. that it is independent of the state of motion of the body of reference. But we have just seen that this assumption is incompatible with the most natural definition of simultaneity. (*Relativity* 30-31)

The impossibility of simultaneity in “Cita de los tres” is emphasized through the flux that permeates the tolling of six o'clock in the story, whereupon the hour is questioned, mirrored, and refracted through narrative devices that depend upon the perspective of a certain character. If we are to learn anything from Einstein, it is that perspective determines the coordinates that will define the frame that we are viewing, in this case through the eyes of Ángel, who is also known as Jorge—another doubling that allows for the basic principle of multiplicity that underlies the entire story. Regarding the implications of the impossibility of simultaneity for our young protagonist, and considering the multiple temporal frames that shatter the unity of time in the story, it would appear unlikely that the young lovers ever have the possibility of meeting: they inhabit different emotional coordinate systems. Thus we must focus on the waiting as the real pleasure, not a “prelude” to it. It is in the act of waiting in “Cita de los tres” that Salinas finds the narrative space he requires to explore the dilatations of time, as well as the effects of its fragmentation. Thus, time, in this story, complicates and thwarts love as a result of the idiosyncrasies of the peculiar, idyllic chronotope in which the action takes place.

We will end our discussion of simultaneity in “Cita de los tres” here, but we are far from finished with the concept itself. In the next section we will discuss simultaneity as an informing factor in the structure, content, and overall aesthetic composition of Federico Garcia Lorca's challenging drama *Así que pasen cinco años*, which is often said to exist, according to Margarita Ucelay, in “the shadow of Einstein.”³² What this turn of phrase means we will examine next.

Objective Time, Simultaneity, and the Interior Dreamscape: Federico García Lorca's *Así que pasen cinco años*

In an interview with *La Nación* in 1933, Federico García Lorca divulged that he had arrived in Argentina bearing two manuscripts, neither of which he planned on staging in Buenos Aires. One of the texts was *El público*, and the other was “un misterio, dentro de las características de este género, un misterio sobre el tiempo, escrita en prosa y en verso,” a work titled *Así que pasen cinco años* (“Llegó anoche Federico García Lorca” 992). Lorca considered the play to be one of his “comedias irrepresentables” in which he found the “verdadero

³² Margarita Ucelay writes about the openness of the work in her critical introduction to *Así que pasen cinco años*: “Continuamente aparecen nuevos ensayos que aprotan insospechada luz a distintos y sorprendentes aspectos, aunque por necesidad cada crítico venga generalmente a detenerse en un aspecto concreto, ya sea la posible influencia de Freud o Jung, o la sombra de Einstein, o el contagio surrealista de Dalí o Buñuel, por mencionar sólo temas de permanente actualidad. El hecho es que la lectura de *Así que pasen cinco años* sigue siendo fascinante y abierta a interpretación.” Margarita Ucelay, “Introducción,” *Así que pasen cinco años: Leyenda del tiempo*, ed. Margarita Ucelay, 4th ed., Letras Hispánicas (Madrid: Cátedra, 1998) 28-29.

propósito” of his dramaturgy.³³ The fact that *Así que pasen cinco años* was considered to be unperformable—and indeed was only staged after Lorca’s death—is crucial to our understanding of the mechanics of the play. Of special interest to this study are how those mechanisms—principally those that refer to the spatial and temporal aspects of the work—function on a larger level to develop, and yet still preserve, the “mystery” of time that Lorca asks us to contemplate. Through the insistence on time-keeping in the play—a play in which time arguably does not pass, as I shall explain below—Lorca forces the observer (be they reader or audience) to recognize and confront the paradox that is Time.³⁴ The experiential frames of objective and subjective time on the stage / in the text, and that of the observer do not and cannot coincide, creating a phenomenological friction between the action that occurs within the play and its apprehension by the observer. In the following paragraphs, I will outline the ways in which the play seeks to augment this friction, and the consequences of doing so, using as the basis of my analysis Einsteinian theories of time and measurement.

*

Einstein-Infeld in their book *The Evolution of Physics* ask a very simple question: “What is a clock?” According to their analysis, a clock is a mechanism by which objective time is measured:

By the use of a clock the time concept becomes objective. Any physical phenomenon may be used as a clock, provided it can be exactly repeated as many times as desired. Taking the interval between the beginning and the end of such an event as one unit of time, arbitrary time-intervals may be measured by repetition of this physical process. All clocks, from the simple hourglass to the most refined instruments, are based on this idea. With the hourglass the unit of time is the interval the sand takes to flow from the upper to the lower glass. The same physical process can be repeated by inverting the glass. (Einstein and Infeld 180)

A clock, therefore, as we have previously established, is meant to standardize time. In Lorca's *Así que pasen cinco años*, while it could be argued that El Joven is the main character, the subtitle of the play—*Leyenda del tiempo*—leads us to the conclusion that time is, if not the protagonist, then at least the unifying theme and motivating force behind the contrivances of the play—a secondary protagonist, as it were. This is emphasized by the tolling of the hour, which

³³ It should be noted that while Lorca felt that the play was “*irrepresentable*,” he did not object to the fact that one theater company, Club Anfistora, was planning on staging *Así que pasen cinco años* in 1936, before the tragic events of that year’s summer unfolded, making the performance impossible. See Felipe Morales, “Conversaciones literarias: Al habla con Federico García Lorca,” *Federico García Lorca, Obras completas*, vol. 2 (Madrid: Aguilar, 1977) 1077.

³⁴ I am intentionally choosing to use the word “observer” rather than “audience” in this section, principally due to the fact that Lorca wrote the play as “*teatro irrepresentable*” and to use the word “audience” posits the definitive performability of the work. “Observer” in this case will stand in for either reader or audience—in other words, those who are witness to the work either imaginatively or with their physical presence.

happens twice in the work—during Act I, and at the very end as the curtain falls. The clock, like time itself, is invisible and has no physical presence on the stage, being only heard and not seen, either through its chimes or announced by another character.

We hear the clock for the first time in a conversation between El Viejo and El Joven at the start of Act I, just before the heartbroken Mecnógrafa, in love with El Joven, crosses the stage. The conversation has to do with the future, and remembering the future before it has passed.

VIEJO: ...Es decir (*bajando la voz*) hay que recordar, pero recordar antes.

JOVEN: ¿Antes?

VIEJO: (*Con sigilo*) Sí hay que recordar hacia mañana.

JOVEN: (*Absorto.*) ¡Hacia mañana!

(*Un reloj da las seis. LA MECANÓGRAFA cruza la escena llorando en silencio.*)

VIEJO: Las seis.

JOVEN: Sí, las seis y con demasiado calor. (194-95)

Act I closes with a brief conversation between El Joven and his servant, Juan.

JOVEN: Es demasiado tarde. Juan enciende las luces. ¿Qué hora es?

JUAN: (*Con intención.*) Las seis en punto señor.

JOVEN: Está bien. (243)

During the course of the first act, no time has passed, if we are to believe both the clock and the servant. Within the time-space continuum of the library, time appears to have stalled. When the clock reappears at the final curtain of the work, it sounds the midnight hour, giving the impression that six hours have gone by. But have they? Following as it does on a passage in which the dying Joven has a dialogue with his echo, it is possible that the clock is striking six yet again, and displaying its echo for the audience.^{35,36} This central ambiguity about the final toll of the clock has provided critics with various ways of construing the action (or decided lack of it) in the play. For example, Mabel Brizuela subscribes to the notion that the action of the play actually has a chronological order—that of six hours (43). Of the relationship between time and space, Brizuela writes that

³⁵ This is the view supported by Robert Lima, who writes of El Joven that “[h]is last desperate words are answered only by a strong echo which repeats every syllable distinctly. A second echo joins in as El Joven dies. Juan crosses the room with a candelabrum as the clock chimes six times. The echo repeats the six strokes. The time is the same as at the start of the play and nothing has changed except one life which has become death.” Robert Lima, *The Theatre of García Lorca* (New York: Las Américas Publishing Company, 1963) 186.

³⁶ In portraying El Joven’s death the play posits an essential paradox about the nature of the passage of time in this particular frame that is not resolved: Though the argument can be made that El Joven’s death at the end of the play proves that time does pass in the play, seeing as time runs out for the protagonist, it only does so if we take El Joven’s death literally. Within the space of psychological/surreal reverie, there is no need for this death to be of necessity physical; it could be a psychical death just as easily.

la obra se configura en una suerte de composición circular, cuyo núcleo es el joven, hacia quien convergen—con carácter de visión múltiple—el viejo, el niño y los amigos que, como referentes de tres etapas de la vida, conforman la estructura cíclica del drama. La misma se traslada también a los niveles de tiempo y espacio, ambos cerrados: el tiempo cronológico es de apenas seis horas, y el espacio que inicia y cierra la pieza es el mismo: la biblioteca. (43)

In contrast, Ana María Hernando de Schröder writes of the opposite effect of the clock's chimes:

Hay en relación al tiempo, un rechazo del orden cronológico. El poeta inmoviliza el tiempo y el reloj, que marca las 6hs., en el inicio y al final del Primer Acto, no está actuando en su función de medir el tiempo, sino como símbolo de representar el tiempo. El reloj no marca las horas, inmoviliza, paraliza el tiempo. (185)

In spite of these differing interpretations of time, the critics appear to be in agreement about one essential facet of the play—that it takes place within the mind of El Joven. C. Christopher Soufas writes that “A nearly unanimous critical opinion has insisted that *As Soon as Five Years Pass* is physically set in the dream, or reverie, of the Youth” (69). And though he later goes on to challenge the centrality of El Joven, he does not question that the play evolves within some sort of inner, subjective space that is dream-like and consequentially, illogical and/or anachronic.

Let us consider the indicators that we have of time in *Así que pasen cinco años*: the clock which remains stalled at six for the majority of the work, and the five years of the title. Both of these are actually quite impotent when it comes to the measurement of time. The five years of the title are really five years of prolonged desire for El Joven, and of dread, for La Novia; they are a time of waiting, a seeming eternity, especially for El Joven. And as for the six hours that remain steady on the clock until the final moments of the last act, how do we read this? If it is true that the play is an exploration of the subconscious (or preconsciousness, according to Mabel Brizuela) then really there is no need for the clock to move (Brizuela 48). The impotence of the clock, its unnecessary presence in terms of objective time, actually strengthens the argument for the “legend of time” being a meditation on subjective, interior time. However, this is not to say that there isn't a way to interpret the events with a scientific lens; we must however in our analysis bear in mind that whatever idea of objective time develops must be stood against other, more apparent arguments about psychology, surrealism, and the dominance of the subjective.

According to Einstein-Infeld, the “subjective feeling of time flow” is “primitive,” but it “enables us to order our impressions, to judge that one event takes place earlier, another later. But to show that the time interval between two events is 10 seconds, a clock is needed” (180). Thus we are returned to the primacy of the clock, or the cosmic event of the eclipse, as representative of objective time, and are granted a way in which to understand both the “action” of the play, with all its dreamlike qualities, and its relationship to the clock which appears to stand still: it is none other than the dialectic of the subjectivity vs. objectivity, wherein the clock within the work symbolically represents the human need for sequence and the objective aspects of “sooner” and “later.” Einstein's theory of relativity challenged this notion when it defeated the

concept of absolute time.³⁷ However, in spite of Einstein's work that undid absolute time and space, he did not throw out the possibility of measuring them. In other words, while Einstein admits that when approaching the speed of light, time slows down, he never rejects the idea that time and space ever cease to be measurable, as long as we take into account that we must have, as he phrases it, "a good clock"—able to take on the task without distortion. And, preferably, we should have more than one, so as to synchronize them and thereby resolve questions of simultaneous action (Einstein and Infeld 181).

Simultaneity as an Einsteinian concept revolves around the idea that an event when observed from differing relative systems in motion will appear to happen at different times depending on the position of the observer. The idea of simultaneous events as "real" events whose simultaneity is unquestionable depends again on the idea of absolute time and space, which in the previous section we established as being incongruent with the Einsteinian paradigm. Simultaneity as a concept is therefore undermined by Einsteinian physics, and attempting to search for simultaneity produces such strange things as causes happening after effects, the inversion of events, and other startling inconsistencies with what we normally regard as a naturally occurring sequence of events.

It is the concern with sequence that is troubling with regard to *Así que pasen cinco años*. If we return to the earlier quote from El Viejo about remembering "hacia mañana," we can begin to unravel the problems of chronology and sequence that pervade the work, and put them in a context other than that of the surrealist "reverie." Putting the future within the realm of the past (remembering) and the present (the act of remembering in the precise moment of remembrance) manages to create a temporal fusion that results in a unification of time, space and action: All possible moments, and the thoughts pertaining to them—since thought and action are parallel, if not equivalent, in this psychological realm—are contained within the singular space of the library.

The best indicator of this species of fusion of time, space, and action occurs in the episode of, and subsequent references to, the death of El Niño and El Gato, which we first see in Act I. The scene is almost a non-sequitur within the play, interrupting as it does the conversation between El Joven and El Viejo.

Por la puerta de la izquierda aparece EL NIÑO MUERTO y EL GATO. EL NIÑO viene vestido de blanco, primera comunión, con una corona de rosas blancas en la cabeza. ...

El gato es azul con dos enormes manchas rojas de sangre en el pechito blanco/gris y en

³⁷ "In classical physics, we had one clock, one time flow, for all observers in all CS. Time, and therefore such words as 'simultaneously,' 'sooner,' 'later,' had an absolute meaning independent of any CS. Two events happening at the same time in one CS happened necessarily simultaneously in all other CS. Assumptions (1) and (2), i.e., the relativity theory, force us to give up this view. We have described two events happening at the same time in one CS, but at different times in another CS. Our task is to understand this consequence, to understand the meaning of the sentence: 'Two events which are simultaneous in one CS, may not be simultaneous in another CS.'" See Albert Einstein and Leopold Infeld, *The Evolution of Physics: The Growth of Ideas from Early Concepts to Relativity and Quanta* (New York: Simon and Schuster, 1938) 179.

la cabeza. (217)

In terms of the issues of sequence and simultaneity, the scene is pivotal not for its content, but for the way it serves to bolster the argument of the paralysis of time within the play. While the actual figures of El Niño and El Gato never reappear, it is their mention at various other times within the play that demonstrate temporal stagnancy.³⁸ Their first mention is in Act I, where El Criado intervenes in the continuing discussion between El Joven and El Viejo. We learn at that point the cause of El Gato's death: "Los niños arrojaron a un gato que habían matado sobre el tejadillo del jardín y hay necesidad de quitarlo" (232). If we are to consider sequence in this case, then the death of the child and the cat occurred either during the conversation between El Joven and El Viejo, or previous to it. However, this theory is undone by the next mention of the incident in Act II, where El Joven tells La Novia the reason for his lateness: "Ustedes me perdonarán pero de correr, de subir las escaleras, estoy agitado. Y luego..... en la calle he golpeado a unos niños que estaban matando a un gato a pedradas" (265). This has the effect of placing Act II squarely within the temporal boundaries of Act I, making the previous sequence of events—the cat being in the previous act already dead and tossed into the garden, but in Act II still alive when El Joven departed the house—untenable. Yet it is this inversion of the sequence of life and death that has the effect of keeping the hour between Act I and Act II at six o'clock, because the deaths of cat and child come to demonstrate and represent the perpetuation of the present. There is no mourning—the cat and child are in a state of perpetual death.³⁹

It is in Act III where we get a sense that time has (perhaps) moved on, when La Mecnógrafa recalls to the Máscara the day that she left the house of El Joven:

Yo me fui de su casa. Recuerdo que la tarde de mi partida había una gran tormenta de verano y había muerto el niño de la portería. Yo crucé la biblioteca y él me dijo: "¿Me habías llamado"; a lo que contesté cerrando los ojos: "NO". Y luego, ya en la puerta dijo: "¿Me necesitas?"; y yo le dije: "No. No te necesito." (304)

Leaving aside that La Mecnógrafa gives an inverted version of the events of her departure, the above passage serves as the confirmation of the death of the child at the same hour as the cat. While this would seem to suggest the passage of time, we are reminded that this scene does not take place within the library, which is the spacetime coordinate that remains in stasis. This external event thus serves as a species of "clock" that marks the fact that "el tiempo inmovilizado ha quedado reducido en la obra a una única hora: las seis" and that this is demonstrated "en forma directa en el primer acto, o a base de referencias esporádicas al Niño o al Gato" (Ucelay 139). In sum, the twin deaths of child and cat are our timekeepers in the work;

³⁸ Robert Lima theorizes that the use of El Gato and El Niño has a Brechtian quality that is "effective in alienating emotional response and involvement. Lorca uses the scene between El Niño and El Gato as the reference point for the unreality of the play, choosing it whenever the surrealist tendencies become hidden by necessary references to life, order and reality." I agree with Lima on this point, especially with regard to the distancing effect between stage and observer. It is the particular reason for and nature of this detachment and alienation that I am investigating here. Lima, *The Theatre of García Lorca* 175.

³⁹ Or, like Schrödinger's cat, they are both alive *and* dead at once.

the sequence of their deaths alters according to the perspective of whoever is speaking. This takes us back to Einstein, who shows with the theory of special relativity that “simultaneous” events are relative to the coordinate system in which they occur. Therefore, when outside of the paralyzed spacetime of the library, it can appear that the deaths occur in the past thus giving us the sensation of forward motion. It is possible, therefore, to assume with *La Mecnógrafa* that time has passed, and thus the ambiguity of the final twelve chimes of the clock is increased. However, as soon as we return to the library of the first act, we are reminded that it is still six o’clock through the words of the servant who mentions the dead child “que acaban de enterrar” (334). Thus our timepiece continues to function, continues to affirm the dreamscape in which time has ceased to flow, setting an *objective marker of time* against the unordered chaos of the interior, psychic space in which the rest of the action takes place. What is unsettling, however, is that this timepiece, which should serve to set a firm sequence of events in the play, only functions to sustain the unsettling awareness that sequence is impossible in this piece of frozen spacetime, and that the ordering of events is entirely relative to the observer.

The essential irony of the work lies in the fact that *Así que pasen cinco años* clearly embraces the idea of subjective, interior time, but the only way that it can demonstrate its passage is by marking (and stopping) objective time. The final ambiguity of the tolling of twelve gives the audience permission to believe that the events of the work occurred within a linear narrative structure, but I am personally more convinced, along with Margarita Ucelay⁴⁰ and Robert Lima,⁴¹ of the final chime being an echo of itself. The echo theory lines up nicely with other theories of doubling (*desdoblamientos*) within the text, espoused particularly eloquently by Mabel Brizuela: “La visión plural de la vida, la revelación del oculto paisaje interior en un drama, sólo se alcanza desbordando el tiempo y el espacio, para afianzar el sentido del pasado y la profética anticipación, sin límites ni fronteras” (48). Our (dis)continuity principle—to return to that fundamental concept—lies in the contrast between the established stasis of spacetime within the library, contrasting with the discontinuous and anachronic events that define the reverie which we are witnessing, the dreamscape of an undefined dreamer.

The significance of having a timepiece within the work that demonstrates the shifting frames of reference and the paralysis of time on the stage has less to do with the play’s action than instead, the observers’ reaction to what they are witnessing. Lorca’s *irrepresentabilidad* rests in the fact that the traditional theater audience would feel the psychological need, instinctually and also according to the conventions of the theater, to insist on a linear, sequential narrative that at the very least respects the unities of time, space and action within the scene, if not the entire play—and that these bear at the very least a modicum of verisimilitude. The play is “unperformable” because it asks the audience to carry out the daunting task of suspending their disbelief with regard to the nature of the passage of time, which is essentially what Einstein’s theory of relativity asked the world to do: reconfigure and adjust the collective concept of time

⁴⁰ “Entendemos, pues, que las doce campanadas en tan breve espacio no son más que las seis, y el Eco que viene repitiendo una a una las palabras del agonizante.” Ucelay, “Introducción,” 139-40.

⁴¹ “El Joven is alone. His last desperate words are answered only by a strong echo which repeats every syllable distinctly. A second echo joins in as El Joven dies. Juan crosses the room with a candelabrum as the clock chimes six times. The echo repeats the six strokes. The time is the same as at the start of the play and nothing has changed except one life which has become death.” Lima, *The Theatre of García Lorca* 186.

away from configurations of the absolute. The observers of the play would feel an insurmountable phenomenological friction as the action of the play—the illogic of non-sequential spacetime and the interior reverie in the infinitely flexible, mutable representational space—conflicted directly with their witnessing of the play’s action in a linear fashion—the logic of direct experience. In order to accept the truth of the play (that time can stall), one would have to admit that the “primitive” ordering of time that one instinctually feels is not the only way to experience reality; conversely, the ambiguities of the play admit the possibility of the passage of time, which would come as a relief to the perplexed observer—thus the two schools of criticism with regard to the play’s clock. What I have attempted to show is that it is not the chiming of the clock that serves as the ultimate timepiece here, but rather a recurring event—the presence of El Niño and El Gato—which functions in a less ambiguous, but less directly evident, manner. It stands to reason that the observer would want to heed the chimes of the clock; it is only natural. But Lorca was not in pursuit of the natural—he was in pursuit of ways in which to dramatically reframe the essential elements of human existence so as to make them foreign and strange, and yet still retain that which is true.

The Poetic Equation: $E=mc^2$ in Jorge Guillén’s *Cántico*

¡Gozos, masas, gozos,
Masas, plenitud,
Atónita luz
Y rojos absortos!

(Jorge Guillén, “Los amantes”, vv. 9 – 12)

In *Relativity*, Einstein describes the importance of his most famous equation, $E=mc^2$ (Energy (E) equals mass (m) times the speed of light (c) squared):

The most important result of a general character to which the special theory of relativity has led is concerned with the conception of mass. Before the advent of relativity, physics recognized two conservation laws of fundamental importance, namely, the law of the conservation of energy and the law of the conservation of mass; these two fundamental laws appeared to be quite independent of each other. By means of the theory of relativity they have been united into one law. (51)

Einstein’s equation revolutionized physics by bringing matter and energy into a singular relationship; although its significance is often not entirely understood by the general public, there are very few who aren’t at least familiar with the formulation $E=mc^2$ and know of its progenitor.

It is more than likely that Jorge Guillén was also acquainted with Einstein's work, as he was in Paris in 1922 and attended at least one public lecture given by Einstein.⁴² Guillén wrote two letters about his experience at the Collège de France—one dealing with the resistance of the French to this new “German” intellect and relating it to the discourse of nationalism in post-World War I France; the other letter is more a portrait of Einstein, and it is clear that Guillén has a great admiration for the man. In his letter, Guillén writes mostly about Einstein's appearance, but the subtext is that of decided respect for the man's brilliance (and his enigmatic presence), as we see in the opening paragraph of his letter:

Ni tipo de alemán, ni tipo de israelita, ni tipo de profesor, ni tipo de hombre de ciencia. Ningún lugar común en su persona. Bien que nacido en la Europa central, moreno con morenez de balcánico, y semicivilizado de la Europa del Sudeste. Y luego, ¡qué trazas de artista en este creador de abstracciones! ¿Cómo le identificaría por esas señas quien se imaginase a un sabio alemán con aspecto de sabio alemán? El espíritu clasificador se desazona. ¿Qué casillero corresponderá a nuestro artista balcánico? ¡Ah! Ya está: “Tzigane”. ¿A cuántos Einstein hemos visto con frac rojo? ¡Oh, violinista de terraza, junto a la costa, en las ciudades de los estíos, de nocturno comedor, fosforescente de fuegos fatuos, en las ciudades de los inviernos! Resalta en Einstein ese cariz nostálgico, soñador, errabundo y tenebroso del meridional encendido de morenez, mitigada por no sé qué vales dispersos en su alrededor. Mas Einstein es el zíngaro que ha acertado a cifrar en la pauta de la matemática un vals que nadie había discernido entre los sonos que oían ya los pitagóricos “en la más alta esfera.” (*Obra en prosa: Jorge Guillén* 145)

What is notable about this passage is that Guillén immediately relates the discoveries of relativity to the arts—in this case, calling it a “waltz.” The rest of the letter is similarly musical and artistic, in which Einstein comes to life in vivid descriptions of his physical persona. The connection between art and science here espoused by Guillén make it difficult for anyone to argue that scientific concepts in the 1920s did not have an impact on his work or his outlook on the interconnectedness of phenomena. Additional confirmation of this point of contact between the scientific and artistic worlds in the poetry of Jorge Guillén can be found in the basic vocabulary of *Cántico*, which thrives on two lexical sets—the emotional and the intellectual—according to editor José Manuel Blecua in his edition of the book (44). As an example of the “intellectual” vocabulary, Blecua designates words such as *exactitude*, *equilibrio*, *estilo*, *nivel*, *perfección*, *perfil*, *línea*, *recta*, *término*, *equilibrar*, *limitar*, and *ceñir*. As it happens, many of these words create a sub-set of mathematical precision—*línea*, *recta*, *equilibrio*—to which we can add the spatial vocabulary that is also characteristic of Guillén's masterwork: Blecua notes the prevalence of the geometrical words *curva*, *recta*, *esfera*, *círculo*, *línea* and *plano* in particular (57).

