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Shapiro, Hailey Lyn

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UNIVERSITY OF CALIFORNIA
SANTA CRUZ

**THE POTENTIAL OF ART AND PERFORMANCE IN A
PEDAGOGICAL SETTING**

A thesis submitted in partial satisfaction
of the requirements for the degree of

MASTER OF ARTS

in

THEATER ARTS

by

Hailey Shapiro

June 2015

The Thesis of Hailey Shapiro
is approved:

Doctor Michael M. Chemers, Chair

Professor James Bierman

Professor Kimberly Jannarone

Tyrus Miller
Vice Provost and Dean of Graduate Studies

TABLE OF CONTENTS

I. Abstract.....

II. Pedagogy Essay.....

1. Introduction: Illegitimate Separations

2. Theory: An Unsung Kinship

3. Birth of Stars: Putting Theory Into Practice

4. Reception: Furthering the Discourse

5. Reflection: Moving Forward

6. Conclusion: A Call to Action

III. Appendix.....

1. Casebook.....

IV. Works Cited.....

THE POTENTIAL OF ART AND PERFORMANCE

IN A PEDAGOGICAL SETTING – BY HAILEY SHAPIRO

ABSTRACT:

Through an examination of the UCSC production of *Birth of Stars*, this thesis investigates the potential of performing arts as a pedagogical tool, the relationship between art and science, and the potential they hold if utilized together to gain a better understanding of the human condition and the universe around us. The project consists of two parts: a dramaturgical casebook for the UCSC production of *Birth of Stars* and a thesis that documents my process working on the show as a dramaturg. The show joins a repertoire of productions confirming the importance of performing arts disciplines as viable approaches towards a greater understanding of the human condition and the world we inhabit. It also illustrates how artistic performance can have pedagogical success, making difficult content an audience may not be familiar with easier to understand and learn about. This thesis has found that art is a necessary, yet underutilized, exploration for knowledge and learning that is just as influential and crucial to one's education as are the sciences.

1. INTRODUCTION: Illegitimate Separations

When examining disciplines within the field of the arts, in the context of an academic setting, artistic enterprises can be compared against events within the realm of scientific discovery. This comparison underscores an unnatural separation of two differing, yet comparable, methods for discovery and learning, causing dissonance for many creative thinkers who would benefit from an intermixing of the two. The University of California Santa Cruz theater department put on a production of the new play, *Birth of Stars*, in November 2014. I worked on the show as the dramaturg, and this thesis is based on an examination and analysis of my work on the production as well as further research and expansion of the ideas examined within the play. This thesis argues that the artistic profession employs an alternative approach to exploring the natural and perceived world that is just as fundamental to one's education as the sciences. Through an examination of the UCSC production of *Birth of Stars*, this thesis investigates the potential of performing arts as a pedagogical tool; the relationship between art and science; and the potential they hold if utilized together to gain a better understanding of the human condition and the universe around us.

2. THEORY: An Unsung Kinship

In *The Everyday Work of Art*, Eric Booth describes how “in Paleolithic times, art was a life-essential, right up there with food, water, shelter, sex, sleep, and worship” (13). Booth goes on to explain how art was a social norm so integrated into daily life that it did not even have a name. Humans learned how to live in society and the best ways to function through the practices and exploration of art. Art began to be viewed as a distinct discipline in ancient Greece, and, Booth argues, “we have been arguing about art ever since and still never have set a good definition” (13). For the Greeks, argues Booth, art still maintained an intrinsic connection with the mysterious and spiritual impulses. Throughout the centuries, this association has been lost, and many people no longer have habitual connections with art in their day-to-day lives; it came to be that “art was not viewed as a critical tool for connecting to the most important things in life, nor as a means to teach and develop understanding about how society should be and how we should be in society” (14). In modern times, art, according to Booth, has become separated from everyday life, something that would be done by the talented few and “too expensive for all but the privileged” (14).