It would seem that, according to Blecua's analysis, the emotional and the intellectual phenomena—“dos fuerzas tan claras, y tan contrarias”—are at odds with each other in *Cántico*

⁴² K.M. Sibbald notes that between 1921 in 1924, Guillén was a correspondent for the newspapers *La Libertad* and *El Norte de Castilla*, chronicling his stay in France. K. M. Sibbald, “Jorge Guillén, crítico y poeta: El desdoblamiento de la personalidad,” *Hispania* 64.1 (1981): 23.

(44). Yet the work is harmonious throughout. How can this be? Through the use of scientific-mathematical imagery, Guillén's poetry searches for and finds equilibrium through the quest of a poetic subject that interrogates, probes, and praises its surroundings. As the poetic subject interacts with the world around it, a barrage of precise, yet still abstract, images is unleashed in a great torrent of poetic energy.⁴³ In order to investigate further the nature of the equilibrium in *Cántico*, I return to Einstein, this time to his formulation of $E=mc^2$. In my analysis I will focus on the physical concepts of mass, light, and energy and how they form a continuous whole via both Einstein's formulation and Guillén's poetic affirmation of the subject in relation with its surroundings that is *Cántico*. In the upcoming paragraphs, I will discuss the ways in which the poetic subject reaches its fullness (in Guillén's terms, *plenitud del ser*) and energetic release through interactions with light (*la luz*, or *c*) and mass (*las cosas*, or *m*), to arrive in a world that the poetic voice thoroughly celebrates.

As an introduction to this type of analysis, we can read the poem "Profunda velocidad," the content of which only encourages us to look at *Cántico* from the standpoint of Einsteinian physics:

Sola silba y se desliza
 La longitud del camino
 Por el camino. ¡Qué fino!
 ¡Más cómo se profundiza
 La presencia escurridiza
 Del país, aunque futuro,
 Tras el límite en apuro
 Del velocísimo Ahora,
 Que se crea y se devora
 La luz de un mundo maduro!⁴⁴
 (67, 201)

While the most likely interpretation here is that of the experience of a moving vehicle—locomotive or automotive, it seems not to matter—the lexical choices—*límite*, *velocísimo*, *luz*—suggest an awareness of the physical connectedness between speed and its relationship to both time and space: $v = x/t$ (velocity equals distance over time). Yet the last line suggests that there is a congruent speed between time and light: the speed of light is the upper limit of all velocity—it has the capacity to “devour”, and it “limits” time in the sense that time slows when objects approach the speed of light. While these specific relationships are not detailed in the poem, the linkage of space (*longitud*), time (*Ahora*), velocity, and light, testify to the advent of an Einsteinian universe, and perhaps this is the *mundo maduro* to which Guillén refers in his last

⁴³ It would seem that an image cannot be both exact and abstract at once. However, if one considers the nature of mathematical language, in which, for example, the word “curve” denotes a precise phenomenon, its referent is still abstract in that, barring the appearance of an actual mathematical function, the exact nature of the curve remains unknown, and exists only in its essence.

⁴⁴ All poems cited are from Blecua's edition of *Cántico*, indicated above. The number of the poem and its corresponding page will be given in parenthetical notations with the parts quoted above. Jorge Guillén, *Cántico*, ed. José Manuel Blecua, Clásicos de Biblioteca Nueva (Madrid: Editorial Biblioteca Nueva, 2000).

line: a world that is revealing its mysteries through math and science, and whose basic concepts of time, space, matter and energy are changing from day to day, year to year.

As Sara Ávila Robles notes, praise of the universe by the poetic “yo” is pervasive throughout *Cántico*, and it stems from the recurring image of *la luz*:

[T]odo lo que la luz presenta al hombre, al poeta, provoca su regocijo, hasta tal punto que el propio título del libro, *Cántico*, muestra una fuerte carga semántica relativa a la exaltación y admiración ante toda la realidad; es en definitiva, un cántico de alabanza y de júbilo. (51)

Though *Cántico* has often been criticized as being the prime example of the “dehumanized art” diagnosed by Ortega—cold, precise, mathematical—it is difficult not to see how the work is infused with the very human quality of effusive joy. What is perhaps misleading is that this joy settles not in the subject’s anecdotal existence, not in events, but rather is found in *relationships* to other “elements.”⁴⁵ It is light that awakens the subject in the first poem of *Cántico*’s first section, “Más allá;” once awakened, the subject moves through cycles of action and reaction that coincide with the passage of day into night.⁴⁶ Light figures into a stunning number of poems throughout the book; the majority of these poems have as their basis this initial reaction of light and being. The light has a role in evoking and invoking the “yo” of the poem, as notes Juan Montero:

La luz, que no ha faltado a su cita con los ojos y con el nombre, tiene valor ejemplar, porque en ella descubre el hombre que el mundo no es un ser-en-sí, sino un ser intencional, un ser-para-mí que, por medio del lenguaje, se convierte en propiedad constitutiva del sujeto mismo (mi ser). (162)

Let us consider “Más allá” as being our initiation into the elemental forces at work in *Cántico*. The poem is of exceptional importance, providing as it does a species of primer for the rest of the book, and has been so extensively commented that it would be redundant to restate what many critics, especially Joaquín Casaldüero, have written before about its necessity to *Cántico* as a whole.⁴⁷ “Más allá” was not included in the first edition of the book in 1928; it appears for the

⁴⁵ J.M. Blecua uses the word “elemental” to describe various thematic moments in *Cántico* such as light, water, love, and violence all of which have an essential energy to them. José Manuel Blecua, “Introducción,” *Cántico*, ed. José Manuel Blecua, Clásicos de Biblioteca Nueva (Madrid: Editorial Biblioteca Nueva, 2000).

⁴⁶ Sara Robles Ávila notes the diurnal rhythms in *Cántico*: “Así pues, en *Cántico*, las luces, las sombras y los astros juegan el papel más importante, pues casi todos los poemas girarán en torno al tema de la luz en sus fases diarias de mayor a menor intensidad: amanecer, mediodía, tarde, atardecer, y noche. Además la ordenación de los poemas obedece a una táctica basada en el ciclo diario amanecer-noche, luz-oscuridad; claro está que a lo largo del libro este proceso se sucede regularmente y va desentrañando acepciones y modos que amplían el campo semántico de la *luz* hasta alcanzar límites de gran originalidad.” Sara Robles Ávila, *La connotación en el lenguaje poético de Jorge Guillén: A propósito de los sememas luz y aire en Cántico* (Málaga: Servicio de Publicaciones e Intercambio Científico de la Universidad de Málaga, 2003) 62.

⁴⁷ See Joaquín Casaldüero, “*Cántico*” de Jorge Guillén y “*Aire nuestro*”, Biblioteca Románica Hispánica, ed. Dámaso Alonso (Madrid: Editorial Gredos, 1974).

first time in the second edition (1936) and remains at the forefront for the two editions that follow in 1945 and 1951. The stability of the poem and its overall significance remains intact over the course of the development of *Cántico* into its final form.

Posing the question of analysis in terms of our analytical platform of $E=mc^2$, we begin with the first stanza:

(El alma vuelve al cuerpo,
Se dirige a los ojos
Y choca.)--¡Luz! Me invade
Todo mi ser. ¡Asombro!
(2, 85, vv. 1 – 4)

The “yo” is in a state of disorder as the poem begins, the soul separate from the body. The light is, as Montero states, the element that brings the subject into being. Light proves itself to be the energetic principle behind the totality of being—the symbolic force or substance by/through which the “yo” is able to become a fully-realized subject. It does more than simply provide a means for perception, the perspective and vision of this “yo”; it serves as the energy which will launch the “yo” into the relationships that will come to define it, surround it or limit it (*ceñir* is a common verb throughout *Cántico*), and in so doing, actualize the subject. In other words, the “E” of our equation is actually the subject *en plenitud*: the energetic self balanced in an equation with mass and light.⁴⁸

“Más allá” presents us with another element that will remain pertinent throughout the book—this is the world of *las cosas*, things, or in the terminology of physics, *mass*. The relationship between the “yo”, *las cosas* and light is developed in the second, third and fourth stanzas of the poem.

Intacto aún, enorme,
Rodea el tiempo... Ruidos
Irrumpen. ¡Cómo saltan
Sobre los amarillos
Todavía no agudos
De un sol hecho ternura
De rayo alboreado
Para estancia difusa,
Mientras van presentándose
Todas las consistencias
Que al disponerse en cosas
Me limitan, me centran!
(2, 85, vv. 5 – 16)

⁴⁸ I don't believe that it is coincidental that another significant word that pervades *Cántico* is “equilibrio,” which also suggests an awareness of a balance between forces or substances, a profound relationship between elements.

The light allows amorphous matter to resolve into form, and the resulting appearance of shapes, objects and things allows the subject to find its center and its limits—in other words, its very being—which it comes to know through the world surrounding it. Of this, Guillén himself says that: “Ese hombre [el “yo”] se conoce así, gracias al contacto con un más allá que no es él. Nada sería sujeto sin esa red de relaciones con el objeto, con los objetos...”—indubitably, a vital ontological equation (*El argumento de la obra* 91). Eventually, in a later moment in “Más allá,” the poet will go on to exclaim “dependo de las cosas!” (2, 90, v. 143). As the energetic equivalent of the relationship between mass and light, this is indeed true. Blooming from this equation is the actual *ser* of the poetic voice. The first part of “Más allá” concludes with the following stanzas:

Todo me comunica,
 Vencedor, hecho mundo,
 Su brío para ser
 De veras real, en triunfo.
 Soy, más: estoy. Respiro.
 Lo profundo es el aire.
 La realidad me inventa,
 Soy su leyenda. ¡Salve!
 (2, 87 vv. 53 – 60)

The *ser/estar* contrastive dialectic is established for the first time here and will recur repeatedly throughout *Cántico*: it is both the similarity and difference between a simpler “being” (*ser*) and the more complex “being-in-the-world” (*estar*)—*estar* is the being in *plenitud*, the subject made complete by its integration with its surroundings. The first section of the poem ends with an exclamation of praise, of greeting, of joy—“¡Salve!”—a burst of physical and psychical energy that shows the subject in an excited state. Again, we have our “E.”

*

This is perhaps an opportune moment to discuss the role of punctuation in Guillén’s poetry. He is not spare with his use of exclamations and (less frequently), interrogatives. While some may say that this is a simple device that is characteristic of most poetry, used to convey the emotional and human weight of the poem, it would seem that in a world of relations as complex and dynamic as that of *Cántico* there would be a way to view the presence of the interrogative and exclamatory functions as representative qualities that gesture towards the thematic unity of the work. This is achieved through a singular strategy of punctuation wherein exclamations release the energy of being and multiply it, and interrogatives bring being into doubt and uncertainty.

Throughout *Cántico*, interrogatives function curiously, drawing attention to the subject’s patterns of energetic reactivity with the surrounding world. As Casaldueiro points out, “[p]ocas veces siente Guillén la necesidad de acudir a la frase interrogativa. Su frase es exclamativa, exclamación no tanto de sorpresa como de admiración y triunfo” (49). In one of the few poems that truly focuses on the subject in an intermediary state of becoming, “La rendición al sueño,”

the poetic voice moves from the usual assessment of the exterior to a dreamlike state, in which the specificity of the images perceived by the “yo” gradually dissolves into a fog, and logic disappears in favor of a more traditional and instinctive theology.

Una pululación amable de Invisibles
En el vaho se espesa.
Sucesiones de suertes profundizan espacios.
Niebla.
¿Hay grises de altitudes?
Barajas, nubes,
Caos.

¿Caos de Dios?
(104, 245, vv. 24 – 31)

The interrogative betrays a “yo” that is settling into a world of energies in wild fluctuation. An ordered world of things devolves into a world of chance that can only be determined by a divine principle, not through any effort of the individual. Chaos and God, we are brought backwards through evolution to the moment of Genesis, which is unintelligible to a very human subject. The questions formed in these stanzas are so vague and surreal⁴⁹ that the “yo” actually becomes lost, subsumed within the presence of the primal force of the divine chaos.

If we continue with this poem, it is possible to see how the indeterminate poetic voice manages to recuperate itself in a moment of awakening similar to that encountered in “Más allá”. The next stanza reads:

Caos. Lo informe
Se define, busca la pesadumbre.
Atestada cabeza
Pesa.
Avanzan, se difunden
Espesores.
Robustez envolvente, noche sólida,
Apogeo de las cosas,
Que circundan, esperan, insisten, persuaden.
(104, 246, vv. 32 – 40)

⁴⁹ It is important to note that Jorge Guillén felt little attraction to the surrealist movement as originally conceived, and is very deprecating of it in one of his essays. He says: “Arte de la poesía y, por lo tanto, ninguna simple efusión—ni al modo del siglo pasado ni con violencia de informe chorro subconsciente. No hay charlatanería mas vana que la del subconsciente abandonado a su trivialidad. En España nunca se contentó nadie con el «documento» superrealista.” Jorge Guillén, “Una generación,” *El argumento de la obra*, ed. Diego Martínez Torrón, Temas de España (Madrid: Taurus, 1985) 76.

The chaos is remodeling itself, and the poetic voice is reawakening into a world of forms and things, all of which have a very precise weight. We sense at the center of this evolution not only the mass of the poetic body and the dreaming mind in the process of awakening, but the weight of the entire inchoate world, of which the poetic voice is a part. The relationship becomes explicit in the following stanza:

¡Oh dulce persuasión totalizadora!
Todo el cuerpo se sume,
Con dulzura se sume entre las cosas.
¡No ser, estar, estar profundamente!
¡Perderse al fin!
(104, 247, vv. 41 – 45)

The interrogatives have disappeared and have been replaced by a vigorous poetic voice in the process of exclaiming the sweetness of the forms surrounding it. While the frequent interrogatives indicate the uncertainty of a subject-in-process, the ensuing exclamations insinuate the joyful stages of this process and gesture towards plenitude. In these five lines of “La rendición al sueño,” we find not only the jubilant tones of praise, but again the *ser/estar* juxtaposition which we have established as a signifier for the process of becoming, and this apparently in answer to a battery of interrogatives that end the first stanza of the poem. The uncertain and enervated “yo” filled with questions has evaporated, replaced by the energetic *ser* that, losing itself amid the masses that surround it, again realizes itself as a profound *estar*.

If we examine this process according to the Einsteinian concepts outlined earlier, it can be said that the exclamatory function, sown throughout *Cántico*, is a way of expressing the energy that is released when one substance (the “yo”) interacts with an element—mass or light—in its surroundings. Exclamation in itself is forceful, but when viewed through this framework it has added significance, as it is the product of the activation of the poetic subject. Far from divorcing a completely humanized voice from a poetics meant to be pure and precise, constant exclamatory phrases betray the insistent humanity that lies beneath the polished formal surface of *Cántico*. This is exaltation at its best, a joy in being and being-in-the-world that defies the usual classification of Guillén’s work as exemplifying the aseptic aesthetic of Pure Poetry.

The forces that work to define the “yo” throughout the individual poems of *Cántico* also work macroscopically between the poems themselves. The poems have affinities to each other, and the trajectory of their totality also defines a process: we begin with the awakening and cycle through night, sleep and dreams, only to emerge in the last moment of the book, triumphant, with the light-and-mass-as-energy principle making a dramatic reappearance as an awakening into ontological fullness, one bonded to reality, bonded to love, in *plenitud*:

Bajo Agosto van los seres
Profundizándose en minas.
¡Calientes minas del ser,
Calientes de ser! Se ahíncan,

Se obstinan profundamente
 Masas en bloques. ¡Canícula
 De bloques iluminados,
 Plenarios, para más vida!
 Todo en el ardor va a ser,
 Amor, lo que más sería.
 —¡Ser más, ser lo más y ahora,
 Alzarme a la maravilla
 Tan mía, que está aquí ya,
 Que me rige! La luz guía.
 (125, 280-1, vv. 27 – 40)

Excerpted from the section of “El cielo que es azul” subtitled “Ardor,” this final fragment is emblematic of all that has been discussed above with regard to the Einsteinian formulation of $E=mc^2$: the poetic voice here assumes a true lust for life that is called into being through the elements of mass, space, time, and light. The poetic subject follows the light which called it into being in the first moments of *Cántico*, and departs with it.

I should also note there is a strong cosmological aspect to *Cántico* that merits commentary. The cosmic vision of Guillén—planet, stars, universe—is decidedly Einsteinian, as Casaldueiro observes, without attributing a scientific connection to his analysis:

Sobre el espacio concreto, palpable está siempre el espacio absoluto y abstracto, pero aun éste se ofrece siempre finito, aunque ilimitado: “Se cierne lo inmediato Resuelto en lejanía”, “Horizonte, tardanza Del infinito espacio”, “Estricto, pero infinito”. De aquí que pueda decir: “La luz resbala Sin fin sobre los límites.” Toda la poesía de Guillén está contenida entre esta finitud y esta ilimitación, su mundo concreto está lleno de posibilidades. (40)

This analysis is akin to Einstein’s formulation in section thirty-one of *Relativity* in which he posits in the title “The Possibility of a ‘Finite’ and Yet ‘Unbounded’ Universe” (122). Einstein’s finite-but-unbounded universe is based on Riemannian geometry in which space is spherical, a “surface of constant curvature” (125). Guillén in *Cántico* is obsessed with the perfection of the sphere and the circle.⁵⁰ It is possible to interpret this according to Einsteinian theoretical principles and his usage of non-Euclidean geometry in his theories, and thereby see these representations of the perfect curve as being representative of the new conceptions about the shape of the universe. Guillén looks to the sky and finds the ideal form; his task was to transcribe an analogous vision using, as the critic Rubén Benítez notes, the word as “a pure verbal indicator, almost... a scientific instrument for refining and adjusting its meaning to the purpose it is made to fulfill” (29). In other words, and referring back to earlier concepts outlined in this discussion, Guillén’s poetry investigates, it discovers, it champions innovation in language and form. What we frequently call poetic “experimentation” finds in Guillén new resonance, as we

⁵⁰ See, for example, the poem “Perfección del círculo”(poem 19) in Guillén, 120.

discover the parallel purities of poetry and physics that unify *Cántico* and make it universally, cosmically sonorous.

An Alternate Vision: Uncertainty in *Cántico*

It is not unusual for literary theorists, especially in poststructuralist theory, to relate the developments in literature of postmodernism to the quantum paradigm. This is what Alan Sokal parodied in his faux essay “Transgressing the Boundaries: Toward a Transformative Hermeneutics of Quantum Gravity”⁵¹ and pilloried in his subsequent treatise on his own hoax, *Fashionable Nonsense*. Sokal’s argument in “Transgressing the Boundaries” was to further the poststructuralist agenda by

[carrying] these deep [poststructuralist] analyses one step farther, by taking account of recent developments in quantum gravity: the emerging branch of physics in which Heisenberg’s quantum mechanics and Einstein’s general relativity are at once synthesized and superseded... This conceptual revolution, I will argue, has profound implications for the content of a future postmodern and liberatory science. (214)

Sokal’s principal objection to postmodern theory, as voiced through his ensuing work *Fashionable Nonsense*, was that it “covers an ill-defined galaxy of ideas,” lacking empirical rigor, and, what’s worse, champions cultural relativism in the name of science, misapprehending basic scientific concepts in order to further a social agenda (Sokal and Bricmont 182). To be quite clear, my study attempts in no way to engage these critical discourses that have appropriated scientific and mathematical vocabularies in order to perpetuate postmodern social theories. Rather I am suggesting that scientific knowledge can have an effect on culture, and can come to play a significant role in cultural production. Sokal’s disparaging of postmodern theory is useful in this regard, in that it establishes that the way I will be discussing Uncertainty is unrelated to the major critiques of postmodern theory that he endorses in his work. Instead, I will

⁵¹ Sokal’s second paragraph outlines the philosophical-critical apparatus that he is parodying and points a clandestine finger at the worst “sinners”, complete with bibliography: “...[D]eep conceptual shifts within twentieth century science have undermined [the] Cartesian-Newtonian metaphysics; revisionist studies in the history and philosophy of science have cast further doubt on its credibility; and, most recently, feminist and poststructuralist critiques have demystified the substantive content of mainstream Western scientific practice, revealing the ideology of domination concealed behind the façade of ‘objectivity’. It has thus become increasingly apparent that physical ‘reality’, no less than social ‘reality’, is at bottom a social and linguistic construct; that scientific ‘knowledge’, far from being objective, reflects and encodes the dominant ideologies and power relations of the culture that produced it; that the truth claims of science are inherently theory-laden and self-referential; and consequently, that the discourse of the scientific community, for all its undeniable value, cannot assert a privileged epistemological status with respect to counter-hegemonic narratives emanating from dissident or marginalized communities. These themes can be traced, despite some differences of emphasis, in Aronowitz’s analysis of the cultural fabric that produced quantum mechanics; in Ross’ discussion of oppositional discourses in post-quantum science; in Irigaray’s and Hayles’ exegeses of gender encoding in fluid mechanics; and in Harding’s comprehensive critique of the gender ideology underlying the natural sciences in general and physics in particular.” Sokal and Bricmont, *Fashionable Nonsense: Postmodern Intellectuals’ Abuse of Science* 213-14.

be looking at the advent of quantum mechanics as creating a significant ripple in the cultural matrix that, due to its nearly immediate uptake by venues such as the *Revista de Occidente*, whose 1928 article by Lothar von Strauss und Torney, “La imagen del mundo según la física moderna,” which addresses the new developments in physics from a cultural perspective, was one of the first published essays that allowed for a diffusion of the basic principles of the New Physics within (humanistic) intellectual circles.⁵²

Sokal and postmodernism aside, let us now return to the poetic output of Jorge Guillén (*Cántico*, 1928 and 1936), placed within the context of the principles of quantum mechanics and Uncertainty within the Western cultural matrix. There is a multitude of lenses by which to view Jorge Guillén’s *Cántico*, and with the 125 poems that comprise the 1936 edition, it is impossible to provide a comprehensive analysis that references all of the potential interpretive moments of the book. In our paradigm of (dis)continuity, we have already examined *Cántico* from the point of view of the continuum of the Einsteinian relationship between mass, light, and energy. What of the discontinuous element? Is there any way to understand *Cántico* as having the qualities of discontinuous energy, such as that of quantum theory and uncertainty? The word “uncertainty” has already appeared in the analysis in relation to the sparing, but significant, use of interrogatives in *Cántico*, in particular in the poem “La rendición al sueño.” I shall now return to the moment in which I left off, where the exclamatory function proclaimed the fullness of being amid the “totalizing” reality of *las cosas*, beginning with a few words on quantum theory and Heisenberg’s Uncertainty Principle.

Interrogatives, (Dis)continuity, and the Uncertainty Principle in «Cántico»

José Manuel Blecua’s edition is the 1936 version of *Cántico*, published before the Spanish Civil War which brought about a shift in the author’s focus from that of the perfection of form to social awareness and commentary in the 1945 and 1950 publications. About *Cántico* as a whole: written as it was as an “organic” work, with revisions and additions that add up to four separate (and very different) editions, *Cántico* in and of itself quite represents the epitome of the (dis)continuity paradigm described at the opening of the chapter. Changing drastically between editions, *Cántico* never rests in its evolution—yet it is an evolution that we don’t see in progress, only its results. For that reason it appears to take discontinuous leaps in its development, yet we know that the critical attitude towards the work affirms the continuity of its development: “La crítica ha destacado acertadamente cómo *Cántico* crece de una a otra edición, pero siempre de una manera orgánica, desarrollando todos sus aspectos parciales, y profundizando en la misma temática” (Martínez Torrón 9). Thus, while the work takes leaps between its separate visions—quanta of public production, as it were—it simultaneously embodies the idea of continuous change over time, albeit limited to the private editorial process of the author.⁵³

⁵² See Lothar von Strauss und Torney, “La imagen del mundo según la Física moderna,” *Revista de Occidente* 20.58 (1928).

⁵³ “Estas variaciones, a veces mínimas, solamente de una palabra, o de un signo gramatical, demuestran la meticulosidad del poeta para con su obra, la forma pausada y disciplinada con que revisa sus versos, costumbre que se le descubre desde sus comienzos, puesto que poemas fechados en 1919 han sido reelaborados en los años 20, y en

This view of *Cántico* as a “quantized” work is only a small aspect of its quantum mechanical interpretation. To refresh what we have already stated about quantum physics and its most basic epistemological and ontological implications,⁵⁴ we can state the following principles: Firstly, the appearance of nature is entirely dependent on the way in which we observe it. The nature of the “real” lies in the apparatus we use to apprehend the world around us. Secondly, we are to conceive of “uncertainty” as the inability to attain a complete knowledge of nature—one can know a particle’s speed but not its velocity, and vice versa, to use the famous example. The more we refine our knowledge of one aspect of the object being observed, the less we have in knowledge of its other properties.

The centrality of observation and “subjectivism”—to use Heisenberg’s term—to the developments of quantum physics cannot be understated. In a famous summation of the tenets of quantum theory, Heisenberg writes that the subjective element (the measuring device constructed by the observer) determines our view of nature: “we have to remember that what we observe is not nature itself but nature exposed to our method of questioning” (*Physics and Philosophy* 32) and that “quantum theory does not allow a completely objective description of nature” (80-81).

Therefore, the transition from the “possible” to the “actual” takes place during the act of observation. If we want to describe what happens in an atomic event, we have to realize that the word “happens” can apply only to the observation, not to the state of affairs between the two observations. It applies to the psychical act of observation, and we may say that the transition from the “possible” to the “actual” takes place as soon as the interaction of the object with the measuring device, and thereby the rest of the world, has come into play; it is not connected with the act of registration of the result by the mind of the observer. (28-29)

In sum, we must look to the agency of the observer and his/her instruments for the composition and texture of the “realities” of the world around us; that reality itself is comprised of this particular “uncertainty” or lack of precision, in that “actuality” is not just elusive or evasive but perpetually incomplete; that nature is, on the quantum scale, probabilistic rather than deterministic, is by default unsettling even now. Within the historical context of their development, the unease brought about by the Uncertainty Principle was to show itself in a variety of ways in literature and the arts.

Still, looking at Guillén’s work, it is at first difficult to see where exactly these conditions of quantum physics and the Uncertainty Principle demonstrate themselves on the level of the individual poem, rather than the book as a whole. Certainly the precision of *Cántico* could lead

algunos casos no solamente una vez, sino varias. Y lo mismo ha sucedido con poesías que se hallan incorporadas a *Cántico*, en la segunda, tercera o cuarta edición, y que desde su primera redacción hasta la definitiva han pasado por varias fases.” Carlos Meneses and Silvia Carretero, *Jorge Guillén*, Colección Los Poetas (Barcelona: Ediciones Júcar, 1981) 37.

⁵⁴ Stephen Kern speaks of this in his treatise on causality in fiction: “Quantum indeterminism does not refer merely to the inability to make precise measurements and predictions based on them. According to Niels Bohr, it extends to the nature of objects themselves, or at least to the way nature allows, or disallows, us to interact with it, and in this sense quantum indeterminism is ontological as well as epistemological.” Stephen Kern, *A Cultural History of Causality: Science, Murder Novels, and Systems of Thought* (Princeton, NJ: Princeton University Press, 2004) 361.

the reader to an anti-probabilistic reading. The work *is* precise in terms of form, with its metrical regularity and controlled rhyme schemes. But if we examine certain trends—the aforementioned use of interrogatives, for example, or a particular construction of poems around substantive nouns—there develops a subtle engagement in these poems with quantum mechanical principles. This interpretive mechanism hinges on the relation between observer and the surrounding realities, agency and subjectivism, wherein the poetic “yo” investigates its observed “reality,” questions it, and reports the vital energy in it. As we have already seen, the celebration of the energetic principle is the basic thematic unity of *Cántico*. What I will now describe takes place not on the level of theme, but rather as a part of the stylistics of the work.

There is a marked pattern in *Cántico* that suggests a quantum theoretical process, and it is to be found in an array of poems that begin in a particular fashion: with the simple declaration of the existence of a noun. In the poems “Los nombres” and “Las sombras,” the opening line consists of a single noun followed by a period, “Albor” and “Sol,” respectively. “Los nombres” appears early in the book and is concerned with the ancient instinct to define objects by naming them. Is this not the adamic act of naming, of finding order? Is this not a psychical act of observation, an intervention into the “real,” the insertion of the human classificatory apparatus that diagnoses the characteristics of nature?

Albor. El horizonte
 Entreabre sus pestañas,
 Y empieza a ver. ¿Qué? Nombres.
 Están sobre la patina
 De las cosas. La rosa
 Se llama todavía
 Hoy rosa, y la memoria
 De su tránsito, prisa.
 Prisa de vivir más.
 ¡A largo amor nos alce
 Esa pujanza agraz
 Del Instante, tan ágil
 Que en llegando a su meta
 Corre a imponer Después!
 ¡Alerta, alerta, alerta,
 Yo seré, yo seré!
 ¿Y las rosas?... Pestañas
 Cerradas: horizonte
 Final. ¿Acaso nada?
 Pero quedan los nombres.

(26, 130, vv. 1 – 20)

The final lines of the poem establish the above pattern of ontological uncertainty based on the function of observation. The interrogative expresses doubt in the roses themselves, reducing them to “perhaps nothing” in the penultimate verse, and then affirming the continuing existence

of at least the theory of the rose (which is its name) even in the face of a withered actuality. Whereas in other moments of *Cántico*, we are confronted with *las cosas*—mass, or matter, having a very concrete existence—which have the effect of energizing the poetic subject, in “Los nombres” we find a poetic subject enervated and frustrated by the inability of the object, the rose, to withstand the passage of time. The “yo” observes the wilting of the rose (“...La rosa / Se llama todavía / Hoy rosa, y la memoria / De su tránsito, prisa.”) and the disconnect between the being of the thing-in-itself and its Platonic shadow that is preserved in the name of the object. All that remains of the rose is its name and its memory; its impermanence is its defining characteristic. Here, Guillén enters into a dialogue with past usages of the rose as a metaphor for the swift passing of time, and there is in fact a sense of *carpe diem* (“¡Alerta, alerta, alerta, / Yo seré, yo seré!”). Whereas the Renaissance or Baroque employment of the image as a rose stood as a metaphor for time, it would appear that in Guillén’s construction, the rose *is* time, and according to the last verses, which posit a “horizonte / Final” even time cannot last when confronted with *la nada*. The only thing that manages to survive are *los nombres*, the essence of the Thing; *las cosas* are annihilated when the horizon closes its eyes, when they can no longer be seen. But in the mind of the subject, they remain as theories, and the object wavers between being and not-being according to the gaze of the observer.

In “Las sombras” this stylistic pattern and its relationship with the paradigm of observer/observed becomes more explicit. Coming as it does near the end of the book, with just one poem between “La rendición al sueño” and it, not only has Guillén well established the substantive structure, but also now allows for the stylistic and thematic elements to meld. In this case, it is the image of *sueño* and the interrogative that fuse to create the air of uncertainty (in this case an existential uncertainty) that pervades the poem.:

Sol. Activa persiana.
 Laten sombras.—¿Quién entra?
 ... Huyen. Soy yo: pisadas.
 (¡Oh, con palpitación
 De párpado, persiana
 De soledad o amor!)
 Quiero lo transparente.
 También las sombras quiero,
 Transparentes y alegres.
 (¡Las sombras, tan esquivas,
 Soñaban con la palma
 De la mano en caricia!)
 ¿Tal vez mi mano? Pero
 No, no puede. Las sombras
 Son intangibles: sueños.
 (106, 251, vv. 1 – 15)

The word *esquiva* in this instance is telling—it suggests the same sort of elusiveness of measurement, of capture, that is the cornerstone of the Uncertainty Principle. “*Intangible*” assists

in emphasizing the ineffability of the phenomenon being observed, of the “reality” that exists only as a reflection or shadow and is untouchable. The interrogatives function to underscore that there is a doubt of existence as the poetic “yo” questions his own hand, signaling to the reader that even the most immediate experience of being can be questioned.

When being is questioned, because of its intimate and explicit relationship to the world around it, the entire shape of reality becomes uncertain. Thus we have poems such as “Aridez,” which ponders the need for a participatory, shared reality between observer and observed. The poem asks for whom does space exist—what relationship does the world have with those who live in it? What reality does *la plenitud* possess if it has no one who can observe it? Without a participatory relationship between world and watcher, the fullness of being becomes dry—“arid” with neglect:

¿Para quién, espacio, claro
De aridez, sin confidente,
Rendido a tu desamparo
Sin reloj, ante el presente
Perenne de la altitud?
¿Para quién la plenitud
En pura aridez, o ardores
Escuetos de lo absoluto,
Que con tal ímpetu enjuto
Quemáis los propios cantores?
(62, 196, vv. 1 – 10)

In “La rendición al sueño” the question of “For whom?” that pervades “Las sombras” is perfectly echoed in the final stanza:

¿Para quién, para quién tan lejos,
Pulsación confidente?
¿Hacia dónde,
Recatos veladores,
Hacia dónde se aleja
La mirada,
Tan retraída y plena?
¿Hacia la seña
Clara
De otra verdad?
(104, 248, vv. 54 – 63)

For whom? indeed. “*La mirada*” is pivotal—it is the poem’s power of observation; “*Verdad*”—the results of observation, perhaps? All in all, the linkages between quantum theory and poetry in *Cántico* remain subtle, and definitely are subordinate to the Einsteinian imagery discussed earlier. With regard to the aspect of observation and nature, however, there is certainly a connection between the two paradigms.

*

There are many more examples throughout *Cántico* that could be employed in this analysis, but I will leave off here having sketched a relationship between poetics and Uncertainty. What should be apparent is that whatever effect the advent of the Uncertainty Principle had, it was not one that promoted a sense of comfort and stability to the universe. Then again, neither did Einstein's work. The "epistemic trauma" provided by science ran deep into the cultural matrix and provided poets with a language to voice the great uneasiness ushered in by World War I, Einsteinian physics and quantum mechanics, both of which rid the world of its easy determinism in matters of cause and effect. The comfortable Newtonian world became infused with doubt, with gaps and jumps. It became porous and depleted for some as absolutes faded from view; for others, the world was suffused with a new energy for discovery. Neither relativity nor quantum mechanics is inherently positive or negative in and of itself—they are theories, scientific and nothing more. Attributed to them through their interpretation by institutions and individuals beyond the insular world of scientific experiment, was a certain moral value that came as a result of the application of theory to the environment. In this chapter we have examined literary-scientific relations at their most theoretical level, their "purest" level, in which no societal value was assigned to science, no judgment made. In the coming chapter our findings will confirm that the evolution of theory into praxis had a decided ethical valence within society. The discussion of technology or applied science within literature, the implications and extensions of what was previously only theoretical, is laced with judgment about the modern world. It is this judgment by the non-scientific world, by the arts, that I will analyze in the last chapter.

Chapter 5: Maleficent Modernity—Critiques of Science by the *Vanguardia*

Introduction: The Rehumanization of Art and the Ethical Axis between Science and Literature

The preceding chapters have addressed the issue of how it is that scientific knowledge came into significant contact with the literary world; so far we have seen literature engaging the scientific paradigm in an aesthetically positive, ethically neutral way. The authors who chose to delve into issues of time and space, continuity and discontinuity, observer and observed, did so from an angle that embraced the new physical world without overtly critiquing it. As the worldview shifted and traditional concepts dissolved amid the cacophonous clamor of 20th century modernity, the *vanguardia* found in this new reality a dynamic homology to its own uprisings against fossilized forms of expression. For a short time science and art ran parallel in their revolutions, with authors and artists feeling at liberty to use the new discoveries to undergird their formal and linguistic experimentation. According to Renato Poggioli, this type of experimentalism in which literature was seen as “laboratory” or “proving ground”

reveal[s] above all a concept of artistic practice which differs radically from the classical, traditional, and academic one. The laboratory and the proving ground doubtless serve to train the artist: that is, they aim toward his perfection as an artist; this is profoundly different from the goal of a school, which is the perfection of the school itself. The laboratory and proving ground serve, in the second place (perhaps it is really the first place), an even higher aim: the technical and scientific progress of art itself. (136)

In other words, not only was science a theme within the literary paradigm, it was also a model for its formal development.

In Spain, the experimental(ist) avant-garde ran at its height until about 1929-30, when political unrest and the larger problems of society began to take the sheen off the *vanguardia*, with its emphasis on dehumanization. As concerns about the State and the human condition grew more prevalent, ideas about the rehumanization of art began to present a challenge to the vanguard movement. This became particularly clear in 1930 when Ernesto Giménez Caballero printed in *La Gaceta Literaria* a series of responses from fellow members of the intelligentsia titled “¿Qué es la vanguardia?”; the variety of opinions expressed about the *vanguardia* demonstrated a movement clearly in decline, though some continued their pursuit of vanguardist principles, notably Ramón Gómez de la Serna and Valentín Andrés Álvarez, two authors very important to this present study.¹ The questions asked in the survey—

¹ The survey was published across three separate issues of *La Gaceta Literaria*—numbers 83, 84, and 85 in June and July of 1930.

1ª ¿Existe o ha existido la vanguardia?

2ª ¿Cómo la ha entendido usted?

3ª A su juicio, ¿qué postulados literarios presenta o presentó en su día?

4ª ¿Cómo la juzgó y la juzga ahora desde su punto de vista político? (Pérez Ferrero “Una encuesta sensacional: ¿Qué es la vanguardia?” 1)

—by their very nature demonstrate that many of the intelligentsia were of the opinion that experimentalist tendencies of the *vanguardia* had either reached their peak or exhausted themselves, and that new priorities, namely the political and social aspects of literature, needed to be established. A trend towards social awareness began to emerge, and was also reflected in *La Gaceta Literaria*'s increasing emphasis on political life in Spain—albeit from the decidedly biased viewpoint of its fascist-leaning director.

For José Díaz Fernández, author of the vanguardist novels *El bloqueo* (1928) and *La Venus mecánica* (1929), director of the politically-oriented literary review *Post-Guerra* (1927-1928), and critic who published in 1930 *El nuevo romanticismo*, the issue of the rehumanization of art was a moral imperative. Díaz Fernández proposes a *vanguardia* whose aesthetic would answer first to life and then to art—that is, the new literature's ethical axis would shape its aesthetic direction—and this he calls the “*literatura de avanzada*,” inspired by the “*moral*” of the Russian Revolution (56). Díaz Fernández was concerned that art had become more a game, and less a part of daily life, a symptom of the intellectuals' indifference to the working class. To counter the dehumanized aesthetic, he offers the reader a “new romanticism” based on “la vuelta a lo humano... que agrega a su pensamiento y a su estilo las cualidades específicas del tiempo presente” (56). He notes with alacrity that a large component of the “present time” is characterized by the injection of technology and the machine into quotidian existence, and questions the spiritual consequences of the blind acceptance of technology:

Europa ya no puede más de cansancio, de escepticismo y de desconcierto. Dicen que el alma no puede vivir sin una religión. Nosotros, hijos del siglo más científico y mecanizado, hemos extirpado quizá toda clase de mitos y simbolismos; pero no podemos vivir sólo para esto, para esto tan breve, tan personal, tan egoísta y tan efímero. Necesitamos vivir para el más allá. No para el más allá del mundo, puesto que no es posible creer en una tierra detrás de las estrellas, sino para el más allá del tiempo. Es decir; necesitamos vivir para la historia, para las generaciones venideras. (57)

It is civilization itself that is in question, the newness brought on by technology encouraging the author to reexamine the role of the political in the modern way of life, as well as in the arts. In discussing the present moment in relation to the 19th century, he says that:

...al siglo de las intuiciones y los descubrimientos ha seguido el siglo de la especialización, de la técnica y de la ciencia aplicada. El hombre se beneficia ahora, como nunca, de la civilización. ¿Cómo es posible que no se ocupe de regir y administrar esa enorme fortuna de vitalidad que es toda la vida moderna? Porque la política es la

actividad pública más cargada de realidades, la más sujeta a los grandes problemas que rodean la existencia individual y colectiva. (63-64)

Díaz Fernández recognized quite clearly that technology had become an intrinsic part of human existence, of its history and its future. In order to orient oneself politically, one had to take into account how the advances in science and technology shaped reality for the individual and the collective. And it serves as a consequence that the rehumanized art would of necessity reflect this reality—thus the call for politicized representations of modernity, including the role of *la técnica*, without, however, the idealizations of Futurism or *Ultraísmo*. Technology and science, as a commonplace commodity, needed to be de-aestheticized and in a sense “rehumanized” if they were to serve the needs of humanity, rather than encouraging the growth of a population subservient to and fascinated by *la técnica*.

What, then, did the rehumanization of art mean for the relationship between art and science, heretofore examined as a relationship of aesthetics rather than moral values? In the next pages, I will look at ways in which vanguard authors rejected the pure art/pure science analogy and began to evaluate science in its ethical valence—that is, how science was contributing to the (de)moralization of the population in an ever-accelerating, rapidly-modernizing world. My hypothesis is that the increasing importance of scientific advancement and its application in the form of new technologies provoked a number of emotional responses from the literary world, resulting in an open nostalgia for past paradigms and a suspicion of the new knowledges and technologies surging from the flourishing (if disquieting) discoveries of the New Physics. This would lead to an apocalyptic vision of the modern world, one that would critique the present as well as the apparent trajectory towards a dangerous future.

A variety of journalists, poets and playwrights of the day presented science and technology as a problem for modern society—at the base of feelings of purposelessness and the emptiness of daily existence within the budding technocracy. In the following sections, I will discuss how Rafael Alberti, Federico García Lorca, and Valentín Andrés Álvarez chose to represent science, technology—and also their consequences—in their poetic and dramatic works, including Alberti’s *Cal y canto* and *Sobre los ángeles*; Lorca’s *Suites*, and later, *Poeta en Nueva York*; and Andrés Álvarez’ play *¡Tararí...!* To begin my literary analysis, I will start with an examination of the cultural milieu that was making possible these critiques of science and technology by the literary establishment, beginning with an important work by José Ortega y Gasset, *La meditación de la técnica*.

From Pure Science to Technology

Luis Jesús Llana González notes that with the enormous increase in the amount of knowledge produced by the sciences, there existed alongside it a parallel need for the interpretation of that knowledge through an intersection with philosophy and indeed literature as

well (224).² Quantum physics had the effect of radicalizing reality, of pushing the issue of how it is we know our world to the forefront of epistemological debate. But the facts of quantum physics were so obscure, so strange, so rarefied, that they definitely required a filter, an interpreter who could make it intelligible to the masses; however, no philosopher immediately rose to the task. Rather, it was the scientists themselves who became the interpreters. Domingo Marrero comments that:

Es sumamente interesante señalar que en el período de exaltación eufórica, del triunfo dramático de la ciencia física, fueron los mismos físicos los que se plantearon el problema de la naturaleza del conocimiento que nos brindaba esta ciencia y propusieron la necesidad de reformar los principios de la misma. Fue síntoma de madurez en las ciencias físicas plantearse las cuestiones de principio que de antaño no se planteaban. ...[En] un momento en que muchos filósofos daban excusas por serlo y se lamentaban de no ser físicos, los más eminentes físicos se meten a filósofos. Éstos se ven obligados a filosofar sobre sus ciencias. Poincaré, Mach, Duhem, Planck, Einstein, Whitehead, Eddington, J. Jeans, Weyl. (291-92)

Many of these names should now be familiar, as they are those that we have already seen in the *Revista de Occidente* and *La Gaceta Literaria*.³ And true enough, many of the essayists who published in the *Revista de Occidente* do precisely what Marrero outlines above—the physicists made themselves into philosophers, and the philosophers, at least temporarily, held their tongues.

José Ortega y Gasset, once so vocal about relativity and the philosophical implications of Einsteinian physics, fell oddly silent as quantum physics began to show signs of being even more immediately significant than relativity had been in its time, barely more than a decade previous to Heisenberg's 1927 epiphany. It would not be until 1947 that Ortega would offer any serious commentary on the quantum revolution, and then only to oppose it.⁴ We can interpret Ortega's

² He states that in the second half of the 19th and beginning of the 20th centuries "...se establecen nuevos campos de actuación científica, que exigen, según los casos, ampliación de los objetos tradicionales de cada ciencia clásica, la creación de nuevas ciencias, así como la estructuración de disciplinas comunes que correlacionan zonas de influencias mixtas, hechos que obligan a acotar síntesis válidas para la nueva situación, que, a la vez, permitan su utilización en terrenos diversos. Luis Jesús Llana González, "Ortega y la ciencia de su tiempo," *Conversaciones sobre Ortega: Actas de las primeras Jornadas Culturales de Aller* (Aller [Asturias]: Instituto Nacional de Bachillerato Príncipe de Asturias, 1983) 224.

³ Not included in Marrero's list is Heisenberg, who would prove to be one of the more eloquent interpreters of the quantum discoveries, but whose philosophizing would be largely postponed until after the Second World War, when he published his masterful popularization, *Physics and Philosophy* (1958). By then, one of the ramifications and extensions of the New Physics had presented themselves to the world in the form of the atomic bomb; Heisenberg, as one of the fathers of quantum physics, felt compelled to give his account of the philosophical implications of the theory that had changed the scientific, political, and technological composition of the entire world.