The most current of this type of correlation is rooted in a controversial comparison between the arts and science that has negatively influenced their relations within the academic scope since the late 1950s. It is a modern perception that sets the disciplines of art and science as wholly separate fields with no influence on each other. Gregory McNamee, writing in 2001, isolates a particular landmark incident in this perception: a 1959 Cambridge lecture by the writer and scientist C.P. Snow, during which Snow

lamented that the postwar emphasis on intellectual specialization had created ‘two cultures’--the scientific and the artistic. As a result, Snow argued, scientists were not equipped to understand the problems of literature or the humanities, while literary scholars and artists could not fathom what their scientific peers were up to. Neither side had any notion of how to begin talking to the other one, Snow complained, and what was worse, neither side seemed to care (McNamee).

Fifty-six years later, Snow’s lamentations have been proved prophetic, and an art/science divide pervades modern culture and society.

Many strides have been taken to address the problems Snow revealed, but the two disciplines are still socially constructed as intellectual oil and vinegar. As Robert Crease discusses in his 1993 book, *The Play of Nature: Experimentation as*

Performance, in the past, the theater has been accused of altering the truth and degrading human spirituality:

This distrust of the theater began in ancient times, in the quarrel between philosophers and poets that already Plato characterized as "ancient" and in which he himself was one of the fiercest participants. Plato's complaint was ontological; theater imitated rather than presented... Traces of such scorn persist even today among contemporary scholars, who, despite a few notable exceptions, choose to ignore it as a fit subject for philosophical inquiry... [This is an injustice] to the understanding of theater; for theater (like experimentation) is in my terms first of all presentative rather than representative and confirmatory, revelatory and disclosive rather than imitative (96).

With the passage of time, there has been an increasing sense among academics that the traditional boundaries between art and science are not only fake, but also detrimental to forward thinking.

In her 2015 article *The Science of Dramaturgy and the Dramaturgy of Science*, Jules Odendahl-James discusses how “contrasting views of experimentation are a fundamental stumbling block when theater and science meet on a collaborative field of enquiry beyond the mechanics of illustrative representation” (381). In the theater and other performing arts, there is an inborn freedom from restraint, an “engineered chaos” (381) to be found within experimentation. The mechanics of experimental theater are often exposed and laid bare in front of the audience. Scientific

experimentation also deals with chaos, but it is an “engineering and measuring of chaos...where the disciplinary legibility of the process and results are scrupulously ordered and transparent to other practitioners. Experiments are an investigation of aspects of the unknown through known means and measures” (Odendahl-James, 381). Artists and scientists both use a process of exploring content through trial and error, they then must parse through all of the data they have collected to obtain meaning from it. Odendahl-James drives this point home when she argues that

collaborators must agree that each discipline provides different means to organize experience... Both realms are essential to insightful communication.

The subject of collaborative investigation should determine the interaction among and between those realms and the audience (386).

This argument for the similarities between art and science closely mirrors how his own student, Aristotle, argued against Plato’s diatribe against the theater.

Dr. Chemers, the lead playwright of *Birth of Stars*, has specifically devoted significant time to the study of Aristotle’s concept of *phronesis*. In a 2015 article, Chemers observes that Aristotle, in his moral handbook *Nicomachean Ethics*, describes five “intellectual virtues”: these five virtues are Art (making), Science

(observation of first principles in nature), Metaphysics (study of spiritual matters), Intuition (capacity to understand new ideas without being taught them), and “Practical Judgment,” which he called *phronesis*. Phronesis is an idea used to describe all that one must know in order to live a good and harmonious life. Through phronesis one “searches for truth and knowledge... [To benefit] the creation and maintenance of happiness and harmony for humanity” (Chemers, *Routledge Companion*, 364). Both artists and scientists employ phronesis in the attempt to cultivate the understanding and sharing of ideas with their intended audience. In fact, fundamentally, the practices of art and science are quite similar. Both are techniques used to help us gain a better understanding of the universe we live in, are based on centuries of experimentation and refinement, and both attempt to help us understand and explain the idiosyncrasies we encounter in nature and every-day life. The “gulf” between the arts and sciences has been present, in one form or another, since ancient times; yet it has become increasingly influential and perpetuated within the academic setting, to the point where only a small percentage of primary schools include the arts in their curriculums.