⁴ Onofre Rojo writes about Ortega's silence: "Se podría afirmar de un hombre que así pensaba en 1923 y así analizaba la teoría de la relatividad, que era una persona bien preparada para entender y aceptar la nueva teoría cuántica; pero parece que no fue así, sí se juzga por las pocas referencias que hay en sus escritos sobre la generación científica de los años veinte (Heisenberg, Born, Bohr, Schroedinger, entre otros), por la falta de comentarios sobre sus implicaciones y consecuencias, y por el silencio casi absoluto que observa Ortega ante los desarrollos de la investigación atómica y subatómica que alcanzó ver en sus días y que no le merecieron casi ningún comentario. Sólo

silence in a variety of ways, but I don't believe that the reasoning behind it is of as much importance as how this particular silence was indicative and symptomatic of a larger phenomenon: quantum physics had largely failed to capture the public's imagination. Its findings were disquieting, but it lacked a charismatic figurehead who would give it a face, as Einstein had to relativity. Its abstractions were not necessarily of import to the immediate circumstance of the common man, unlike the theory of relativity, which gave new meaning to the quotidian categories of time and space. Darío Maravall Casesnoves explains this lack of interest in the citation below:

Siendo tanto la teoría cuántica como la relatividad dos descubrimientos de parecida importancia, y aun a pesar de que con el paso del tiempo, la primera teoría se ha mostrado mucho más decisiva en el progreso científico y técnico y ha influido mucho más sobre la manera de vivir de los hombres, sin embargo, su impacto emocional sobre el gran público fue mayor el de la relatividad, porque al afectar profundamente y revolucionar nuestros conceptos sobre el tiempo y el espacio, tan ligados a nuestros sentidos, a nuestro entendimiento y a nuestra conciencia, y que se creían inmutables, ha despertado el interés del hombre medio. (11)

The emotional response of the public, or its apparent absence, allows us to view Ortega's lack of commentary as more of an echo of a larger sentiment than as a direct commentary or opinion on the merits of quantum theory. Ortega understood the importance of the theory—otherwise he would not have translated or published the articles on the topic that appeared in the *Revista de Occidente*. In this, therefore, I disagree with Onofre Rojo's assessment of Ortega's ability to decipher quantum theory. Rojo puts forth the the idea that

Lo que le pasa a Ortega, como a otros muchos formados en los conceptos y modelos mecanicistas de los siglos XVIII y XIX, es que están acostumbrados a pensar en poleas, resortes, engranajes y fuerzas, operando de manera continua y determinada, y no son capaces de entender la discontinuidad, la probabilidad y, por tanto, la contingencia. (50)

Ortega's problem was not that he could not understand the importance or the implications of quantum theory—the *Revista's* content testifies to this.⁵ Rather, he chose to take the long view

en *La idea de principio en Leibniz y la evolución de la teoría deductiva* (1947) se refiere abiertamente a la teoría cuántica y en esta ocasión para criticarla y oponerse a ella. ¿Es posible que Ortega ignorase cuánto tiene de perspectivista la teoría cuántica, en la cual el observador juega un papel decisivo, y que se quedara solamente traumatizado ante el 'conocimiento simbólico' como él lo llama, el 'indeterminismo' y el 'hacer la Realidad' en vez de 'conocer la Realidad', que el experimentador fabrica al observar el hecho? Habría que suponer que quizás por estar absorto y disparado hacia otros blancos, Ortega no profundizó en el análisis de la mecánica cuántica con el mismo interés y dedicación que lo hizo con la relatividad." Onofre Rojo, "La ciencia y la técnica en la obra orteguiana," *Ciencia y Desarrollo [México, D.F.]* 9.53 (1983): 50.

⁵ It is important to remember also that quantum theory did not arrive in full in Europe until 1927, and by then, the cultural matrix was saturated with the findings of psychoanalysis, also considered a science, if only a young one; the dominance of the surrealist aesthetic demonstrates how totalizing the effects of Freud's work were within the arts.

and turned his interpretive lens towards the growing importance of *técnica* in modern life.⁶ Considering what the technological outcome of quantum mechanics would eventually be—that is, the ushering in of the atomic age—Ortega’s move towards issues of technology seems almost prescient.

In 1933, Ortega gave a course titled *Meditación de la técnica* at the Universidad de Verano de Santander, which was published by the Argentinian periodical *La Nación*, and then later released as a book in 1939. *Meditación de la técnica* demonstrates Ortega’s knowledge of how the world had changed due to technological advances. At the outset of his lecture series he states that it is clear that a new day has dawned:

Lo que nadie puede dudar es que desde hace mucho tiempo la técnica se ha insertado entre las condiciones ineludibles de la vida humana de suerte tal que el hombre actual no podría, aunque quisiera, vivir sin ella. Es, pues, hoy una de las máximas dimensiones de nuestra vida, uno de los mayores ingredientes que integran nuestro destino. Hoy el hombre no vive ya en la naturaleza sino que está alojado en la sobrenaturaleza que ha creado en un nuevo día del Génesis: la técnica. (*Meditación de la técnica* 14)

In general, *Meditación de la técnica* attempts to historicize the human impulse towards technological advancement, essentially attributing it to the human instinct not just to live, but to *live well* (*el buen vivir* or *el bienestar*).⁷ In Ortega’s view, technological development is just as much a part of our biology, as is our need for nourishment and protection from the elements. These basic needs awaken a natural instinct to make the “circumstance” more amenable to the subject. Ortega presents these ideas without philosophizing about the morality involved in *el buen vivir*. However, in the tenth lecture he offers an opinion that contradicts his previous neutral attitude:

Y por si se me olvida o no tengo tiempo de decirlo, aun cuando pertenece a otro capítulo, aprovecho el conexo para hacer observar a ustedes que la técnica, al aparecer por un lado como capacidad, en principio ilimitada, hace que al hombre puesto a vivir de fe en la técnica y sólo en ella, se le vacíe la vida. Porque ser técnico y sólo técnico es poder serlo todo y consecuentemente no ser nada determinado. De puro llena de posibilidades, la técnica es mera forma hueca—como la lógica más formalista—, es incapaz de determinar el contenido de la vida. Por eso estos años en que vivimos, los más intensamente técnicos que ha habido en la historia humana, son de los más vacíos. (84)

⁶ Notably, the *Revista de Occidente* included in its October 1935 issue a translation of a chapter titled “Assimilation of the Machine” from Lewis Mumford’s 1934 book *Technics and Civilization*. Mumford was an historian of science and technology, who wrote several significant treatises on the importance of technology in modern societies. The inclusion of Mumford’s work in the *Revista de Occidente* is highly indicative of Ortega’s interest in technological matters. See Lewis Mumford, “Asimilación de la máquina,” *Revista de Occidente* 50.148 (1935).

⁷ On the nature of being human, Ortega says the following: “Pero el hombre es hombre porque para él existir significa desde luego y siempre bienestar; por eso es *a nativitate* técnico, creador de lo superfluo. Hombre, técnica y bienestar son, en última estancia, sinónimos.” José Ortega y Gasset, *Meditación de la técnica y otros ensayos sobre ciencia y filosofía*, Obras de José Ortega y Gasset (Madrid: Revista de Occidente en Alianza Editorial, 1982) 35.

The modern world, as technologically advanced as it is, with all its comforts and amenities for *el buen vivir*, has left humankind bereft of a deeper meaning. The world has become empty, according to Ortega, precisely due to its ceaseless impulse to invent; the limitless potential for creation, but with an undetermined trajectory, has undermined the sense of the purpose for humanity.

Marshall Berman notes that Ortega, in this sense, participated in the discourse of “cultural despair” that came as a result of a “dismal flattening out of social thought” in the 20th century as the major thinkers and philosophers of the day gave in to the temptation of the “sterile antitheses” of either the glorification of, or vituperation against, modern life (169-70).⁸ In the literary world there was a similar polarized response to technology in the early 20th century, the phenomenon of whose dominance played out as the *leitmotiv* for more than one literary movement—*Ultraísmo* and the *vanguardia* can both be characterized by their obsession with technology and its effects on everyday life. Though initially the movements vigorously embraced the machine, the complex realities brought on by the inescapability of constant change provoked skepticism among the intelligentsia. As alluring as the new technological world was, it did not receive a uniform celebration of its benefits. Just as frequently as the “new existence” was praised, members of the Spanish intelligentsia also perceived the advance of technology and science as a threat to humanistic values. Thus it is possible to see why it is that, towards the end of the 1920s, as the *vanguardia* began to decline in aesthetic vitality, the critiques against *la técnica* grew sharper, more frequent, and more pronounced.⁹ The sheen had worn off its object of worship, and the *vanguardia* struggled for a viable existence in a world that had ceased to be distracted by novelty, and was now deeply questioning the nature and effects of an unending imposition of *lo Nuevo*, which was the essence of “modern” life.

Tim Armstrong notes in his study on Modernism that technology often served as a synecdoche for the phenomenon of modernity, and was, as with the Futurists and *ultraístas*, frequently positive in its assessment;¹⁰ however it also was

⁸ Berman adds that “[f]or the visionaries of cultural despair, from T.E. Hulme and Ezra Pound and Eliot and Ortega, onward to Ellul and Foucault, Arendt and Marcuse, all of modern life seems uniformly hollow, sterile, flat, “one-dimensional,” empty of human possibilities: anything that looks or feels like freedom or beauty is really only a screen for more profound enslavement and horror.” Marshall Berman, *All That Is Solid Melts Into Air: The Experience of Modernity* (New York: Penguin, 1988) 169-70.

⁹ For example, with regard to poetry, literary critic Juan Cano Ballesta notes that much of the *vanguardia*’s poetic product oscillates “entre el fervoroso cántico a la modernidad, que es avance tecnológico y moda literaria, y los primeros indicios de una actitud dudosa que contempla vacilante el esplendor del mundo contemporáneo o que subordina la máquina a valores humanísticos superiores... Otras veces el joven poeta ultraísta se balancea indeciso entre la ambigüedad, la nostalgia del pasado y el canto a la nueva existencia...” “Ambiguity” and “vacillation” prove to be important concepts here with regard to Spanish literary attitudes towards the new powers of technology. The ambiguous response of the intelligentsia towards technology and modernization is marked in Spain, but it should be noted that this may have more to do with the political configurations of the time, and the fight between *conservadurismo* and the new cosmopolitanism. The relationship between the surge in technological progress and competing political ideologies will be addressed in the dissertation’s Conclusion. Cano Ballesta, *Literatura y tecnología: Las letras españolas ante la Revolución industrial (1890-1940)* 179.

¹⁰ Berman and Poggioli both make mention of Marinetti’s coinage of the term “modernolatry” for the unqualified praise of technology that characterized the work of the Futurists and the *ultraístas*. Berman offers it as the opposing pole of “cultural despair,” highlighting its intellectual sterility and uselessness as an interpretive paradigm, while

posited as a set of problems relating to its demands and structural implications. At the bodily level technology is seen as overload or as dwarfing the human; ...at the level of production technology it is seen as standardizing the commodity and displacing or regulating the human maker. And at the level of social metaphor technology functions as an image of alienation, instrumentalization, and estrangement from the natural order. (129-30)

As we proceed to examine the works of authors such as Rafael Alberti and Federico García Lorca, we must bear in mind this particular tension between praise and denunciation in order to fully understand the nature of the critique that literature was offering of *la técnica* and its increasing power within society.

Twentieth-Century Janus: Modernity, Nostalgia and Cataclysm

The early 20th century was a time of rapid changes that brought about various species of disorientation within the populace of the Western world—at times spiritual, psychological, even ethical. Advancements in science and technology came at such a speed that “*lo Nuevo*” acquired an almost quotidian normalcy. Newness was expected, even anticipated, discovery never quite lost its shock value, and the phenomenon of “modernity” continued to produce awe within the public. In a way, modernity had become a sublime entity in a Kantian sense, beautiful and terrifying at once; in its sublimity, it naturally produced both positive and negative responses. As C.G. Bellver notes:

La revolución industrial prometió un paraíso tecnológico de escenario urbano, que aterrorizaba al mismo tiempo que excitaba a las almas sensibles. [Se] ha señalado... la constancia de esta actitud doble respecto a la modernidad: por un lado oposición en cuanto la modernidad representa progreso material e ilustración científica, pero, por otro lado, adaptación de ella como aportación de nuevas experiencias. (542)

Literature was sensitive to this double valence, expressing a reflective nostalgia for aging or overthrown paradigms and projecting a coming cataclysm based on a deep suspicion of science—a modern eschatology for an uncertain, unpredictable future in the hands of the mysterious scientists who were unlocking the secrets of the universe. It would seem that people had become aware of the fact that science, while purporting to be the purest pursuit of knowledge, upon its development into applied technologies was no longer pure or benign. In the minds of many, scientific advancement would bring certain destruction.

But what type of destruction? For some, the horror of progress lay in the loss of traditional values, and these cast their gaze toward the past, looking to revive what was either

Poggioli disparages modernolatry as the being the basest form of Modernism, where the movement itself descends into caricature and self-parody, albeit an “unconscious” one. The concept of modernolatry will prove significant, and we will return to it later in this chapter. See Berman 169, and Poggioli 218.

dead or dying. For others, the fear was for the future of humanity in general; new knowledge would bring new power, and the elemental forces that science was uncovering were, in the view of many, not to be toyed with. This was the Janus face of modernity, in whose image the past and the future were of equal concern to the present. The controversy over progress, therefore, had a decidedly ethical nuance. Science itself was undoing an ancient moral code, or the unscrupulous manipulations of its inherent power could lead to an inglorious and violent end to civilization. To probe the nostalgia/catastrophe juxtaposition, I have chosen two stories: Valentín Andrés Álvarez' "Telarañas en el cielo", which subtly evokes the nostalgic paradigm; and Ramón Gómez de la Serna's "El dueño del átomo", which comically echoes the fear of an apocalyptic catastrophe and a growing suspicion of the power of scientists to manipulate nature.

"Telarañas en el cielo" (1925)—Nostalgia in the Stars

"Telarañas en el cielo," a short story about the solitary life of an astronomer, was published by the *Revista de Occidente* in December of 1925. Its author, Valentín Andrés Álvarez, had in 1919 been a *becario* of the *Junta para Ampliación de Estudios*, receiving a scholarship to attend the Sorbonne in Paris where he studied astronomy—celestial mechanics in particular. In an interview with *La Gaceta Literaria*, however, he half-lamented that the trip to Paris was a qualified failure, in terms of his education in physics. "Bastará que le diga que inicié mi vida intelectual trasladándome a París para dedicarme a estudios de mecánica celeste y regresé con un libro de poesías bajo el brazo" ("Tararí y su autor" 5). Though he did not pursue a career in physics after Paris, he still could claim the honor of having received his doctorate in *Ciencias* from the *Universidad Central* in 1914, in addition to having worked at the *Laboratorio de Investigaciones Físicas* under the direction of Blas Cabrera for several years after obtaining his degree. Andrés Álvarez's training in physics and mathematics was of the highest quality that one could expect for the time period, and it is clear from the various appearances of scientific topics in his writings that he never entirely lost his passion for the field—he simply had other interests, such as the theater, and later, economics, an area in which he would eventually gain a lasting and notable reputation for excellence. Though he published a variety of short fiction, including the work we are about to discuss, his dramatic masterpiece, *¡Tararí...!* would end up being his most durable contribution to the literature of the *vanguardia*, and to the scene of Spanish theater—we will be discussing it towards the end of this chapter. "Telarañas en el cielo", unlike *¡Tararí...!*, testifies more openly to Andrés Álvarez's educational background, having at its center a young man who did the opposite of the story's author: the protagonist dedicates his life to the exclusive pursuit of science.

Juan de Dios Ruiz-Copete, in his critical work *La otra Generación del 27*, classifies "Telarañas en el cielo" as being an example of Andrés Álvarez's fiction "de frívola inspiración surrealista", saying additionally that it is a text "en el que le da la vuelta a todo, arrasa con todo lo constituido, una especie de tabla rasa dadaísta, que fue, en realidad, su vocación primera" (38-39). Ruiz-Copete, while he may be right about this being the general trajectory of Andrés Álvarez's work, misclassifies "Telarañas en el cielo" as participating in the author's Dadaist tendencies. The short story is surprisingly linear, which is not to say that it participates in any

sort of realism—the heightened interiority of the protagonist and the minor role of plot give it a decidedly modernist feel. It proceeds in the form of a biography from the birth of the unnamed protagonist until his apparent spiritual death, voiced through a “yo” that is suggested in the first sentence of the story, and then disappears beneath the surface of the narration: “Me han asegurado que él, al nacer, tradujo su primera impresión en este mundo por un gran berrido, el cual apenas fue lanzado por su boca, el mundo se lo devolvió por sus oídos” (81).¹¹ The subject of the “Me” is never defined and remains undeveloped throughout the course of the narrative, creating the sense of an impressionistic (but not necessarily disjointed) narration in which the possible connections between cause and effect, between characters, and between the various moments of psychological development in the protagonist are purposefully left in their potential state, remaining nebulous throughout, when not entirely abandoned. Nonetheless, the biographical structure that it follows by default puts limits on the amount of disorientation the reader feels, and therefore weakens its categorization as “surrealist fiction.” The presence of the linear, in this case, is our first instance of narrative nostalgia, as the author creates a temporal structure that reflects earlier, 19th-century sensibilities of a logical progression within the action of the story. Calling on the biographical form of earlier centuries, while at the same time proffering a modernist haziness, gives our first concrete example of the conflict in (aesthetic) values wherein the author avails himself of certain literary devices—linearity, in this case—that were previously held in high regard, exploiting them and critiquing them simultaneously.

The narrative, as just mentioned, is stylistically modernist in that plot is subordinate to the protagonist’s interiority; paradoxically, however, this results not in discontinuity, but in an oddly melancholic and occasionally florid prose that harkens back to the sentimentality of the Spanish *modernistas*—Valle-Inclán’s *Sonatas*, in particular. With this in mind, and knowing the aims of the *Revista de Occidente* to promote the New Art, why would the magazine publish a story that has the shine of being not only derivative, but also representative of the literary trends that had inspired the *vanguardia*’s rebellion against the 19th century? The answer to this question lies in the context of the story, which is astronomy and the nature of scientific inquiry, as well as the mysterious mind of the man of science.

Against the backdrop of the New Physics, the protagonist’s struggle to discern the comparative values of knowledge, love, and of the love of knowledge, takes on a starker configuration: the hard facts of the contemporary astronomer, contrasted with the spiritual components of ancient ways of interpreting nature—mythology, astrology—, come up lacking, causing the spiritual death of the protagonist. He forgets his wonder at the universe, and begins to see only patterns of facts marching across the sky. Increasingly his calculations sadden him, and he anthropomorphizes the stars with which he feels profoundly connected: “¡Pobre estrellita, libre antes en el cielo, caída en la trampa de un telescopio para no volver a levantarse más, encerrada ahora para siempre en una jaula de cálculos!” (92). As he deepens his studies, the connection he feels with the stars on an emotional level falls away, as does his capacity for love. Running parallel to the astronomer’s quest for knowledge is a similar quest for love—that of

¹¹ Citations from the anthology *Proceder a sabiendas*. Valentín Andrés Álvarez, “Telarañas en el cielo,” *Proceder a sabiendas: Antología de la narrativa de vanguardia española 1923-1936*, ed. Domingo Ródenas de Moya (Barcelona: Alba Editorial, 1997) 81. Originally printed as Valentín Andrés Álvarez, “Telarañas en el cielo,” *Revista de Occidente* 10.30 (1925): 265-89.

Lolita. At the point in the narration where the two story lines cross, the astronomer is anxiously awaiting a response from his beloved, whom he hopes to marry.¹² At the climax of his fears he turns to the stars, not as an astronomer, but wishing to be an astrologer instead:

Semana de grandes preocupaciones. Como todos los que gustan de la contemplación de los Astros, acostumbraba a pasearse en las noches claras por parajes abiertos, donde hubiera mucho cielo. Pero ahora no observaba los granitos de luz del firmamento, más bien se sentía observado por ellos y hubiera dado todo cuanto él sabía de los astros por lo que los astros sabían de él; hubiera cambiado todos sus conocimientos Astronómicos por unas breves nociones, por unos simples rudimentos de astronomía judiciaria. Si en vez de astrónomo hubiese sido astrólogo podría resolver entonces él mismo su inquietante duda, podría conocer el curso de su vida orientándose, como los navegantes, por los astros... (89-90)

The astronomer's sense of mythic wonder at the universe gradually breaks down until the sky is nothing but a pattern of facts, a "prison for the stars" for which he ceases to feel any empathy after all his years of study.¹³ The story concludes with the very poignant phrase: "En cuanto a los astros, desde que era astrónomo no había vuelto a verlos más" (100). The dehumanization of the scientist, his education in his trade, is thus complete.

The ending is construed by the narrator as tragic, and in so doing asks us to examine the ethics of a scientific endeavor that destroys the emotional bond between humankind and nature. In conveying these questions through the evocation of older means of knowing such as mythology (the moon as a Goddess whose wrinkles the astronomer's precise instruments count) (98) and astrology (the Sun is "el astro rey") (95), the author creates a nostalgia for past paradigms of knowledge that resonated with the human soul. Physics, in this case, is set up as the ultimate paradigm of demystification, wherein the power of factual knowledge and of measurement destroys the lyrical knowledge that came before it and turns the human being into as much of a machine as the "aparatos complicados de manejo difícil" which he uses to routinely observe the night sky to make his calculations (100). Nostalgia for emotion, for interpersonal connection, and for the previously shrouded mysteries of the universe, as Andrés Álvarez constructs it here, demands an emotional response from the reader, to the question: at what cost to ourselves does this knowledge come? And as for the scientist, what moral compass can the scientist have, when humankind is nothing more than a mere phenomenon to be observed, just like the stars? Thus, in "Telarañas en el cielo", we have a sharp critique of science as a wonderland of empiricism, devoid of emotion, and spiritually fatal to its practitioners. It is an

¹² And he eventually does—this is not a story of unrequited love, but rather one of lost illusions. Lolita goes from being a wondrous star, filled with mystery, to being "otra infinitud celeste cercenada por el cielo raso." In other words, in becoming a unremarkable fact in his life, just like the stars, her ubiquity and her value as a known quantity deprive the protagonist of his previous mystical adoration of both sky and woman.

¹³ "Comenzó por trazar sobre el papel una cuadrícula de meridianos y paralelos, las rejas de la cárcel celeste. El cielo, en efecto, es una vasta cárcel. Aun esos astros que suponemos vagan libres por el universo, los astrónomos los siguen en sus movimientos a través de los barrotes de la reja." Andrés Álvarez, "Telarañas en el cielo," 93.

ethical critique that we will see played out again in other forms. In the next example, rather than evoke the past, the author chooses to evoke the future—a catastrophic one.

Ramón Gómez de la Serna's "El dueño del átomo" (1926)—The Dark Comedy of Catastrophe

“Inclasificable, especial, peculiar, insólito, incluso ‘mirador’ son... palabras que definen la figura de Ramón Gómez de la Serna” (Martínez-Collado 13). In the case of his short story “El dueño del átomo” (1926), one would have to add the word “prescient” as well. The vignette is a darkly comic tale of a scientist who, as in the previous story, devotes himself to his work with unforeseen consequences. The story is full of subtle but astute observations about the role of science in society that camouflage themselves within the overall comedic play on popular conceptions of the existence and reality of the atom. For the protagonist of Gómez de la Serna’s story, don Alfredo, his principle desire is to know the secrets of the atom, with one significant aim: he will master the atom not for the love of knowledge, but for the personal gain of money and power.¹⁴

“El dueño del átomo”, like “Telarañas en el cielo”, is intertwined with a love story, and begins with the declaration of love between don Alfredo and Ángela: “—Te casas,” he says, “con un hombre riquísimo... Si yo logro como espero dominar el átomo seré el amo del mundo.. La dote que yo apporto al matrimonio puede ser fabulosa” (59). Rita Mazzatti Gardiol sums up the romanic plot tidily:

Don Alfredo, a researcher in an obscure institute, promises his sweetheart Angela that they will become very rich when he achieves the goal of splitting the atom. They marry and live a quite life except for a few regular dinner guests: a colleague, an old schoolmate, and a favored student... Alfredo becomes so obsessed with his experiment that he ages unduly. Angela, hoping for riches, encourages him. When he senses success, he sends for her to witness his great experiment and then begins...” (70)

The experiment is the splitting of the atom, which John A. McCulloch rightly assesses as “noteworthy in that it raises the issue of splitting the atom before it was achieved by scientists” (106). Don Alfredo’s project will split the atom, the result of which will be the “invisibility” of the atom that has split: “Disociará en átomos lo que vaya tropezando, disolviendo la multitud de átomos que componen cada cosa como individuo proceloso que en una muchedumbre buscase a su cara mitad...” (71). When Don Alfredo announces the object of his study to his small *tertulia*, one of the members exclaims “—¡Pero ese medio microátomo puede disgregar el mundo!” (71).

¹⁴ Interestingly enough, “El dueño del átomo” appeared in the thirty-fourth issue of the *Revista de Occidente*; two issues later, the *Revista* published an article by Max Born titled “Ley y materia” in which the author discusses the atomic theory as “el polo contrario de la continuidad”—discontinuity *par excellence*—and closes by summarizing the principal desire of the New Physics: to arrive at “una concepción unitaria, sin contradicciones, del mundo material; a la explicación de la materia por el gobierno de leyes eternas.” Max Born, “Ley y materia,” *Revista de Occidente* 12.36 (1926): 315, 28.