Plato's complaints of imitation can only reach so far, as practitioners of experimental theater continue to push the limits of what can be depicted onstage, leading theater away from simple imitation into the realm of the more comprehensive explanation and presentation. Booth describes the similarities between the scientist and the artist when he writes:

Common thinking places the choreographer and the chemist far apart, but in truth, many of their most basic practices are very similar, for example: the precision of observation; their detachment from assumptions; their ability to extract significant, subtle linkages, from massive amounts of data; their use of intuition; their ability to identify the best problems to address, as defined precise questions; evening means to communicate their discoveries to the use of metaphor (96).

It is even known now that human memory is more than a retrieval system; there is an aspect of creativity inherent in the construction of memories. Booth continues to explain that "hard-fact scientists now use metaphors like reconstruction, improvisation, and holography to describe the memory mechanics of the brain" (96). Such descriptions include the acceptance of an innate connection between the human thought-process, within a scientific context, to the instinctual creativity so many modern individuals are encouraged to stifle within themselves. This facet of creativity

within memorization holds heavy implications for the position of creativity and the arts in educational settings.

Involvement in the arts can be linked to increased academic successes in the areas of math, reading comprehension, cognitive aptitude, critical thinking, and verbal skills as well as improved inspiration, attentiveness, confidence, and collaborative skills. When people have continual exposure to the arts, or anything that inspires them, they are able to create intimate connections with the content of the world around them, allowing them to examine the world with new perspective. In the 2009 *Edutopia* web article, *Why Arts Education is Crucial, and Who's Doing it Best*, Fran Smith writes:

A 2005 report by the Rand Corporation about the visual arts... argues that the intrinsic pleasures and stimulation of the art experience do more than sweeten an individual's life -- according to the report, they 'can connect people more deeply to the world and open them to new ways of seeing,' creating the foundation to forge social bonds and community cohesion (Smith).

The arts and sciences complement each other like the two sides of the same coin – the investigation into the countless possibilities and limitations inherent within the world and reality. The artificial distinction between these fields of study actually inhibits

many forms of knowing and understanding, preventing both the disciplines and the individuals pursuing them from achieving their full potential.

When presented with the evidence that art and science can constructively build upon each other, it seems counter-intuitive that such a rift between the fields still exists. The modern incarnations of these fields of study have lost connection to their ancient predecessors. In explaining his analogy between theater and scientific experimentation, Crease discusses how closely related the practices were in ancient Greece when he writes: “the appropriateness of the analogy is suggested by the common root of “theory” and “theater” in the ancient Greek word *theoria* (noun form *theorein* [viewing the world firsthand]). Originally, *theorein* meant simply seeing something for oneself as opposed to hearing about it; a *theatron* was literally a place for seeing” (95). Over the millennia, this inherent intimacy between the two disciplines, as expressed by Crease, would disappear as the practices themselves were increasingly deemed as separate from each other. Artists and scientists continue to struggle as they are forced to persist, while competing against each other for resources and funding. Even the difficulties and pains felt by the professionals are

incomparable to the damage wrought upon the American educational system by the disparity between the two disciplines.

The institutional separation of the arts and sciences has led to a significant decline in the study and application of the arts within the typical classroom setting. There is a significant amount of pedagogical potential in the performing arts, and performance practices can be utilized in the academic setting with very positive results. Gaining understanding is an act of creativity, a facet of learning that has been removed from the educational system, as Booth points out:

Knowledge is only useful in the actions of knowing... The basic dynamic of instruction is that someone who "knows" tells or shows someone who "doesn't know," and the not-knower tries to learn it — which usually means to reiterate it on demand... it requires that the learner apply tremendous energy to turn the instruction into real understanding, and in most cases the learner cannot accomplish that successfully (134).

Booth examines learning and understanding as acts of creativity and imagination. Human imagination is channeled by inspiration and intuition; it can travel beyond reality into the fantastical. Exercising the imagination allows for the experimentation of new combinations that may never have been considered otherwise.

The nature of human imagination is exactly what theater practitioners and other artists aim to explore, alongside concepts of theoretical, intellectual, spiritual,

political, cultural, and other ideologies. This integration of creativity within art disciplines holds the potential to aid humanity in learning more about itself and the rest of the universe. One of the dominant factors of human imagination that relates to learning is the human concept of *empathy* – the ability to imagine oneself in another’s position. In his 1976 essay, *The Social Function of Intellect*, British psychologist N. K. Humphrey coined the term “creative intellect” as a necessary imaginative characteristic of thoughts in higher functioning animals, which becomes more apparent within social structures. He suggested that the life of man

does depend critically on the possession of wide factual knowledge of practical technique and the nature of the habitat. Such knowledge can only be acquired in the context of a social community – a community which provides both a medium for the cultural transmission of information and a protective environment in which individual learning can occur (308).