Don Alfredo does not see it that way—he envisions his discovery as one that will revolutionize the world, changing the nature of life and death, war and peace. His friends will not listen to his idealizing of the transformative powers of his aim, and insist that if he pursues his goal, the world will end. The colleagues' fears prove correct in the last moments of the story, when Alfredo finally achieves success, starting a chain reaction that step by step begins to dissolve the world. Alfredo, horrified, shouts for it to stop, breaking the test tube that holds the destructive particle, the split atom, thinking he has the power to stop the powers that have been unleashed: “—¡Ah!—gritó con una A mayúscula como aguja de catedral; pero el medio microelectrón, retrocediendo al sentir el imán de su otra mitad, invadió un Nuevo sector de disolución y devolvió también a lo invisible a los tres seres atónitos” (84). Alfredo, Angela, and his assistant Silvio perish in the wake of their ambition, unable to control the particle whose unpredictability they had not anticipated.

John A. McCulloch states that the setting of “El dueño del átomo” and its themes are “in line with the theory of quantum mechanics which argues that quarks and atomic particles do not obey Newton’s laws of gravity, but are driven by unpredictability” (107). While anachronistic in his analysis—quantum mechanics had yet to make its full debut—McCulloch is correct that the story “is significant in that it suggests that the characters have become involved in an aspect of the world that is beyond their control and understanding” (107). Gómez de la Serna’s story is representative of the previously mentioned motif of cataclysm as a result of irresponsible, ethically suspect science. The author questions the motivations of scientists who would harness the secrets of the universe for their own personal gain, demonstrating an awareness of the power of nature and the concurrent power of the scholars engaged in penetrating its secrets. “El dueño del átomo” reflects a modicum of public paranoia about not just science, but also its practitioners. The story also presents us with an archetypal character inspired by modernity’s advancements: the mad scientist. We will return to the implications of this new motif in literature in our discussion of *¡Tararí...!*.

In examining these two short stories, I hope to have established a framework for the later analysis of important poetic works by Rafael Alberti and Federico García Lorca. Our two paradigms—nostalgia and cataclysm—will not be so starkly separated in the next sections, but will rather find themselves in an uneasy coexistence, sometimes overlapping, reflecting the disquiet and apprehensiveness of the authors about technology and science as it existed within their historical (and in Lorca’s case, geographical) circumstance.

Ethic and Aesthetic in Alberti’s *Cal y canto* (1926-1927) and *Sobre los ángeles* (1927-1928)

Published at roughly the same time, *Cal y canto* and *Sobre los ángeles* represent two distinct, but related moments in Rafael Alberti’s poetic development—his period of Gongorism and Pure Poetry for the former, and his “Surrealistic” mode in the latter.¹⁵ Critic Salvador

¹⁵ “Surrealistic” as contrasted with “Surrealist”, wherein the former still pays a continued attention to form and rejects automatism, though the use of the startling image and intense psychologism is the same.

Jiménez-Fajardo gives the chronology of publication, and the consequences, unforeseen, for the reception of *Cal y canto*: “*Revista de Occidente* published *Cal y canto* in 1928, but hardly had it begun to be noticed by the critics when *Sobre los ángeles* came on the scene, coincidentally with the beginnings of the political unrest that was to usher in the Republic in 1931” (25). These were the last two books that Alberti would write that were devoted to the pursuit of form and aestheticism, although with *Sobre los ángeles* we begin to see the beginnings of the social awareness that would characterize his later works. In terms of their relation to the nostalgia/cataclysm juxtaposition with regard to the accelerated process of modernization through technological advancement in Spain, both works display traces of the two elements, in an uneasy mixture. On the whole, *Cal y canto* appears to embrace technology and the modern world, but not without moments of ambivalence within the text. *Sobre los ángeles* is more firmly rooted in the paradigms of nostalgia and cataclysm; overall, a nearly apocalyptic vision of the future dominates the work. In this next section, I will examine via the close readings of several poems the manner in which Alberti’s manipulation of images of technology and science in *Cal y canto* and its successor communicate nostalgia for the technologically innocent past, as well as the projection of a desolate and soulless future.

«*Cal y canto*»: *Form, Imagery, Conflict, Critique*

Cal y canto is a book that initially seems to lack coherence, moving abruptly between Alberti’s clear pursuit of formal perfection in the first half of the work, thematically oriented towards the ideals of the past, as inspired by the celebration of the tercentenary of Góngora’s death; and the latter half which is laden with *ultraísta* imagery of the modern world. However, as Solita Salinas de Marichal points out, the two parts of the book are not as disjointed as one would first assume, exhibiting rather “la coexistencia... del mundo gongorino y el moderno, vinculados por la aspiración y la exigencia de competencia técnica” (207). Regarding the overall aesthetic vision of *Cal y canto*, Peter Wesseling points out that “[p]ersonal emotion, aside from the general enthusiasm for pure form, is almost completely lacking. Before Alberti decided to call the volume *Cal y canto*, he favored the title *Pasión y forma*, which, slightly modified to *Pasión por la forma*, would have been a concise description of the contents” (18).

“*El jinete de jaspe*”

Alberti’s pursuit of form dominates *Cal y canto* to the extent that there is harmony when traditional form is met with the traditional image, but when the poet attempts to blend a modernist imaginary with the strictures of traditional form, the effect is jarring and disquieting to the reader. The first striking example of this kind of dissonance appears early in the second section of the work, in the poem “*El jinete de jaspe*.”¹⁶ The poem is written in tense hendecasyllabic tercets; until the last line, the imagery is consistently reminiscent of Alberti’s

¹⁶ This poem and all subsequent references are from Hans Lauge Hansen’s edition of *Cal y canto*. In Rafael Alberti, *Cal y canto (1926-1927)*, Clásicos de Biblioteca Nueva, ed. Hans Lauge Hansen (Madrid: Biblioteca Nueva, 2002).

earlier maritime paradigm from *Marinero en tierra*, but, in contrast to the earlier work, in this instance hardly natural or evocative of the poet's personal history. Rather, it recalls Góngora and his baroque adaptation of Greek and Roman mythology: In verse 10, Alberti invokes "las Náyades segadores y tritones" and continues until the last verse with consistent references to the myths of the sea, in its idyllic form. The last stanza of the poem, though, abruptly breaks with the previous idealizations, by figuring the cataclysmic destruction of the oceanic paradise:

Rompe, hirviendo, el Edén, hecha oceano,
cae de espalda en sí misma toda entera...
y Dios desciende al mar en hidroplano.
(vv. 22 – 24)

The word "*hidroplano*" initiates the disruption of classical tropes by representations of modernity, and it is not insignificant that Alberti should choose a highly technological image to bring about this change in focus. The sea is frequently employed in his poetry as a representation of his childhood paradise; in this poem the sea is threatened by the hydroplane, by the vehicle that slashes it open, disturbs its peacefulness, and roils it with the activity of modern life. The "*hidroplano*" is the vehicle by which God descends to Earth to cast his judgment over the defiled Eden; with this in mind, it is difficult to view Alberti's use of the technological image in this instance as ethically neutral. Alberti, too, is casting judgment, and suggesting that a paradise has been lost as a result of an intrusion by the modern world, with all its mechanical marvels that are meant to subdue nature and instate a new order for humanity. Yara González discusses the importance of the image of the hydroplane, and its overall negative connotations:

Es una geometría deshumanizada moviéndose mecánicamente en un universo poético único... En él lo más trascendente pierde su altura en un descenso mecánico que nos sume en la desolación más absoluta: "y Dios desciende al mar en hidroplano"... La mecanización de Dios es sólo comparable en su desolación a la mecánica de la muerte... (162)

With the shift in imagery towards mechanization, Alberti begins his critique of technology, demonstrating a subtle but pointed negativity in his strategic construction of *la técnica* as a recurring motif in *Cal y canto*.

"Romeo y Julieta" and "Carta abierta"

The next poem that I would like to offer as an example of Alberti's calculated use of technological images is his retelling of the Shakespearean drama *Romeo and Juliet* in verse form. "Romeo y Julieta" is comprised of three parts: "(Baño)," "(Fuga. X. 99.999)," and "(Sueño. Fracaso.)" Yara González summarizes the basic trajectory of the poem's three movements:

En “Romeo y Julieta” vamos a presenciar una completa transformación femenina. El poema se inicia con la contemplación admirativa de un cuerpo de mujer. Esta vez el cuerpo inmóvil se va a transformar en dinámico. Este cambio se debe en parte a un principio genérico de la poesía moderna... Su movimiento, por la forma y los elementos que entran en juego, obedece a un dinamismo tecnológico. Por eso el resultado del mismo es negativo... [L]a atractiva figura femenina en vértigo por la metrópoli, en “Fuga”, termina en un “Sueño. Fracaso” en que el hombre aparece decepcionado, y frustrado después de una experiencia vivida que termina en separación. (53)

The first movement, “(Baño)”, retains both traditional form and imagery, placing emphasis on *la forma*, both of the female figure being contemplated, and that of the tight hendecasyllabic meter of the tercet, although there is no rhyme scheme. Because of the poem’s conservative beginning, as well as its title which is a direct reference to Shakespeare’s play, the second movement, “(Fuga. X. 99.999)”¹⁷ with its abundance of technological references comes as a jolt; the reader is violently launched from a voluptuous meditation on the beauty of the human form into a mechanical, dehumanized space. In this space, the play of metaphor accelerates—each line is dense with swiftly-moving images that propel the female form, the “precipitada rosa” (v. 13), through the chaos of urban life:

Precipitada rosa, limpia, abriendo
con tus hombros el aire... *Las aceras,*
saltando atrás, en fila, comprimiendo,

tumulto y colorín, multiplicadas,
árboles, transeúntes, vidrieras,
en una doble fuga de fachadas.

Raudo amor, más ligero que los cines,
que el volar de la azul telegrafía,
pero extático en sí... *De los confines*

de las tiernas fugaces, desbocados,
entran los montes y la hidrografía
abrevada de troncos y ganados.

¹⁷ Hans Lauge Hansen in his critical introduction to *Cal y canto* explains the strange title “(Fuga. X. 99.999)”. He states: “La segunda parte representa una postura estética vanguardista, que parece la del ultraísmo por la importancia que se les concede a los cambios de perspectiva, a la velocidad y a las maravillas técnicas de la modernidad. La “fuga” del subtítulo puede referirse tanto a la fuga física como a la forma musical, mientras la fórmula (X, 99.999) puede entenderse como una referencia a un concepto casi matemático de la belleza, de que estaban influidas las corrientes artísticas de vanguardia como el ultraísmo y el creacionismo.” In *Ibid.* 144, c.f. 7.

Ahora que es inminente el atropello
del sol y que la estrella inevitable
a lo garzón se corte ya el cabello,

deja a la lengua de los faros, muda,
que entre las sombras se prolongue y hable,
mientras que a ti mi sueño te desnuda.

(vv. 13 – 30)

As Yara González said in the passage quoted above, Alberti's use of technological references ends up having a negative connotation as a result of the tragedy of the third movement, "(Sueño. Fracaso.)" In this last passage, the poetic voice mourns the death of the beloved, equating her soulless body with that of a similarly soulless machine. The vital "precipitada rosa" of "(Fuga. X. 99.999)" becomes the lifeless "rosa mecánica" (v. 34) of the third movement; the *yo poético* asks "¿Cómo hacerle subir hasta mi frente, / retornar, flor mecánica, mentira?" (vv. 41 – 42). The word "mentira" weighs heavily in this line, betraying a view of *la técnica* as false vitality: though technology may speed human existence, it is not existence itself, nor is it something in which society should have faith, as it is a mere fabrication and imitation of life's energies.¹⁸

In sum, the negativity displayed towards the increasing ubiquity of technology is not conveyed with a leaden hand—these are very dynamic images that Alberti offers the reader, but there is very little of the awe and enthusiasm towards the new that had characterized the *ultraísta* poets. Instead there is the bite of cynicism as the poet deploys technological images to convey disillusionment and loss. The only modern phenomenon for which Alberti displays any open enthusiasm is film, and in the case of the preceding poem, translates the cinematographic technique into poetic form.¹⁹ References to the cinema are interspersed throughout the second half of *Cal y canto*, appearing in poems such as "Venus en ascensor," "Telegrama" and "Cita triste de Charlot". Alberti's fascination with cinema was well known—he was a member of *La Gaceta Literaria's Cine-Club*—and eventually would write a series of poems dedicated to the

¹⁸ In this assessment I disagree with Soledad Salinas de Marichal, who views Alberti's cityscapes as jubilant praise of the modern world. She writes: "En *Cal y canto* asistimos al encuentro entre el mar de leyenda y la ciudad moderna y mecanizada, nuevo símbolo, que absorbe las aguas en su ser mágico y dichoso. Se ha trasladado el mito de mar a tierra, el cambio de rumbo espacial afecta el cambio del enfoque temporal: el mar retrocedía hacia el pasado vivido e imaginario, mientras que la ciudad divisa el presente que existe y la utopía futura. De ahí la alegría con que la canta el poeta y el ímpetu arrollador con que impone al mar el alocado ritmo, el movimiento vertiginoso de la "nueva vida"." The "future utopía" of Salinas de Marichal's reading is, in my opinion, not as evident as she would have us believe. Considering that the technological imagery used in *Cal y canto* is frequently dissonant and confrontational, it is therefore difficult for me to accept that Alberti was employing these images in order to exalt the modern. The exception, of course, is Alberti's joy in the invention of the cinema, which I will discuss below. Solita Salinas de Marichal, *El mundo poético de Rafael Alberti*, Biblioteca Románica Hispánica (Madrid: Gredos, 1968) 208.

¹⁹ If we carefully observe the function of the italicized verses in "(Fuga. X. 99.999)," it could be said that they form a species of screenplay that "directs" the reader to visualize the scene as if it were a film montage of layered, refracted, and multiplied images that move with such haste that they can barely be captured—*se fugan*—and flee the grasp and gaze of the artist, leaving the reader with a growing sense of disorder and chaos, a premonition of the darkness that will characterize his next book of poetry, *Sobre los ángeles*.

exploration of film and cinematography, that would be collected into a book later titled *Yo era un tonto y lo que he visto me ha hecho dos tontos* (1929); he gave a reading of a few of these poems at the sixth meeting of the *Cine-club* on May 4, 1929 (Morris 29). His choice of theme was not surprising to many after his famous declaration that was issued in “Carta abierta”, the poem that closes *Cal y canto*: “Yo nací—¡respetadme!—con el cine” (v. 33). Aside from this praise of film, however, “Carta abierta” is generally a bleak poem that manages to reflect the major themes of *Cal y canto* and Alberti’s previous work, and also foreshadows the coming psychological crisis that will dominate the thematic texture and formal deliberations of *Sobre los ángeles*; in other words, it contains the elements of nostalgia and cataclysm that function as a critique of modernity.

The first stanza of “Carta abierta” brings us back to the sea of the poet’s youth, and his education on the shores of the Mediterranean and in the classroom:

...Hay peces que se bañan en la arena
y ciclistas que corren por las olas.
Yo pienso en mí. Colegio sobre el mar.
Infancia ya en balandro o bicicleta.

Globo libre, el primer balón flotaba
Sobre el grito espiral de los vapores.
Roma y Cartago frente a frente iban,
marineras fugaces sus sandalias.

Nadie bebe latín a los diez años.
El Álgebra, ¡quién sabe lo que era!
La Física y la Química, ¡Dios mío,
si ya el sol se cazaba en hidroplano!

(vv. 1 – 12)

Again, the image of the *hidroplano* disrupts the idyllic images of youth, reintroducing the problem of mechanization that stands in conflict with traditional values—God and the hydroplane, the mechanization of what had been ineffable. The following six stanzas are meditations on the cinema; during these, the pace of the appearance of images of technology begins to increase, so that by the end of the meditation, when we arrive at the famous declaration, the velocity of the poem, propelled by the motor of its *imaginario*, has increased dramatically:

Yo nací—¡respetadme!—con el cine.
Bajo una red de cables y de aviones.
Cuando abolidas fueron las carrozas
de los reyes y al auto subió el Papa.

(vv. 33-36)

There is an increase in the tension between religious and technological imagery that began with the *God/hidroplano* juxtaposition and now the image of the Pope and the automobile in verse 36. The imagistic vortex that Alberti is creating has tradition and modernity in reaction with each other, and the effect is vertiginous, cacophonous, and jarring:

Vi los telefonemas que llovían,
plumas de ángel azul, desde los cielos.
Las orquestas seráficas del aire
guardó el auricular en mis oídos.

De lona y níquel, peces de las nubes,
bajan al mar periódicos y cartas.
(Los carteros no creen en las sirenas
ni en el vals de las olas, sí en la muerte.)
(vv. 37 – 44)

The “surrealistic” effect that will dominate *Sobre los ángeles* is in evidence already, in this last poem of *Cal y canto*, and the shadow of death has entered Alberti’s poetic universe. The poem continues in its negative spiral, referencing the horrors of World War I,²⁰ the apogee (at the time) of the horror caused by the union of technology and violence. After this cataclysmic vision of a world in ruins, in the last two stanzas the poet offers us a final summation, accomplished through another imagistic whorl, of his vision of the modern world:

Nuncio—la voz, eléctrica, y la cola—
del aceleramiento de los astros,
del confín del amor, del estampido
de la rosa mecánica del mundo.

Sabed de mí, que dije por teléfono
mi madrigal dinámico a los hombres:
¿Quién eres tú, de acero, estaño y plomo?
—Un relámpago más, la nueva vida.
(vv. 65 – 72)

There is a sense of disorientation that comes with the interrogative phrase in line 71, one that suggests that the surrounding world has become entirely unfamiliar in its cold, metallic and mechanistic form. Thus the poetic voice in these final stanzas takes on the role of the prophet—or perhaps, “broadcaster” would be a better term— announcing (via telephone, no less) that this

²⁰ Cascos de chispa y pólvora, jinetes
sin alma y sin montura entre los trigos;
basílicas de escombros, levantadas
trombas de fuego, sangre, cal, ceniza.
(vv. 57 – 60)

strange new world (*la nueva vida*) has come, this mechanical rose of modern life. In recalling the image of the “rosa mecánica” that was so intrinsic to the poet’s construction of the relationship between death/soullessness and technology, the poet elevates the image from the individual (previously only associated with “Julieta”) to the collective, and in so doing extends the reach of his critique to include all of society without any sense of praise or laud. As notes Hans Lauge Hansen: “En la tercera parte del texto, es decir, en las estrofas de 10 a 15, podemos ver un deslizamiento desde la fe optimista en las maravillas técnicas de la modernidad, hacia las posiciones más disfóricas y pesimistas” (63-64). The poem ends abruptly—the last page is missing, just as is the first—and the last image lingers: the menacing metropolis and the lightning-shock of this new existence.²¹

Alberti’s negative vision of modernity is a cumulative one; that is, reading the poems of *Cal y canto* in isolation does not give the same dissonant impression that the reader receives when viewing the work as a continuum of sorts. The trajectory of *Cal y canto* takes us from Alberti’s images of innocence by the sea, dehumanizing it then via its complete aestheticization through form; he then injects the mechanical element into the peaceful idyll, creating sharply contrastive and conflictive images that have an overall tone of foreboding—this new world, it is a sublime wonder. What fresh horrors will descend with the next bolt of lightning, the poet seems to ask. As if in answer, *Sobre los ángeles* appears, the personal catastrophe of the poetic subject voiced through the angels of the modern apocalypse.

«Sobre los ángeles» (1927-1928)

It is widely accepted that Rafael Alberti’s best known collection of poetry, *Sobre los ángeles*, is a work motivated by the onset of the author’s severe psychological crisis. As Jiménez-Fajardo mentions, this crisis had been building while the poet was still composing *Cal y canto*:

The last poems of *Cal y canto* were written under the shadow of Alberti’s oncoming crisis. Not only did his world enter a prolonged period of turmoil, his visible behavior also appeared to change... Alberti suddenly felt that he had irretrievably lost a youthful Paradise. His health was again faltering, and he felt trapped, alone, attacked from within by dark angers and resentments. He turned these obscure forces into the angels that people his next book, *Sobre los ángeles*. (25)

Margaret Heisel, in her structural analysis of *Sobre los ángeles*, gives a succinct formulation of its central themes, saying that it “presents... a universe in chaos, both in the natural world and in the realm of human relationships; a sense of confusion, loss, and personal deception are the dominant notes” (864). Robert C. Manteiga calls it simply “a book of contrasts”, in accord with

²¹ Derek Gagen also analyzes this stanza and remarks that “...Alberti—like Lorca, Cernuda, and Aleixandre—had seen through the surface gloss of the ‘New Life’... The New Life is a passing phenomenon, a lightning flash, potentially lethal but soon extinguished.” Derek Gagen, “Rafael Alberti’s ‘Muerte y juicio’: Death, Judgment, and the Poetry of (Dis)Belief,” *Modern Language Review* 99.4 (2004): 944.

his visual approach to the work (63); Solita Salinas de Marichal's thematic analysis labels it as "un libro de ausencias" (328). More importantly, however Salinas de Marichal points out that in *Sobre los ángeles*, "este libro, tan de aparente fantasía, está en estrechísima relación con lo que venía sucediendo en el mundo: con la crisis de conciencia universal y la angustia del hombre moderno" (282).

Alberti's construction of a fantastically allegorical world populated by inhuman creatures which paradoxically embody our most human characteristics—goodness, evil, (dis)honesty, beauty—is extremely pessimistic, if not nihilistic, about the human condition and the future of the world's societies. As in *Cal y canto*, the hollowness of modern existence is communicated through the use of layered images; unlike *Cal y canto*, however, the arrangement of the work is not a crystalline network of symbols held in tight formation, but rather a more nebulous configuration of looser forms.²² There is indeed dehumanization in *Sobre los ángeles*, but it is not the dehumanization of the aesthetic manifesto; instead, it is the literal process by which the poetic *yo* moves from shadow to shadow, "huésped de las nieblas", as it announces in the epigraph to the book, never taking form, a mere "cuerpo deshabitado"—the title of the third poem of the collection. This poetic subject is antithetically dehumanized, in the sense that where aesthetic dehumanization asked for clarity, Alberti's dehumanization of *Sobre los ángeles* is achieved through fog and mist, a murkiness of spirit that alludes to a pervasive disillusionment with the modern world, and a nostalgia for "el paraíso perdido" of the poet's youth.

In this section, I would like to focus on Alberti's poems about his childhood, specifically about his educational background, his days in the schoolhouse. I will perform a close reading of "El ángel de los números," "Muerte y juicio," and "Los ángeles colegiales." Through these three poems, I hope to establish that Alberti exhibits the traits of what I previously called "Janus-faced modernity"—the gaze cast backwards over the past and into the future simultaneously. In the case of *Sobre los ángeles*, it appears that the more the poetic *yo* loses itself in remembrances of the past, the more it is actually commenting on its current state of crisis and fears of a bleak future.

"El ángel de los números"

In reading "El ángel de los números," many critics have focused on the relationship between form and content, noting that it is one of the few poems that has a regular meter, even if its stanzas take an erratic shape and there is no discernible rhyme scheme. Marilyn D. Rugg asserts that "the metric regularity is an affirmation of the orderly existence of the angel of numbers, yet the poem depicts the death, the destruction of that order. This disorder is evident in the irregularity of the stanzas..." (261). Salinas de Marichal argues that the tension between order

²² Anthony L. Geist discusses the role of reason and logic in the discourse of the dehumanized art: "The language of dehumanization, accessible only to an intellectual elite (again according to Ortega) is in fact an intensification of rational discourse. The difficulty... of any of Alberti's neo-baroque texts in *Cal y canto*... lies in their extreme rationality, what has been called their "blinding clarity." Anthony Leo Geist, "Hell's Angels: A Reading of Alberti's «Sobre los ángeles»,» *Hispanic Review* 54.2 (1986): 173.

and disorder in the poem is reflective of the nostalgia for the *paraíso perdido* of the poet's youth: "esta pérdida se expresa en forma ordenada, de repeticiones fijas, con sus variaciones" (346).

The poem begins with the unusual image of "vírgenes con escuadras" which, according to Jiménez Fajardo, along with the angel himself, "have custody over angels and numbers in the ideal firmament of reason:... Impeccable clarity of lines is the responsibility of the virgins, necessary sequence that of the angel" (54).

Vírgenes con escuadras
y compases, velando
las celestes pizarras.

Y el ángel de los números,
pensativo, volando
del 1 al 2, del 2
al 3, del 3 al 4.
(vv. 1 – 7)²³

The process that the poem follows is the gradual dismantling of the logic of numbers, and the undoing of the most basic forms of knowledge retained since childhood. The clear light of rationality dissolves into a fog of unknowing, as the lost world of childhood, with all of its insights, slips further away from the poet's recollection.

Tizas frías y esponjas
rayaban y borraban
la luz de los espacios.

Ni sol, luna, ni estrellas,
ni el repentino verde
del rayo y el relámpago,
ni el aire. Sólo nieblas.
(vv. 8 - 14)

The image of the lightning bolt reappears—the very image that inaugurated the New Life in the last stanza of *Cal y canto*—but this time it is less an image than a mirage, or a shadow of an image, as it has been negated by the preceding "ni" that disallows its presence. In the final stanzas, the poem's principal figures—the virgins and the angel—begin to disintegrate. The tools of their profession lost, they mourn. The angel himself is dead among the integers.

Vírgenes con escuadras,
sin compases, llorando.

²³ All poems cited from this work come from the following edition of *Sobre los ángeles*: Rafael Alberti, *Sobre los ángeles, Yo era un tonto y lo que he visto me ha hecho dos tontos*, Letras Hispánicas, ed. C. Brian Morris, 8th ed. (Madrid: Cátedra, 2002).

Y en las muertas pizarras,
el ángel de los números,
sin vida, amortajado
sobre el 1 y el 2,
sobre el 3 y el 4...
(vv. 15 – 21)

“El angel de los números” is a taut construction that attempts to balance on the one hand the poet’s yearning for his lost world and the order found therein—thus the metrical regularity, and the theme of the poem itself, reason and logic—and, on the other, the present sense of the destruction of that order, which is displayed through the loss of a regular form for the entire poem. Images that suggest vagueness and loss—the mists, the erasing of the blackboards— increase the sensation of a dissolution of the lost world into nothingness. Jiménez-Fajardo summarizes the nature of the loss within the poem. He says: “The most secure truths known since childhood... have been cancelled; light, the laws of the cosmos and those of nature equally abolished. Only formless fogs remain. The angel of numbers lies dead on his obliterated domain...” (Jiménez-Fajardo 54).

With regard to the Janus-like qualities of Alberti’s poetics, it would seem that the poem is pulled towards past and future at the same time through its emphasis on remembrance of the past and the consequent inability to reach through the mists and rescue it. Seemingly as a result of the straining between these two temporal poles, the poem opens itself to the presence of death in the form of the shrouded *angel de los números* of the last stanza. The death of the angel closes the door on the past, though the infinite process of counting, the metering of time and space, continues indefinitely, as suggested by the final ellipsis. However, it is unprotected, with no guardian to oversee the processes of learning, nor the passage of time.

“Muerte y juicio”

In his biographical analysis of Alberti’s poem “Muerte y juicio” from the last section of *Sobre los ángeles*, Derek Gagen makes an explicit tie between the previously-mentioned poem from *Cal y canto*, “Carta abierta” and “Muerte y juicio”: Alberti’s attempt to recover the lost childhood paradise. Gagen reads the two poems on a sort of continuum, using one poem to fill in the holes of the other—where “Carta abierta” discusses the escapism of the cinema, “Muerte y juicio” conjures up nightmarish images of schoolboy struggles to master a variety of academic subjects. The sadness alluded to in “Carta abierta” gains full description through “Muerte y juicio”; the two poems together, in Gagen’s view, tell the story of Alberti’s complicated youth that was both golden and anguished at once.²⁴ It is almost impossible to escape a biographical reading of “Muerte y juicio”—the usual distance between poetic voice and poet’s biography collapses here under the weight of the acute psychological distress present in the poem.

²⁴ See in particular Gagen, “Rafael Alberti’s ‘Muerte y juicio’: Death, Judgment, and the Poetry of (Dis)Belief,” 948-50.

Significantly, throughout the poem, the subject finds one of its primary sources of its agony in the classroom, specifically in the more scientific subjects that he clearly does not comprehend. The poem's conclusion—"Para ir al infierno no hace falta cambiar de sitio ni postura" (v. 54)—suggests to the reader that the mere recollection of these tortured classroom events is the equivalent of a trip to hell, and this time, there is no cinema to save him. Alberti's reconstruction of his hellish schooldays suggests to the reader that for the poet, the discourse of science was incompatible with his essential nature, which is that of a poet. Science thereby dominates and shuts down other "historical" or "minor knowledges," to use the Foucauldian terminology, subjecting them to the "coercion of a theoretical, unitary, formal and scientific discourse" that renders other ways of knowing and understanding the universe both "disordered" and "fragmentary" (Foucault "Two Lectures" 24). Thus, in "Muerte y juicio", Alberti demonstrates the foundation for his growing disaffection with science and technology, and in so doing gives the reader another way to interpret his skepticism about the modern world: that the rules of science that he learned destroyed his sense of wonder at nature, and made the natural world lose its innocence in a parallel fall from grace.

The poem begins with the section "1. Muerte" that paradoxically appears to describe the birth of the "niño" whose figure will dominate the rest of the poem as a species of invocation of the past, punctuating the end of each stanza of "2. Juicio". The first four stanzas of "Juicio" deal with the infancy and first words of the poet; the subject matter changes in the fifth stanza, as we begin to see the poet delve into his years of formal education. Immediately, the subject of mathematics presents itself:

Las flores, sin piernas para huir de los aires crueles,
de su espoleo continuo al corazón volante de las
nieves y los pájaros,
desangradas en su aburrimiento de cartillas y
pizarrines.
4 y 4 son 18. Y la X, una K, una H, una J.
Niño.
(vv. 28 – 32)

The poet here draws a sharp contrast between natural and scientific knowledge, with the latter as the aggressor, bleeding the flowers through boredom. This violent learning in which the poetic voice will participate is met from the start with inaccuracies and confusions in mathematics ("4 y 4 son 18") and later in geography as the charted world invades and dismantles his maritime paradise:

En un trastorno de ciudades marítimas sin
crepúsculos,
de mapas confundidos y desiertos barajados,
atended a unos ojos que preguntan por los afluentes
del cielo,

a una memoria extraviada entre nombres y fechas.
Niño.

(vv. 33 – 37)

The “memoria extraviada” is the poet’s instinctual understanding of nature that is then confused and violated by the forced memorization of the systems that classify it, replacing one type of understanding—idyllic, innocent, vibrant—with another—systematic, taxonomic, deadening. The confusion in the poetic voice alluded to in these previous stanzas is made concrete in the next, as is the relationship between the gaining of knowledge and the loss of soul:

Perdido entre ecuaciones, triángulos, formulas y
precipitados azules,
entre el suceso de la sangre, los escombros y las
coronas caídas,
cuando los cazadores de oro y el asalto a la banca,
en el rubor tardío de las azoteas
voces de ángeles te anunciaron la botadura y
pérdida de tu alma.
Niño.

(vv. 38 – 42)

The structures of knowledge, here embodied in the mathematical and scientific images of equations and geometric forms, usher in the angels of the cataclysm—“sangre”, “escombros”, “asalto” are all words that conjure up disaster—that rob the “tú” of its soul. Upon remembering his disorientation among the “hard facts” of learning, the poetic voice, in the last stanza of the poem, recognizes that in order to descend to hell, all that is necessary is to recall the past. Thus cataclysm and nostalgia exist in “Muerte y juicio” in a tight warp, wherein the presence of one—nostalgia—invokes the other, in a nightmarish recollection of lost innocence. Thus the present is contaminated by the painful past, and, almost as an afterthought, the strange mention of Jules Verne at the end of the poem in conjunction with Jacob’s ladder, suggests that the contrast in images of the future—apocalyptic and utopian, religious and scientific—is also engaged in a conflict of temporalities within the mind of the subject. The poem’s descent into memory is a descent into hell—a hell that undoes the natural universe through the initiation of the subject into formal learning.

“Los ángeles colegiales”

“Muerte y juicio,” however, does not give the final word on the systematic training of the poetic subject; the poem’s equation of learning with destruction does not carry over into the next poem that deals with education, “Los ángeles colegiales.” This poem takes a more mystical, reflective, and somewhat bemused view of the same confusions that plagued the subject in “Muerte y juicio.”

Ninguno comprendíamos el secreto nocturno de
 las pizarras
 ni por qué la esfera armilar se exaltaba tan sola
 cuando la mirábamos.
 Sólo sabíamos que una circunferencia puede no ser
 redonda
 y que un eclipse de luna equivoca a las flores
 y adelanta el reloj de los pájaros.
 Ninguno comprendíamos nada:
 ni por qué nuestros dedos eran de tinta china
 y la tarde cerraba compases para al alba abrir
 libros.
 Sólo sabíamos que una recta, si quiere, puede ser
 curva o quebrada
 y que las estrellas errantes son niños que ignoran la aritmética.
 (vv. 1 – 10)

Here the memories of the childhood classroom are in no way destructive, and have lost all of the menace that they carried in “Muerte y juicio.” If anything, the nostalgia here is for the ineptitude of the educational system when it came to the sciences, which imparted only a superficial knowledge of phenomena to its pupils. In this way, “Los ángeles colegiales” is very much in line with the history of education in the sciences in Spain at the turn of the century. The poet here does not ponder scientific knowledge as having destructive power over nature; rather, he turns it into a series of curiosities and trivialities that produce affinities between nature and the subject. The “estrellas errantes” that are “niños que ignoran la aritmética” is a parallel construction that describes also the state of wayward youth upon which the poet is reflecting—he, too, ignored arithmetic, producing as it did only confusion and chaos in his mind.

Overall, “Los ángeles colegiales” is an anomaly in the last part of *Sobre los ángeles*, as its tone is arguably lighter than the vast majority of the poems included in the collection. In this sense, it is the exception that proves the rule, where “El angel de los números” with its enshrouded angel, and “Muerte y juicio” with its cataclysmic images and descent into an infernal nostalgia, are much more representative of the themes, forms, and images present in the work. *Sobre los ángeles* ends on an intensely anguished note, with the last angel, “El angel sobreviviente,” attempting to take flight, though “herido, alicortado” (v. 12). As Alison Sinclair points out, this final poem, and the final section in general, form a very consistent whole in their negativity, and are “recognizable at a glance from their line-length, and paint a bleak, post-catastrophe landscape, in which debris of past existence is littered over a sterile planet” (187).

In *Sobre los ángeles*, nostalgia and cataclysm are intrinsically bonded to each other, and, as a unit, serve to reflect upon the actuality of 1920s Spain—increasingly modernized, mechanized, and (if we heed Alberti’s vision) dehumanized. The nihilistic pall of *Sobre los ángeles* is descriptive of Alberti’s moment of psychological defeat, but it is from this pit of ashes that the poet would eventually rise and issue a call to social action through his politically

engaged poetry that followed. Therefore it is possible to see *Sobre los ángeles* as the initial soundings of a call for the rehumanization of art, issued through a work that is not aesthetically dehumanized, as was *Cal y canto*, but rather dehumanized in terms of the way it constructs and depicts the contemporary human condition. By pointing out the dehumanization of the world as it stood in the late 1920s, Alberti offered a resounding critique of the trends of industrialization and technological advancements, pointing out their maleficent qualities through the illustration of the apocalyptic demi-universe of his angels.

From Disquiet to Disgust—Lorca’s *Suites* (1920 – 1923) and *Poeta en Nueva York* (1929)

The collective works of Federico García Lorca testify to a life dedicated to a personal aesthetic vision and its perfecting over time. Beginning with his early poems in the late 1910s, one can clearly perceive the young artist in pursuit of an ideal. Upon leaving his native Granada for Madrid in 1918, Lorca took up residence in the newly built *Residencia de Estudiantes* (1910), a place that would become much more than a living space for the young poet. The *Residencia de Estudiantes* was a unique establishment in the Madrid of the early 20th century. According to Antonio Lafuente and Tiago Saraiva, the *Residencia* was “always far more than a University college. Through courses, debates and lectures it guaranteed an education impossible to obtain elsewhere. It not only dealt with hitherto unheard of subjects, but it did it without the shabbiness of official academic life” (543). Cecilia J. Cavanaugh also comments on the importance of intellectual life, particularly with regard to science, at the *Residencia*:

The *Residencia* program placed emphasis on scientific education and research and promoted interdisciplinary academic and intellectual community. Students were offered conferences, opportunities to live and eat and speak with professors and visiting lecturers from every field, and open access to active research laboratories.” (192)

According to Cavanaugh, Lorca was an eager participant in these activities sponsored by the *Residencia de Estudiantes*—one photo from 1923 shows the poet peering into a microscope in one of the many “active laboratories” to which he would have had access (Lafuente and Saraiva 543). This same year was, of course, the year of Einstein’s visit to Spain, where he spoke at the *Residencia*. Einstein was introduced by Ortega y Gasset, a man whose presence was of decided importance at the *Residencia de Estudiantes*, a place which provided an essential point of contact between the philosopher and many of the poets and authors of the Generation of ’27.²⁵

The programs at the *Residencia de Estudiantes* provided Federico García Lorca with an education that went well beyond his studies in Granada, offering him a richly interdisciplinary intellectual context from which to draw inspiration, not to mention the network of colleagues who would accompany him through the process of poetic discovery during the years of the

²⁵ See Francie Cate-Arries, “Poetics and Philosophy: Jose Ortega y Gasset and the Generation of 1927,” *Hispania* 71.3 (1988): 503-04.

vanguardia. I mention the *Residencia de Estudiantes* and its project here to give some historical background to a surprising poem from Lorca's youth included in the unpublished collection *Suites*, and written in the early 1920s while Lorca was in residence in Madrid—this is the poem “Newton,” which we will discuss below as participating in the critique of science and technology through the evocation of nostalgia for aging paradigms, which, in this case, is immediately suggested by the title of the poem. In “Newton” as in *Poeta en Nueva York*, Lorca establishes his critique through the use of contrasts, sometimes subtle and other times biting, between science (and its consequences) and the natural world or religious tradition—in either case revealing the distance between the old or even ancient ways of understanding the world, and the new epistemological order imposed on humanity by scientific discovery. Though Lorca was not interested in establishing what Juan Cano Ballesta calls an “antitechnological utopia” one of the principle aims of the fascist movement once it was established in Spain—it is clear that he was not one to sing the praises of the Machine. His antitechnological stance was based in fears about the destruction of nature, which, considering our present ecological circumstances proved to be eerily prescient. For Lorca it is nature, the lost Edenic paradise, with all its connotations religious and otherwise, that provides the vocabulary for his critique, one that begins with the father of physics in the modern era, Isaac Newton.

Overthrown: “Newton lloraba”

André Belamich in his critical edition of Lorca's *Suites* dates their composition to a period of “intensa experiencia poética y reflexiva del poeta, que se sitúa de finales de 1920 a principios de agosto de 1923” (19). However, the *Suites* were never formalized by Lorca for publication. According to Belamich, Lorca left them “sin intentar siquiera unificar las dos versiones de la última serie, sin ordenar su libro ni establecer un índice, el poeta las abandona para lanzarse a los juegos de las *Canciones* y a la magia serena del *Romancero gitano*” (14). It is possible that Lorca had good reason for abandoning the project, since, according to D. Gareth Walters, they are a comparative failure within the context of the poet's greater opus. Walters writes that overall

...*Suites* is an unfulfilled promise. They are, as Belamich puts it, ‘destellos fugaces’ (fleeting sparks) and ‘bellezas fragmentarias’ (fragmentary beauties), but which through reconstruction have not been converted into anything more substantial... The suites are tentative yet innovative, by turns adventurous and mediocre, unmistakably the product of the Lorca of the *Residencia de Estudiantes*—*stylish* in both the positive and pejorative sense of that word. Above all, they mark a definitive break with *modernism* and clearly align Lorca with the poets of the new epoch... (113-14)

The *Suites* go far in establishing Lorca's personal symbology, but do not possess the unnamable quality that enchants the readers of *El poema del cante jondo* or *Romancero gitano*. They are clearly the work of a poet in the process of finding his individual voice, of constructing a language by which to express his poetic understanding of the universe. The suites are rather

homogeneous in this way, exploring the common themes of love and death—which is why “Newton” stands out as an oddity, a striking departure from the poet’s accustomed preoccupations.

“Newton” is a six-part poem comprised of the following sections: “[En la nariz...],” “En el bosque,” “Armonía,” “El ultimo paseo del filósofo,” “Réplica,” and “Pregunta.”²⁶ The poem describes the moment of discovery by Newton of the law of gravity and its aftermath, however indirectly, through the use of mythological and religious allusions. The poem begins with the historic drop of the apple from the tree:

En la nariz de Newton
cae la gran manzana,
bólide de verdades.
La última que colgaba
del árbol de la Ciencia

El gran Newton se rasca
sus narices sajonas.
Había una luna blanca
sobre el encaje bárbaro
de las hayas.

(“[En la nariz...]” vv. 1 – 10)

In his study “Aproximaciones a las *Suites* de Federico García Lorca,” Dietris Aguilar chooses to focus on the apple as the central polysemic image that unifies the suite’s symbology, allowing for nuanced allusions to other referential systems, yet without losing its integrity through a dispersion of meaning.²⁷ The apple is indeed important, as it references not only the legend of how Newton formulated the law of gravity, but also—and this follows directly after the mention of Newton’s scenario in verses 1-3—the apple of the Tree of Knowledge. Later, in the final part of the suite, “Pregunta,” Lorca draws in another allusion, this time to the Judgment of Paris, where again the apple is a significant object:

¿Por qué fue la manzana
y no
la naranja
o la poliédrica
granada?
¿Por qué fue reveladora
esta fruta casta,

²⁶ All citations of the poem “Newton” are from Federico García Lorca, «*Suites*»: *Edición crítica de André Belamich*, Biblioteca García Lorca, ed. André Belamich (Barcelona: Ariel, 1983) 135-39.

²⁷ Dietris Aguilar, *Aproximación a las suites de Federico García Lorca*, 2001, Available: <http://www.freewebs.com/celehis/actas2001/E/aguilar.htm>, April 25 2009.

esta poma suave
y plácida?
¿Qué símbolo admirable
duerme en sus entrañas?
Adán, Paris y Newton
la llevan en el alma
y la acarician sin
adivinarla.

(“Pregunta” vv. 1 – 15)

Newton’s apple is in this stanza related to the fruits that destroyed the biblical Eden and ancient Troy; the answer to the question as to why no other fruit could be the vehicle by which knowledge was imparted unto Newton lies in the cataclysmic connotations contained in the apple’s referential history. By connecting the physicist Newton with Adam and Paris, the poet suggests that this was no coincidental apple, and that the science that emerged from its voyage from tree to earth also unleashed a species of ruin upon the earth.

If “Réplica” and “Pregunta” are inverted, it is easier to understand the kind of judgment Lorca is passing on science and the consequences of its development. While in “Pregunta” we have the three figures—Adam, Paris and Newton—contemplating the apple without understanding its importance, if we return to “Réplica,” the poet gives his solution to the enigma, and the full meaning of the symbol is revealed to the reader:

Adán comió la manzana
de la virgen Eva.
Newton fue un segundo Adán
de la Ciencia.
El primero conoció
la belleza.
El segundo un Pegaso
cargado de cadenas.
Y no fueron culpables.
Las dos manzanas eran
sonrosadas
y nuevas
pero de amarga
leyenda.
¡Los dos senos cortados
de la niña inocencia!

(“Réplica” vv. 1 – 16)

Newton's apple, just the same as that of Adam and Eve, revealed a world hitherto unknown—the world of scientific laws and knowledge of the mechanisms of the universe. These laws of motion, mass, energy and matter, are the very chains that bind Pegasus in this poem, where the binding of the mythological creature represents the impossibility of the continuation of magical belief in a world made rigid by determinism and the mechanical view of nature. The last two lines, wherein the apples of Newton and Adam are equated with the excised breasts of Innocence, give the reader a sense of what was lost with the coming of science: the innocent myths of creation. Formerly understood as narratives of the human relation to the divine, Newton's discoveries, while still preserving ideas of God as the creator of the universe, removed the possibility of human foible, creating as they did the concept of the Machine-Universe, where, once set in motion, the inviolable laws of nature would propel the cosmos forward, humankind included, bereft of free will, its existence a mere result of the perpetual rhythms of cause and effect.²⁸

Perhaps this is why in the center section, "El ultimo paseo del filósofo," Lorca constructs a melancholy but enlightened Newton who meanders through a garden as a worm eats the fallen apple, the image of which immediately suggests a death, in this case a spiritual one. Lorca's Newton wanders, hoping for another apple to fall:

Newton
paseaba.

La muerte lo iba siguiendo
rasgueando su guitarra.

Newton
paseaba.

Los gusanos roían
su manzana.

Sonaba el viento en los árboles
y el río bajo las ramas.
Wordsworth hubiera llorado.
El filósofo tomaba
posturas inverosímiles
esperando otra manzana.

Corría por el camino
y tendíase junto al agua

²⁸ Clearly, there are also ways to read this poem as an indictment of Protestantism's beliefs in predestination and the negation of free will. Lorca's description of Newton's "narices sajonas" would allude to this as well. The issue of religious doctrine in "Newton" is one deserving of further exploration, but indeed lies beyond the scope of the present study.

para hundir su rostro en
la gran luna reflejada.

Newton
lloraba.

(“El ultimo paseo del filósofo” vv. 1 – 20)

The mention of the Romantic English poet Wordsworth, an avid naturalist, and the construction of a setting in which nature plays such a large role, sets up an important contrast between science and the natural world that will continue into *Poeta en Nueva York*. The short verse “Newton / lloraba” strongly echoes the shortest verse in the bible: “Jesus wept,” establishing a connection between science and religion—if Newton cries, it is because he knows he has caused the death of an earlier type of knowledge, and he has sacrificed himself for a new way of being in the world. The negativity with which Lorca conveys this progression from innocence to knowledge establishes that the poet held science in great suspicion. “Newton,” in this sense, is very much the precursor to *Poeta en Nueva York*, where, as a *flâneur* amid the great mechanical Babylon, Federico García Lorca would denounce all that which came as a result of that last apple fallen from the Tree of Knowledge, the delayed cataclysm of Newton’s revelation.