Humphrey argues that creative intellect is vital to the success and function of society, that this ability to make behavioral changes is preceded by a prediction of future events through conjecture and imagination. This element of imagination seems to be unique to humans, and it profoundly affected the intellectual evolution of man as a species.

In his 2013 essay, *Lyke Unto A Lively Thing*, Michael Chemers expands upon Humphrey's ideas. Chemers concurs that humans are more sophisticated in their ability to imagine themselves in the positions of others, calling the ability to respond to the emotion of others while maintaining subjectivity *empathy*. In an examination of empathy's effects on culture and society it can be observed that empathy has influenced many cultural products, and that humans have a strong tendency to attach human characteristics and emotional intelligence onto a multitude of different things. He states: "the theater is a cultural site described... as primarily a tool for teaching humans how to live among other humans" (243). Empathy is a vital component of art, as the artist relies on the audience member to actively engage in the work, to create an empathic connection with it. Chemers further extrapolates on theater's usage of empathy when he writes:

Ascribing an intelligence [concept, or emotion] to something [or someone] that does not actually possess one may be an attempt to place a problem we are trying to solve into a social context... Theatre [sic] artists generate artificial intelligences, societies and entire worlds to communicate grand ideas and incite powerful, hopefully transformative emotional states. Imaginative anthropomorphic projection is, it appears, a highly favoured [sic] evolutionary trait, and empathy is its most important ingredient (244).

This element of creativity that is the basis of art and theater aims to make the explored content personally relevant to each person experiencing it, with the hope that it can provide an alternate perspective on the topics explored and encourage people to further their personal exploration. The inclusion of arts within education curriculums helps to create a larger context within which students can explore what they are learning.

The faculty advisor for *Birth of Stars* from the Astrophysics Department, Mark Krumholz, highly supports the idea of incorporating art into the teaching of science. When asked about his views, Krumholz indicated a strong support for introducing educational materials through a human lens. The inclusion of historical and cultural context can help to create a larger picture for students; it can be beneficial to expand on who key figures were, what society was like, and the subsequent intellectual context of the concepts being taught. When putting these ideas into practice, Krumholz has found

[it] is often a great aid to learning, which is not surprising: humans are social animals, and many of us (even scientists!) learn best when the material is placed in a social context. Drama can be another tool in the same toolkit. If I were doing to teach a course on modern physics to non-scientists, I would absolutely make them go watch Michael Frayn's *Copenhagen*. If I were teaching a course on math, Tom Stoppard's *Arcadia* would certainly be part of

the curriculum... It can be a way of bringing the material a bit closer to people (Krumholz).

Krumholz's beliefs influenced not only the way he advised the production, but also how the scientific materials ended up being interwoven into the story of the play. The science is always placed within a human context, sometimes even being directly compared to intrinsically human convictions. This is in fact one of the show's goals: to increase the pervasiveness of this methodology throughout society, improve the retention of knowledge, and increase the enjoyment of learning through the cultivation of new modes of inspiration and comprehension.

Art in all forms actively tries to promote new forms of understanding and ideas. Performance is particularly successful at creating unpredictable experiences, as it is temporary and ever changing. In a 2009 article from the *International Journal of Art & Design Education*, Sheridan Horn discusses how

performance art and interactive experiences can provide a catalyst for creative production and lateral thinking. An art curriculum... needs to constantly evolve so that it incorporates traditional approaches, craft skills and contemporary practices to reflect the multidisciplinary, interactive, political and performative society in which we live (28: 160–173).

Performance artists attempt to visualize the concept that the only constant in life is change, in the search to gain more understanding of the meaning of life and its experiences. This is even done by performance artists to the point where new art is being created that attempts to cultivate a more comprehensive, complex, and absolute understanding of groundbreaking concepts still being explored within the confines of modern science.