The Inhuman(e) Metropolis: Lorca’s New York

Federico García Lorca’s poetic masterpiece *Poeta en Nueva York* represents a radical departure by the poet from the Edenic constructions of *gitano* culture, as well as from the dehumanized aesthetic of the *vanguardia*. There is really no disputing the fact that Lorca’s New York is filled with disturbing imagery in the vein of surrealism,²⁹ and as Paul Ilie asserts, “the surrealist word, whether parodic, distortive, or absurd, becomes the necessary reflector of a dystopic existence” (777). Lorca’s dystopia is one whose construction is based, at least in the large part, on his observations of the destructive tendencies and implications of technology and the vices it has engendered in the consumer of its supposed benefits to the “civilized” world. Whatever “dehumanization of art” that occurs in *Poeta en Nueva York* is meant, as Ilie suggests, to distort the image in such a way that the dehumanized symbology reflects a dehumanized—and inhumane—existence within the great modern metropolis. Juan Cano Ballesta in his work *Literatura y tecnología*, says of Lorca’s encounter with New York, that the poet had a complex, but distinctly negative reaction to the *gran urbe*:

Más que impresionado por el espectacular avance tecnológico de Nueva York, se muestra preocupado por su capacidad destructora. La atmósfera de armonía paradisíaca entre

²⁹ Yet like Alberti, the style appears to be “surrealistic” rather than “surrealist” due to the careful construction of both image and form.

hombre y naturaleza se ha disipado. La expansión industrial destruye y contamina el paisaje, mientras el sistema de explotación capitalista divide a los hombres en opresores y oprimidos... Lorca, lejos de los ingenuos cantos vanguardistas a la máquina, percibe con gran penetración las contorsiones y el desquiciamiento de un orden que arroja sombras amenazadoras sobre la humanidad. (269-70)

A plethora of literary critics have commented similarly on Federico García Lorca's antitechnological stance made abundantly clear in *Poeta en Nueva York*. Cano Ballesta's assessment is notable for his succinct analysis of the most basic themes of the work: cataclysm as a result of the triumph of the machine over nature, and the apocalypse that will come to exact revenge on a short-sighted, greedy and slovenly North American population. He writes:

La grandeza de *Poeta en Nueva York* radica en su genial visión profética de las catástrofes a que puede conducir la civilización industrial y tecnológica: destrucción de la naturaleza y el medio ambiente, contaminación, afeamiento del paisaje, ruptura de la armonía social, opresión del hombre por el hombre, alienación, sometimiento del ser humano al poder siempre creciente de la máquina y a los avances, a veces desastrosos, de la ciencia. Es la expresión de un mundo cuyas contradicciones, irracionalismo, incoherencia y absurdo se proyectan en la misma forma literaria, la metáfora y el lenguaje. La escritura misma ha roto con toda la tradición retórica y se ha convertido en decisión ética haciendo una poderosa y violenta denuncia del hombre tecnológico. (Cano Ballesta *Literatura y tecnología* 268-69)

A large portion of this criticism that projects a catastrophic future for New York finds its basis not in the frequent employment of technological vocabulary, but by providing a multiplicity of images of technology's antithesis, which is unspoiled and innocent nature.³⁰ Manuel Durán's essay "Lorca y las vanguardias" likewise suggests that *Poeta en Nueva York* possesses the Janus-faced attitude towards modernity that was discussed in the opening to this section on nostalgia and cataclysm as critiques of technology-based modernity.³¹ The poems that best demonstrate

³⁰ Richard Lionel Predmore remarks upon the paradoxical lack of technological vocabulary in a work that so blatantly indicts the modern world's abuse of technology for personal gain: "One might expect to find an abundance of technical and industrial vocabulary, but, although it is represented in some of the poems, it does not show any conspicuous frequency. Contrary to what might be expected, animal vocabulary is abundant... Without exhausting the list of fauna in *Poeta en Nueva York* it is probably safe to offer at least these generalizations about their function: Some of them are present to play now-familiar symbolic roles; some are present to convey such notions as evil or cruelty or the ultimate retribution that Nature will visit upon the unfeeling metropolis; sometimes the mere naming of them serves to suggest how much of Nature's realm is absent from the city." Richard Lionel Predmore, *Lorca's New York Poetry: Social Injustice, Dark Love, Lost Faith* (Durham, NC: Duke University Press, 1980) 52.

³¹ Durán points out that "[l]os romanos creían que las dos frentes, las dos miradas, del Viejo dios Jano eran precisamente lo que le proporcionaba su especial sabiduría: podía mirar hacia el pasado y también sabía predecir el futuro. Y así ocurre también con los poemas de García Lorca. Una parte importantísima de estos textos se centra en temas que no cambian, o que cambian muy lentamente. Es el mundo de la naturaleza, y también el mundo mental y mágico—y mítico—creado por los hombres pero arraigado en el mundo de la naturaleza, creado precisamente para explicar y relacionar las grandes fuerzas del mundo natural." Manuel Durán, "Lorca y las vanguardias," *Hispania: A Journal Devoted to the Teaching of Spanish and Portuguese* 69.4 (1986): 764.

this attitude (and the sharpest condemnation) are “La aurora” and “Nueva York (oficina y denuncia)”. Both of these poems display the contrast between nature and the technological presence that has defiled it. We shall begin with an analysis of “La aurora.”

“La aurora”: Dawn/Apocalypse

“La aurora” is a poem bereft of any hope—there is not a single image, not one verse that communicates the possibility of redemption for New York City and all that it represents for Lorca.³² The dark pessimism in the first two stanzas are representative of the rest of the poem, outlining the foundation for Lorca’s criticism of metropolitan life:

La aurora de Nueva York tiene
cuatro columnas de cieno
y un huracán de negras palomas
que chapotean las aguas podridas.

La aurora de Nueva York gime
por las inmensas escaleras
buscando entre las aristas
nardos de angustia dibujada.

(vv. 1 – 8)³³

The linear geometry and controlled architecture of New York is in conflict with the organic, chaotic forces of nature. What follows is an unmitigated portrait of despair for those who live amid the razor edges of skyscrapers and rotten waters:

La aurora llega y nadie la recibe en su boca
porque allí no hay mañana ni esperanza posible.
A veces las monedas en enjambres furiosos
taladran y devoran abandonados niños.

³² In this I am in disagreement with Heather Pratt, who in her article “New York, New York: Lorca and Cendrars” insists that the images of mud and silt are actually suggestive of the possibility of the redemption of the city through nature’s ability to reclaim the city for itself; thus “this transgressive incursion of nature into the city prophesies the imminent downfall of the latter’s tyrannical idealism, its reclamation by the soil and the restoration of a more humane regime: earthiness is invoked as an image of redemption.” While the idea of the reclaiming of the city by nature is quite clearly suggested, I find no suggestion of the “humane regime” that Pratt locates within the poem. However, the rest of her analysis focuses on how “the cataclysmic self-destruction of the city is foretold by the ‘huracán’, the ‘enjambres furiosos’, the ‘naufragio de sangre’; in all these disasters nature (the malevolent, embittered form of it that survives in the ‘nardos de angustia dibujada’) has a metaphorical part to play, but the latent allusions to flood and plague contribute, in addition, an overtone of biblical retribution.” Heather Pratt, “New York, New York: Lorca and Cendrars,” *The Modern Language Review* 82.3 (1987): 631.

³³ All citations of Lorca’s New York poems are taken from Federico García Lorca, *Poeta en Nueva York*, Colección Austral, ed. Piero Menarini (Madrid: Espasa Calpe, 1994).

Los primeros que salen comprenden con sus huesos
que no habrá paraíso ni amores deshojados;
saben que van al cieno de números y leyes,
a los juegos sin arte, a sudores sin fruto.
(vv. 9 – 16)

The absence of a future for the residents of New York, slaves to money, bereft of any sort of Edenic existence, condemned to the sterile world of numbers and laws, is a decidedly apocalyptic vision of a world without hope—and Lorca says so directly: “no hay mañana ni esperanza posible.” The poem concludes with an emphasis on the restrictions on human nature and nature in general imposed by the dominance of science and technology:

La luz es sepultada por cadenas y ruidos
en impúdico reto de ciencia sin raíces.
Por los barrios hay gentes que vacilan insomnes
como recién salidas de un naufragio de sangre.
(vv. 17 – 20)

Here, light itself is reined in by the rules and regulations of science, which indeed it was when Einstein discovered that the speed of light is the absolute limit of all velocities in the known universe. The “ciencia sin raíces” conjures the image of a completely inorganic field of study, rigid and disconnected from the realities of nature, cut off from the glorious unruliness of life itself. The “naufragio de sangre” depicts the innate vitality of the human race, sapped by the inhuman and inhumane metropolis. In the next poem, “Nueva York (oficina y denuncia),” Lorca extends the inhumanity of urban life beyond the physical punishments of insomnia and abandonment to include the dominance of death within the city—a force whose presence maintains the madness of the dehumanizing technocracy.

“Nueva York (oficina y denuncia): The City That Preys

And so it is with the poem “Nueva York (oficina y denuncia)” that Lorca finally offers a direct condemnation of the lack of ethics that characterizes New York’s day-to-day existence:

Todos los días se matan en New York
cuatro millones de patos
cinco millones de cerdos
dos mil palomas para el gusto de los agonizantes,
un millón de vacas,
un millón de corderos
y dos millones de gallos,
que dejan los cielos hechos añicos.
(vv. 16 – 23)

Juan Cano Ballesta rightly observes that the poem's dreadful list of the carnage implicit in daily life,

parece como si el poeta viniera de visitar una oficina de abastecimientos o tal vez acabara de leer en un periódico neoyorquino una estadística del consumo de la gran urbe. Fuertemente impresionado, escribe esta tremenda acusación contra la ciudad monstruosa. Es un mundo deshumanizado, reducido a cifras manchadas de sangre animal y humana. El poeta sabe que podría hablar de montañas y bellos paisajes, de magníficos espectáculos como el de las cataratas del Niágara, a las que alude. Pero no, él ha tomado una decisión ética. Lejos de todo escapismo, viene a denunciar la sangre que es preciso derramar a diario para mantener en funcionamiento la ciudad devoradora. (*Literatura y tecnología* 270)

The ethical stance of the poet is unequivocal: “No, no” he states. “Yo denuncio” (v. 64). He denounces the offices that order the slaughter of innocent nature, the city that wipes “los programas de la selva” (v. 68) from the surface of the earth. Predmore adds that in “New York (Oficina y denuncia),” “the poet contrasts the inhuman mechanization and commercialization of life in New York with the blood and passion of exploited living beings. Denouncing the exploiters and taking his stand with the exploited, he offers himself in the final verses as a sacrificial victim” (44):

y me ofrezco a ser comido por las vacas estrujadas
cuando sus gritos llenan el valle
donde el Hudson se emborracha con aceite.
(vv. 69 – 71)

Lorca provides the final condemnation here of the murderous metropolis, where the very earth upon which the city has been built and its surrounding waters are contaminated by both the cries of agonizing nature and the wasteful flow of oil into the increasingly unpleasant waters of the Hudson River. The machines that devour oil befoul the waters, and the river devours the waste of the city as a drunkard would endlessly take in the alcohol that poisons him. In the poem we hear echoes of earlier poems such as “Vaca,” which recalls the violent death of the animal and those drunks who “meriendan muerte” (v. 21) and “Navidad en el Hudson,” in which the poet exclaims over the river that it is indeed “¡Esa esponja gris!” (v. 1). The vivid image conjures up the devastation caused by human imperviousness to the environment, and the river that once gave life to the city becomes its refuse pit, soaking up the abomination of urban existence. Brígida Pastor concludes that the poem “puede interpretarse como la culminación de la visión profética y apocalíptica del poeta, constituyendo el fin de esa búsqueda de identidad en la ciudad moderna. Desde las primeras líneas de apertura del poema entramos en el mundo de los números, números que despersonalizan y deshumanizan” (47). It is the dehumanization of the city against which Lorca sets himself ethically speaking, against the injustices against nature, as well as the social injustices perpetuated upon the less fortunate, especially the blacks of Harlem.

Poeta en Nueva York ends with a celebratory piece, “Son de negros en Cuba” in which the poet returns to a more familiar world, where nature is still valued. He travels to Santiago “en un coche de agua negra” (v. 3), unable to quite rid himself of his personal contamination by the city. The image of the dance of *los negros* in Cuba stands in opposition to the dark visions of the blacks in Harlem, whose oppression Lorca could barely stomach, but whose presence form an intrinsic part of the apocalyptic vision that Lorca presents to the reader. C.G. Bellver aptly observes how Lorca assumes the role of one who represents the underserved, and whose condemnation of the tyrannical domination by white society contributes to the sense of cataclysm in *Poeta en Nueva York*:

Lorca, el portavoz de los seres abusados, asume un tono profético que presta un matiz de grandiosidad funesta a su protesta. *Poeta en Nueva York* implica un mensaje de posible salida del infierno mecanizado a través de horrendos cataclismos que precipitarán una purgadora destrucción del mal para reinstalar la utopía de la pasión primitiva y la emoción de la tierra. (546)

In the end, it is justice for which the poet is crying out—justice for a violated nature, and justice for the exploited and demoralized minority populations of the city. Lorca’s preoccupation with social concerns would not leave him upon his return to Spain, nor would his attention to the problems facing oppressed peoples. Projects such as *La Barraca* would bring theater to impoverished and undereducated audiences; the themes of the Rural Trilogy—repressed women and the ostracized *gitano*—as well as explorations of homosexuality in *El público* demonstrate the author’s commitment to awakening the awareness of the greater public to the sins of a society dominated by harsh divisions according to socioeconomic status. These divisions were made even more severe by the ability of the upper classes to acquire technology and apply it to create a life of leisure, sport and diversion. Thus, Lorca’s antitechnological attitude is one that is nostalgic for a time when such divisions were not reified in objects, and that also looks forward (via a cataclysmic rupture) to a return to the more “primitive” values of the natural world, in which a more egalitarian and utopian existence will come to dwell on earth, and the oppressed shall be released from bondage.

In the following section, we will examine a play that deals with such social issues, only not in terms of race or class, but rather the oppression of the infirm by a society which prized good health and marginalized to the extreme those who exhibited any sign of mental illness. Thus, we shall continue to explore the ethical axis between science and literature, and the rehumanization of art that began to gain momentum as the political tides in Spain also began to shift towards the left. However, it must be noted that if García Lorca attempted to right the wrongs of society through proclamations of the coming apocalypse, Valentín Andrés Álvarez did so through precisely the opposite tactic: that is, he did it through laughter and a celebration of the absurd.

Science and Madness within the Technocracy: Valentín Andrés Álvarez's *¡Tararí...!*

“*¡Tararí...!* y su autor”

¡Tararí...! (1929) was a *rara avis* in the Spanish theater. An avant-garde farce, unlikely by nature of its vanguardist tendencies to gain popular success, *¡Tararí...!* managed to find an audience beyond the élites of the *vanguardia*, arriving at one hundred performances in Madrid alone.³⁴ There is no mystery as to why the play was a national success, as it relies heavily on the humor quite naturally found in the absurd, the ironic, and the satirical. All of these are lightened by the play's setting, the *manicomio*, in which the serious concepts beneath the farcical antics are voiced through the mouths of *locos*, who, due to their incapacity for right reason, cannot be taken seriously at any point. However, the insane characters of the play, especially Don Paco, also embody the timeless archetypal qualities of the Fool who speaks the truth, but to whom no one listens, precisely because of his foolishness. The play's principal conceit—the rebellion of patients in an insane asylum and the carnivalesque inversion of identities—was not necessarily daring or innovative in itself, as the question of sanity vs. insanity is a trope that reached its apogee in the personage of Don Quijote. Perhaps it was due to this thematic, almost subconscious familiarity, that *¡Tararí...!* was able to attract the attention of the bourgeois theater-going audience, an audience whose predilection for the theatrical and the *espectáculo* has been called a “vice” by more than one critic.³⁵ Or it is possible that the play was, to the public of 1929, just plain funny.

A brief synopsis: within the walls of the insane asylum, the patients, led by Don Paco, rebel against their guardians; the initial act of rebellion is to place the PORTERO in a straightjacket. They then begin placing the administrators one by one in separate cells. The DIRECTOR enters, and as he is about to be taken captive, a VISITANTE appears, having come to visit his brother, a philosopher who has gone mad due to his own philosophizing. The injection of the VISITANTE at that precise moment, as Don Paco and the DIRECTOR are engaged in a negotiation of authority, allows for the first moment of uncertainty as to who are the genuine *locos* and *cuerdos*. Don Paco, in an effort to confuse the VISITANTE with regard to his sanity, manages to get him to question the very *reality* of the insane asylum, and his presence there.

VISITANTE: ¿Pero qué es esto, Dios mío? Yo que nunca he dudado de nada en este mundo, más que de la formalidad y del crédito de mis clientes, dudo ahora de todo. Dudo del Director, dudo de usted, ¡dudo hasta de mí mismo! (*Tararí* 184)³⁶

³⁴ These performances were held at the Teatro Lara, the Teatro Zarzuela, and the Teatro Alkázar. For further details see María Francisca Vilches de Frutos and Dru Dougherty, *La escena madrileña entre 1926 y 1931: Un lustro de transición* (Madrid: Editorial Fundamentos, 1997) 558.

³⁵ See José García Templado, *El teatro anterior a 1939*, Cuadernos de Estudio: Literatura, eds. F. Marcos Marín and Ángel Basanta (Madrid: Editorial Cincel, 1980) 10. This same vocabulary is later echoed in Chapter 5 of Andrés Amorós, *Luces de candilejas: Los espectáculos en España (1898-1939)* (Madrid: Espasa Calpe, 1991) 69-94.

³⁶ All citations are from the following edition: Valentín Andrés Álvarez, “Tararí,” *Vanguardia teatral española*, ed. Floriana Di Gesù (Madrid: Biblioteca Nueva, 2006) 184.

The VISITANTE's speech at the end of the first act demonstrates that after this confusing interaction with Don Paco, the young man has come to confuse his identity with that of his brother, and he willingly accepts his new status as madman, because it means his brother's wife "que a mí siempre me ha gustado tanto" is now his own (187). And thus ends Act One.

The VISITANTE goes on in Act Two to become the most insane of them all, and the most comic figure in a vaudevillian way, as he takes to climbing trees like the others, following his own now-uninhibited whims and desires, and eventually breaking his leg in a comic pratfall. Mostly, however, Act Two is dedicated to exploring the individual insanities of the patients, and the interaction between Don Paco and the ADMINISTRADOR, who has also been locked up along with the PORTERO, the VIGILANTE, and the DIRECTOR. Again, the outside world enters, this time in the form of a woman and her daughter, neither of whom are able to discern which are the true *locos* and the true *cuerdos*. The daughter is mildly assaulted by the pleasure-seeking VISITANTE, and the women leave abruptly, signaling that they are going to tell the authorities about the situation in the asylum.

In the Epilogue to the play, the outside forces—a NOTARIO and a COMISARIO—arrive, but are unable, just like the others, to divine who the real madmen are. The pleas of the *cuerdos* are so panicked that they seem insane, and Don Paco, the epitome of calm and apparent Reason, is easily taken for the DIRECTOR of the *manicomio*. In a scene of much confusion, the COMISARIO is called upon to make the final judgment of character. The VISITANTE injects himself into the discussion, and, pointing to their faces stricken with horror, condemns the *cuerdos* as being the truly ill ones. As the curtain falls, the NOTARIO protests loudly, and Don Paco offers him the sage wisdom of one who knows all too well the rules of the madhouse:

DON PACO: Tranquilícese, hombre, tranquilícese y óigame un consejo: le tiene a usted más cuenta ser de los pacíficos, porque si no le pondrán la camisa de fuerza. (211)

Another trumpet is heard (*un tararí*) and the play ends on this note of comic irony, with Don Paco advising his "patient" not to protest the established order. The inversion of identities is complete, and, apparently, the audience has enjoyed a good laugh at the expense of the imprisoned authorities—a cathartic gesture, possibly, in the twilight years of the dictatorship of Primo de Rivera.

A review in *La Gaceta Literaria* describes the appeal of *¡Tararí...!*: "‘¡Tararí...!’ es una obra de humor. Más aún: de buen humor. Contagiosa y persuasiva, su hondura proviene simplemente de su gracia y su gracia deriva de la sagaz hondura de su ideal realidad" ("‘Tararí’ y su autor" 5) This was part of a brief prologue to a short interview with author Valentín Andrés Álvarez, the man who, according to Ortega, "siempre está dejando de ser algo."³⁷ When the interviewer inquired as to what Andrés Álvarez would do after the success of *¡Tararí...!*, the playwright replied with characteristic uncertainty and modesty

³⁷ Javier Vallejo, "Actrices con libertad vigilada," *El País* 24 March 2007.

No lo sé. Ahora voy a Asturias, mi tierra natal, a descansar quince días y a hacer examen de conciencia. He intentado y probado tantas cosas en mi vida que, francamente, no sé todavía por cuál me decidiré; ignoro si seguiré el teatro o emprenderé un camino distinto y una actividad nueva. No sé nada. (“‘Tararí’ y su autor” 5)

In the case of *¡Tararí...!*, the author’s background in physics and mathematics is significant in that it provides a form of insurance that whatever science may appear in the play, it will not be a baseless representation of the topics discussed. In the 1920s, the popular interest in scientific topics, particularly in physics, was widespread, as previously noted. Numerous books and magazine articles popularized extremely complex topics in the hard sciences, giving the illusion of putting them within easy reach of the common, bourgeois reader. Frequently, the reader would thus gain a false sense of understanding complicated topics such as relativity or quantum mechanics, no matter how adequate the popularization. Or, alternately, these new concepts were construed as the epitome of incomprehensibility, a factor played upon by Spanish humorists.³⁸

In the case of Valentín Andrés Álvarez, humor was not so clearly based in the comicality of misunderstanding, or in the extreme unintelligibility of the scientific subject matter. However, the fact that the discussion of science comes not from the *cuerdos* but rather from the *locos* offers a nod in this direction, the implication being that only the insane can truly understand the unreasonable level of complexity of relativity theory, for example. But there is an underlying seriousness to Andrés Álvarez’s use of the sciences that transcends the glib formulations of other Spanish humorists: he is keenly aware that art, ideology, and science exist within the same sphere, and frequently mediate each other’s interests. Through the use of farcical comedy, the author is able to highlight how the conjunction of these three major forces was contributing to the modernization of Spain. Yet he also appears to suggest that perhaps, beneath the overwhelming pressure of political ideology, such modernization, with special regard to the interaction of science and power, was not entirely benign in nature. In this sense, *¡Tararí...!* constituted a subtle warning about the ways in which the world was changing in 1929, and asked the audience to question who indeed was in control: *locos* or *cuerdos*?

Progress, Capitalism, and the Trope of the Mad Scientist: Narratives of Modernity

In the work *Madness and Civilization*, Michel Foucault lays down a subtle distinction between madness—the realm of unrestrained animality and the darkest parts of nature—and unreason, the absence of a logical warp and weft in human thought. It was after the Enlightenment that madness and unreason became indistinguishable from each other, and with the ensuing birth of psychology, pathologized.

³⁸ According to Glick, “Literary humorists typically produced jokes that were plays on the incomprehensibility of mathematics, and on space, time, gravity, or other specific elements in relativity theory.” Glick, *Einstein in Spain: Relativity and the Recovery of Science* 287.

When... this great experience of unreason, whose unity is characteristic of the classical period, was dissociated, when madness, entirely confined within a moral institution, was nothing more than a disease, then the distinction we have just established assumed another meaning; what had belonged to disease pertained to the organic, and what had belonged to unreason, to the transcendence of its discourse, was relegated to the psychological. And it is precisely here that psychology was born—not as the truth of madness, but as a sign that madness was now detached from its truth which was unreason and that it was henceforth nothing but a phenomenon adrift, *insignificant* upon the undefined surface of nature. An enigma without any truth except that which could reduce it. (Foucault *Madness and Civilization* 198)

It is interesting to note that in *¡Tararí...!* there appear no doctors or psychologists who attempt to cure their patients; this absence is highly suggestive of a society that still had not developed a rigorous scientific method for psychological evaluation. The ineptitude of treatment resolves itself in a single image—that of the straightjacket, which Don Paco proclaims should be used “Sólo en el ultimo caso. La camisa de fuerza debe de ser solo un símbolo... ¡Un símbolo!” (181). The final line of the play, as mentioned above, before the last sounding of the trumpet, is of Don Paco calming the converted, former *cuerto*, now under the direction of the “cured” former *loco*, Don Paco, warning him that the straightjacket is much more than a symbol—it is power itself.

Don Paco exhibits knowledge of the workings of power within the societal microcosm of the insane asylum, in the same way that every good revolutionary must know the enemy. Don Paco gives every appearance of sanity, so much so that his confinement within the *manicomio* seems to be just as unreasonable as the manias exhibited by his fellow inpatients. So what is Don Paco’s brand of madness/unreason? In a lengthy monologue in the middle of Act One, we learn that Don Paco is a mathematician whose crime of insanity was to rebel against the “*grandes verdades*” of science and create a system of truths to his liking. His reason for the invention of a new mathematical system was due to his realization that the main tenets of mathematics and science had their basis not in reality, but in the mercantile system: science, according to Don Paco, upholds commerce and can therefore not be questioned. Should it be questioned, or overturned, the world would collapse from lack of regulation. Don Paco’s personal mathematics is a quest for truth, but he recognizes his own *quijotismo*. At the end of his declaration of belief that geometry had been invented not by Euclid, but by landowners in Egypt to divide up their lands, he states that mathematics was created by businessmen for the purposes of commerce, not as a part of a greater pursuit of knowledge of the world:

DON PACO: Y ahora es cuando yo reconozco que la industria, el comercio, las deudas, las ganancias y las rentas dependen de principios que es menester mantener firmes. Aunque parezca mentira, todo principio, todo teorema, toda verdad científica tiene, más o menos remotamente, relación con las pesetas que uno lleva en el bolsillo. Por eso las grandes verdades han de ser incommovibles y a quien las ataca hay que tenerlo por loco... por si acaso... Las grandes verdades tienen que ser sagradas porque, amigos míos, además de verdades... son pesetas. (179)

The conjunction between science and ideology (here, capitalist ideology), in general terms creates narratives of progress, and frequently amplifies the importance of technology in every aspect of daily existence. Don Paco's ability to question this mechanism results in his confinement. In literary terms, Don Paco plays the role of the Fool, pointing out a truth that no one is willing to see or address. It is only the extremism in his views—creating his own calculus to find out where he had been cheated monetarily by commercial enterprises and landlords and demanding restitution—that earns him his insanity. To accentuate the aspect of Unreason in Don Paco, whose madness contains a grain of truth, the author offers a foil for his character, in the form of yet another scientist who is certifiably insane. If Don Paco's mania is to defy the laws of economics, which are bound by human interest, "LOCO 4" earns his diagnosis by disbelieving the very laws of nature, over which no human has any power.

LOCO 4: Yo había inventado el movimiento continuo. Las máquinas iban a moverse solas. Como ganaría así muchísimo dinero, lo repartiría en grandes cantidades. Bueno, pues, a pesar de desearlo tanto, no me dejaron. Jamás se atropelló a nadie como a mí... A pesar de que toda la Física afirma lo contrario, las máquinas iban a moverse solas.

DON PACO: Ya ves. ¿Cómo te iban a permitir los físicos que echaras abajo sus ciencias y los industriales que arruinaras sus fábricas, montadas todas por el régimen antiguo? Tenían que encerrarte en seguida, para proteger tantos intereses. (177)

It is after this exchange that Don Paco gives his reasons for being in the asylum, as described above. The contrast between the two characters is stark, but retains a common thread, which is that of the trope of the so-called "mad scientist."

Conclusion: *Metropolis*, the Mad Scientist, and Modernolatr

The mad scientist motif has an extended history, but took on added weight with the coming of the Industrial Revolution and its consequent push for new technologies in the 18th and 19th centuries. Calls for modernization as these new technologies changed and shaped the traditional way of life in Europe and the West led to massive ideological conflicts, as science replaced religion as the overseer of society. Thus it is not insignificant that in May of 1927, in *La Gaceta Literaria*, there appeared a review by Luis Buñuel of one of the latest films to emerge from Weimar Germany, Fritz Lang's *Metropolis*. Now famous as one of the masterpieces of early cinema, *Metropolis* betrayed the deeply-felt misgivings within German culture towards the growing importance of technology. The vehicle for the communication of this angst was the character Rotwang, the scientist who creates an android version of the ideal woman, tampering with the order of nature. More importantly, though is that Rotwang employs the android "Maria" to mislead the working classes and tempt the ruling classes, bringing about strife between classes that threatens to bring the city to the brink of apocalypse. Thus, the perceived potential for malfeasance that Rotwang embodies hinged on not only the possibility for the scientist to

manipulate nature, but also of his capacity to disturb the established societal order, an idea that was perhaps even more unsettling during the 1920s and 1930s as the struggle for dominance among the conflicting ideologies of fascism, communism, and democracy showed signs of threatening to destabilize the Western world. The figure of Rotwang and his filmic precedent, Dr. Caligari, demonstrate the growing mistrust of the powers of science. The basis for this mistrust comes from a naïve perception of “good” and “bad” science. As Richard Murphy notes, “it is through this dichotomy that modernity’s uneasy relationship to technology, science and ‘administrative reason’ is explored and played out against earlier forms of rationality,” in films like *The Cabinet of Dr. Caligari* and *Metropolis* (212).

The early 20th century, with its many scientific “revolutions” all contributed to a collective sense of vertigo as society rushed into a new world of unknown and mysterious forces that appeared to overturn the “*las grandes verdades*” of classical knowledge. The figure of the mad scientist in literature and film was the expression of societal unease at the potential for misunderstanding, destruction, abuse of power, and general malfeasance that these new discoveries had injected into their daily lives. Also disturbing to the populace was the fact that, whereas classical science had stayed within the intellectual grasp of the common man, the new physics and mathematics were so impenetrable and complex that they required interpretation by third parties, in the form of popularizations. But could these popularizations be trusted to communicate the truth in the power of these new formulations? Or would the populace be at the mercy of those select few who understood the esoteric formulae? This was an entirely new way of wielding power, and it was frightening for many; it is therefore not surprising that the cultural establishment would provide an outlet for the doubts and misgivings about the new technologies pervading modern life.

As Juan Cano Ballesta notes, the appearance of *Metropolis* in Spain was a significant moment for the avant-garde, and around 1928, marked a turning point in the general artistic disposition towards “modern marvels.” He writes that *Metropolis*,

tan llamativa y espectacular por sus efectos especiales, había sido... un fuerte revulsivo para la conciencia de la época al plantear abrumadores problemas de la civilización moderna dándoles gran difusión en las pantallas: poder amenazador de las masas, manipulaciones del capital, difusión de la conciencia de clase, y sobre todo el fantasma del poder esclavizador y destructor de la máquina, que como el dios caníbal Moloch exige sacrificios humanos... Grandes poetas, algunos de los cuales habían entonado beatíficos himnos a la máquina, sucumben a la desilusión y el desencanto ante las consecuencias de la industrialización y las convulsiones históricas de su tiempo. (Cano Ballesta *Literatura y tecnología* 28-29)

However, if we are to take *Metropolis* as emblematic of an antitechnological trend within the West, how do we interpret Buñuel’s *canto a la máquina* in his review of the film?

¡Qué arrebatadora sinfonía del movimiento! ¡Cómo cantan las máquinas en medio de admirables transparencias, arcotriunfadas por las descargas eléctricas! Todas las cristalerías del mundo deshechas románticamente en reflejos llegaron a anidar sobre el

moderno canon de la pantalla. Cada acérrimo destello de los aceros, la rítmica sucesión de ruedas, émbolos, de formas mecánicas increadas, es una oda admirable, una novísima poesía para nuestros ojos. La Física y la Química se transforman milagrosamente en Rítmica. Ni un momento de éxtasis. Incluso los rótulos, ya ascendentes y descendentes, giróvagos, deshechos luego en luces o desvanecidos en sombras, se unen al movimiento general: llegan a ser imagen también. (Buñuel 6)³⁹

One answer is to recall that while in Weimar Germany antitechnological themes had a meaningful presence in film and literature—most likely due to the fact that the Great War had traumatized the national conscience directly, in the form of poison gas, machine guns, airplane reconnaissance, and tanks—in Spain this was not the case. Spain had not experienced the piling up of four years worth of corpses and coffins which would have led to a similar disillusionment with the technology at the root of such mass casualties. Instead, the early Spanish vanguard found inspiration in Italian Futurism, whose celebration of war was largely aesthetic.⁴⁰ The *ultraísta* movement was slow to wear off in Spain, and the *himnos maquinísticos* continued well into the 1920s. However, when the antitechnological sentiment arrived it did so with stunning ferocity, as we have seen over the course of this chapter through the works of poets such as Lorca and Alberti. Buñuel’s review sits on the cusp between these two moments in modern Spanish cultural history—a turning point during which artists were contemplating both the beauty of the machine (and science in general) and the horror of its implications for society and the natural world.

This is the continuum that we have explored in the last two chapters: how the laboratory of literature and ethical neutrality eventually ceded to a nostalgic-cataclysmic duality that contemplated lost worlds in the face of the technological menace to earlier modes of thought and being. It is ironic, if not entirely disconcerting, to contemplate the “innocence” with which so many poets praised the wonders of modernity when, not many years later, the populace would finally experience first-hand the nightmare of technological warfare when the machines of mass-murder finally appeared on the Iberian Peninsula.

³⁹ Luis Buñuel, “Metrópolis,” *La Gaceta Literaria*.9 (1927): 6.

⁴⁰ de Torre, *Literaturas europeas de vanguardia* 239-68.

Conclusion: Science, Culture, Ideology

In the preceding pages, I have endeavored to make clear one basic assertion: that science during the 1920s and 1930s in Spain was not an isolated academic enterprise, but rather was an active presence in a variety of cultural discourses, from the purely aesthetic pursuits of the *vanguardia* to the social and philosophical essays propagated by the ongoing process of modernization and/or Europeanization. Science and culture were deeply intertwined as Spain struggled to assume a modern identity within Western civilization, where it had arguably languished in its development. In other words, science was perceived by the educated public as being a component of the cultural apparatus that inspired new directions in literature, art, and cinema. Its conversion into a cultural enterprise was accomplished through its popularization in written form, in particular in magazines such as *La Gaceta Literaria* and the *Revista de Occidente*, but also through series of books, such as José Ortega y Gasset's *Biblioteca Ideas del Siglo XX* and the associated publishing house of the *Revista de Occidente*. But wide dissemination of scientific ideas also occurred by word-of-mouth in the *tertulias* and cafés of metropolitan Spain, as well as through the popular seminars and presentations by well-known scholars at places such as the *Ateneo de Madrid* and the *Residencia de Estudiantes*, which was a veritable breeding ground for the multiple talents that would emerge to form the voices of the so-called Generation of '27.

Thus, science transcended its academic boundaries, subject to public opinion and also the agendas of intellectuals who would bring the new discoveries into popular parlance. Editorializing about science, technology and its consequences was not uncommon, either in periodicals or, as we have seen, through the literary voices of the era who presented frequently bitter criticism about the perceived dystopia that was emerging as a result of the growing importance of *técnica* in daily life. The assertion, therefore, that science was rarely construed as a neutral phenomenon, has gradually presented itself over the course of the first three chapters. Chapter One, "Spanish Science from the Enlightenment to the Civil War," gave a narrative of the troubled history of science in Spain during the 18th, 19th and 20th centuries as a way of providing an historical foundation for the discussion of scientific content in the *Revista de Occidente* and *La Gaceta Literaria* in Chapters Two and Three, respectively. The second chapter, "The *Revista de Occidente*, the New Physics, and Spain's *Edad de Plata*" described the platform and content of the *Revista de Occidente* and its founder, José Ortega y Gasset—an intellectual devoted to the mission of bringing Spain back into Europe's scientific mainstream. The third chapter, "Zones of Contact—Science as Culture in *La Gaceta Literaria*" explored the importance of that publication in pairing science with avant-garde literature and disseminating scientific information within a specifically nationalist agenda, demonstrating the non-neutrality and manipulation of science according to political aims and goals.

With regard to the political aspect of the inclusion of science in cultural venues, while the *Revista de Occidente* was cautiously reserved about national and international politics, *La Gaceta Literaria* promoted the principles of its founder, Ernesto Giménez Caballero, a voice of extreme right-wing fascism from 1928 on. For Giménez Caballero, the political ideology that

could bring about a stronger Spanish state was, ideally, totalitarian fascism. The *Gaceta*'s main science writer and philosopher Ramiro Ledesma Ramos did not disagree, and the significance of his participation in the *Gaceta* cannot be understated—his articles engaged the polemic of mediating science by ideological leanings. It is significant that he left *La Gaceta Literaria* in 1931 to found his own magazine, *La Conquista del Estado*. From there, he went on to be one of the initial members of the J.O.N.S. (*Juntas de Ofensiva Nacional-Sindicalista*), which later became a part of Spain's fascist party, the *Falange*. The frequent occurrence, therefore, of Ledesma Ramos' contributions to *La Gaceta Literaria* cannot be viewed as being politically neutral, and with that judgment, we are urged to view the greater phenomenon of the pursuit of scientific knowledge from a similar standpoint. The original affinity that we perceived between science and culture in *La Gaceta Literaria* soon became a tight triangulation of science, culture and politics as the nationalist element grew progressively more pronounced.

Consequently, it would be fruitful indeed to question what type of discourse this particular constellation of interests and ideologies was effecting for the nation. The most direct answer is that these were dialogues about the shape/shaping of Spain's brand of modernity, tumultuous in its development, and cannot be easily reduced to binaries like dehumanization vs. social engagement or *pureza* vs. collective action. Nevertheless, it would be worthwhile to extend the literary analyses of Chapter Four, "Literature as Investigation and Discovery," and Chapter Five, "Maleficent Modernity," beyond the antithesis of those authors who embraced science in their work and those who critiqued it through their writings, to ask how said acceptance or rejection reflected the ideological currents of the period and the historical circumstance in which the authors were writing.

It is certain that the literary venue was being employed in order to explore the societal and political problems facing Spain as a nation during the 1920s and '30s—this is indeed no new trend, and not particular to Spain. However, the usual blend of discourses that include both politics and literature is rather altered when the one of the main vehicles that represents the essential controversies to the reader is a scientific image, metaphor, or conceit employed for dramatic effect. Case in point: In September of 1923, in the third issue of the nascent *Revista de Occidente*, there appeared a short story by Corpus Barga titled "El amigo del hombre" that embodies the dynamic described above, in which scientific themes and images serve as the mediator of the interaction of literature and politics, the means through which the narrative comes to illustrate the tensions brought about by the confrontation of cultural and political ideologies. It begins on a mysterious, even sinister note:

Marchaba nuestro amigo por la carrera del Observatorio, desierta y en tinieblas. El reloj daba las tres. Pero nuestro amigo estaba en el secreto: no se sabía qué hora era. Haría—¿cuánto tiempo?—que el Sol había hecho su última puesta. La censura de los astrónomos había decidido ocultar esta duda al pueblo para evitar mayores trastornos planetarios. Era la noche de San Juan y hacía frío.

Nuestro amigo, como astrónomo de tercera clase, estaba movilizado en el servicio de los que buscaban la Luna. Justamente, la desaparición del satélite irredento y de todos los planetas fue la primera sospecha de haberse apagado el Sol... (Barga 155)¹

The sun has disappeared, extinguished—the cataclysmic event has finally happened, the apocalypse has come. The scientists are in pursuit of the moon and other celestial bodies that would reflect the sun’s rays and point their way towards the missing star; however, the accurate measurement of time—though the mechanical clocks continue to tick and toll the hour—has become impossible due to the absence of the natural rhythms of night and day. The astronomers, privy to the knowledge that the “real” hour is unknown to them, as a means of protecting the public from a collective panic, hide this fact from the populace. As the world dims and a perpetual darkness overwhelms the Earth, the scientists then take it upon themselves to search for another sun with which to ally their planet. Quickly, they divide into groups that differ on what such an alliance would mean:

Toda hipótesis era posible y toda sospecha, legítima. No faltaba astrónomo nacionalista para considerar con orgullo que la Tierra se hubiese quedado cabeceando sola y loca entre tinieblas. El nacionalismo los llevaba a otros astrónomos a considerarse rebajados en un sistema planetario sin alumbrado público. Se llegaba a examinar la posibilidad de nombrar un sol nuevo. Sonaba para tan alto puesto el nombre de Sirio. Se trataría de estrechar las relaciones de la Tierra con ese astro, reconociéndole como rey y obteniendo, en cambio, la penetración pacífica en la órbita. Los viejos astrónomos republicanos se oponían a la nueva alianza, ya que eran opuestos por principio a la monarquía de astro alguno. Apoyándose en las circunstancias presentes, señalaban los peligros del poder absoluto, negaban el absolutismo de la luz y, para democratizar el poder luminoso, preconizaban, en lugar de una bombilla, varias; en vez de un sol, una república de soles, una constelación, aunque fuera la Osa Mayor, y no un astro rey... Ante la gravedad de los acontecimientos, el Fascio central de los astrónomos, considerando que el rapto del Sol nacional debía achacarse a un complot de los enemigos de la patria, deseosos de empañar la gloria de la tierra del Sol, disponía, entre otras medidas rigurosas, la movilización de las aviaciones militares. Así fue comunicado, con el secreto debido y para los efectos consiguientes, a las cancillerías diplomáticas y demás centros de espionaje.

Nuestro amigo era astrónomo de tercera clase y espía. (156)

Though the rest of the short story has more to do with human charity and moral stature than with astronomy—the tale ends with the sun’s reappearance as the third-rate astronomer-*cum*-spy returns home to see his wife’s lover departing after the long night’s pleasures, indulging in “el adulterio tradicional” (164)—the author lays the foundation for an exploration of the power of science, and its connection with political ideologies, via the creative medium of fantastical literature.

¹ All citations from Corpus Barga, “El amigo del hombre,” *Proceder a sabiendas: Antología de la narrativa de vanguardia española 1923-1936*, ed. Domingo Ródenas de Moya (Barcelona: Alba Editorial, 1997).

As a work of fiction, “El amigo del hombre” is a muddled mess of conflicting narrative threads that vacillates between the exploration of an apocalyptic event² and the complex dynamics of interpersonal relationships among strangers and bedfellows. As a document, however—and as a reflection of popular attitudes towards science—Corpus Barga’s story reveals the mistrust and suspicion with which popular attitudes held science at the time of its ascent. Scientists were the secret-keepers who, under certain circumstances, could wield more power than any source of traditional authority. The allegorical overtone of the narrative allows for an imagining of the potential relationships between science and power, and reflects harshly on the polarization caused by the frequent unreason of competing political ideologies, as we can see above in the ridiculous juxtaposition of “nationalist” and “republican” astronomers battling over how to ally the earth with its cosmic neighbors.

“El amigo del hombre” witnesses the early stages of science fiction in Spain, a genre naturally given to the depiction of utopian and/or dystopian visions of society, employed by [the] authors in order to explore the prospective outcomes of contemporary scenarios—political, technological, historical, etc.—when exposed to heightened, unusual circumstances.³ In this case, the disappearance of the sun—an object that embodies all the qualities of predictability, regularity, authority (in a temporal sense), and vitality (in a biological sense)—is the extreme circumstance that allows for an oblique, semi-comic, and satirical representation of the foibles of political ideologies. The critique of both Right and Left, of traditionalism and liberalism, is not hidden from the reader, but it is made both palatable and entertaining by the way it is couched in a fantastical narration. The literary form permits a different kind of political discourse, and the indirection of the story’s quasi-scientific conceit allegorizes the quotidian tensions of partisan politics and elevates them, with tongue in cheek, to a cosmic level. The conjunction of science and literature, in this particular case, is a means by which the author was able to comment on his historical condition—the futility and absurdity of political life—through an equally absurd fictional apparatus.

Science fiction was and still is an ideal mechanism by which to ironize and satirize, as well as allegorize, political controversy and social conflict; its growth as a genre throughout the 20th century is surely not coincidental, as those years were a time in which science became entangled with the historical narratives of warring nations, and art became both active in and witness to their deadly dance. It is my assertion, therefore, that when we discuss the relationship between science and literature—either within the confines of the genre of science fiction, or in literary works that avail themselves of scientific images and metaphors—we must also include in our discussion the various political ideologies that existed contemporaneously with the historical context of the work in question. To restate the principal deduction of this present study—science

² The short story would later be given the new title of “Apocalipsis o el amigo del hombre,” emphasizing the importance of the new eschatological consequences of science.

³ Anglo-American critic Carl H. Freedman cites Suvin Darko’s study *Metamorphoses of Science Fiction* when detailing how the quintessential characteristic of the genre of science fiction is a species of estrangement engaged in a dialectic with cognition: “[estrangement]’ refers to the creation of an alternative fictional world that, by refusing to take our mundane environment for granted, implicitly or explicitly performs an estranging critical interrogation of the latter.” Carl Howard Freedman, *Critical Theory and Science Fiction* (Hanover: Wesleyan University Press : University Press of New England, 2000) 16-17.

is not a neutral phenomenon; for all its claims of purity, “pure science” and the pursuit of knowledge is not possible in the modern age without the backing of one authority or another, and these with their own objectives. Thus, when we consider the representation of scientific themes or images, we must also take into account what those representations are communicating about ideological stance, and determine whether a critique is being made, who is being critiqued, and to what end. The triune configuration of art, political ideology and science produces a reading of history that is nuanced and inclusive, where literature and culture are no longer mere diversions or artifacts of other discourses, but active participants in the creation of *la actualidad* with all its implications for society, for government, and for history.

Many questions remain at the end of this discussion of science and literature, and most have to do with the problem of the power(s) that have pushed science to the forefront of our world’s ideas of progress. Future avenues of investigation could address the following issues: Firstly, what, for example, is the relationship between science and power and how does it specifically relate to artistic production? An investigation of art as a critique of and/or commentary on the relationship between science and power could lead to the positing of a process in which progress in the sciences instigates a parallel movement in artistic novelty, specifically within avant-garde movements. Also with regard to artistic production, consequently, we could ask what role art plays in exposing the ethical considerations that science must address as a discipline, along the same lines as those which we examined in Chapter Five, wherein literature serves to draw attention to the dystopian/utopian dialectical visions of the consequences of scientific development. Following this, a series of questions that beg thorough examination and possible theorizing, such as: how does art draw attention to the consequences of science-as-power? How does art reflect the power relations between science and state? What are the implications for institutions of authority? And finally, how does art contribute to the burgeoning technocracy? To wit: how does art wield its own power as a potential mediator of science and political ideologies?

These are very broad issues that could be addressed in a variety of historical and geographical contexts. The theme that unites all of these possibilities for future studies is the ongoing polemic of modernity; what’s more, pursuing the aforementioned areas of discussion would also allow us to discover the meaning of our own time, this new species of existence that has arguably transcended modernity and even postmodernity. However, only by examining the past and the roads that brought us to this strange moment in history can we begin to formulate a means for defining the present.

It was precisely this task—the definition of the present moment—that engaged philosophers, politicians and artists in Spain in the 1920s and ’30s. With the onslaught of *lo nuevo* creating a protean *actualidad* for an alternately eager and fearful public, it was necessary that the intelligentsia assume the project of theorizing the present. However, in the case of the early 20th century, this was accomplished by effecting a definitive break with the past century, and through a process of definition of the present at first in negative terms: what the 20th century was not, as opposed to what the 19th century had been. One of the decisive elements in the rupture between the 19th and 20th century ways of being was the rise of science and technology. It would behoove future theorists of historical narratives to consider how the conjunction of art and science reflected these narratives of disjunction and contributed to their advancement. The

current study has been an attempt to lay the foundation for such work through the positing of an apparent connection between avant-garde artistic movements and the great revolutions in the New Physics, taken as representative of the scientific disciplines that added to the (mis)understanding of modernity, and with the awareness that biology, psychology, and medicine all played tremendous roles in the history of 20th century. A projected expansion of the scope of this project in the direction of other scientific fields will take into account the human element and seek to shed more light on the social realities of the past and their implications for the future.

In closing this discussion I am mindful of the fact that, as in quantum physics, we cannot directly observe the past. What we see is defined by the lens we use to view our subject. While we do not “disturb the system”—an impossibility since the past is a static entity—our desire to understand the forces that shape our present reality is driven by the specific agenda(s) of the observer(s), and therefore, as in the case of scientific knowledge, is neither neutral nor pure. We must therefore proceed with caution; yet we must always persist in our quest to understand the powers that have created, continue to create, and will in the future continue to create an ever-shifting, elusive actuality—the one that we live from day to day, mysterious in that our comprehensive “reality” never ceases to be completely relative to the observer, and the myth of the absolute has been permanently overthrown as a result of the advent of our freshly-established, globalized technocracy. What the poets will have to say about this new world in which we live will be a lasting testament to the fact that art, literature, human creativity in general is the ultimate witness to the power structures that both permit and negate our very status as subjects within our own circumstance.

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