3. BIRTH OF STARS: Putting Theory into Practice

Birth of Stars began as a collaborative research project between the Digital Arts and New Media (DANM) and Theater Arts departments at UCSC, focusing on the field of “performance technologies” seeking new methods to create performance materials through the combination of performance, media, and technology. A cross-disciplinary team of faculty researchers led the research: James Bierman (Theater Arts), Michael Chemers (Theater Arts), and Mark Krumholtz (Astronomy & Astrophysics). The three of them set out to create a new performance that would link the cutting-edge discoveries surrounding the stellar life cycle to the purpose of performance, which is to teach within an examination of the human condition. They

aimed to create a distinctive performance event combining live performance, media and projections that served as more than scenery, social media, and other aspects of digital media and technology, while also illustrating the technological and intellectual skills found within scientific inquiry that lead to these results. As a project, and as a show, *Birth of Stars* aimed to be wholly collaborative and interdisciplinary from its conception to culmination. The story strives to illustrate and create connections between aspects of life that would not be considered similar, to show that what happens in the universe around us can be seen in our personal lives in ways we might never expect. The hope was that creating a direct relation between science and the individual would make the content more accessible and comprehensible by the general audience – tapping into and beginning to harness the potential that art and performance hold in expanding our world’s understanding of science.

When they began the process of writing the script, the team did not know what kind of story they would ultimately be telling. What they did know was that they wanted to create a script that would lend itself towards a production that integrates performing arts and scientific technology together. Keeping the principles of phronesis in mind, Dr. Chemers and the research team began working to create a

script that could serve as a playground for the experimentation of the “remerging” between the arts and sciences. What resulted is a script that allows for a blending of performance and new digital media and technology in a way that has not been wholly explored. One of the fundamental aspects of theater and live performance is the suspension of disbelief and the ability for the production to bring the fantastic and unimaginable to life. Similarly, digital media is capable of modeling circumstances that are not possible when real physics is applied.

Digital media is an aspect of science and technological study, and yet it has been applied to live performance as a new way to bring the fantastical into a realm of reality. The script-writing team wanted to create a piece that would allow for the integration of technology and digital media with aspects of drama and live performance, while also containing a human story that audiences would be able to relate to. We continued with this goal throughout the production process; it is what influenced many of our decisions with where to take the piece and how to use the media projections. Some of the projections are meant to be representations of the characters’ emotional states, while others determine the setting for the scene. In some cases the purpose is obvious, and in others we left it up to the audience to interpret the

projections themselves. While working on *Birth of Stars*, I was able to learn about just how similar art and science are as disciplines of thought and innovation. They often search for answers to the same types of questions, just in different ways.

The story of the play focuses on the character Sofia, a 14-year-old prodigy growing up somewhere in rural America. Sofia's brilliance isolates her from her peers, and she views the potential for relationships with other people around her as more of a burden than a gift. Even when she finally believes she has found another person she can connect with, Sofia must learn that there will always be obstacles to be overcome.

In the preliminary project description, Chemers writes:

Birth of Stars demonstrates that the powerful forces at work in the universe, those that bring us together and those that push us apart, are as immediate for young women as they are for gigantic stars, and forces the viewer to answer the question: 'what would I give up to gain the universe?' (Chemers, *BOS Project Description*, See Appendix 1).

The production team continued to be highly aware and critical of its own process as the project gained momentum. Focusing on the integration of scientific discovery as an intrinsic part of the plot was a vital factor in the play's ability to combine conceptual ideologies of the arts and sciences into a new form of intellectual exploration and discovery.

The initial idea for the plot of the play focused on the story of Cecilia Payne-Gaposchkin, an astronomer in the early 1900s who is now credited with the original theory explaining the internal composition of stellar bodies. The conclusion of Payne-Gaposchkin's work was plagiarized by Henry Norris Russell, an injustice that was not rectified until much later. The writing team took this story and attempted to frame it within a modern context; even though the final version of the play does not directly relate to the events as experienced by Payne-Gaposchkin, the plot of the piece still holds many ties to the original story. Sofia can be seen as a potential modern portrayal of Payne-Gaposchkin, when she discovers the solution to the "Eddington-Jean problem" of how to determine the mass of a stellar body and subsequently has her work stolen by Stephen. The assimilation of Payne-Gaposchkin's story, which has an intrinsic link to science, to the larger notion of forwarding art-science relations made it possible for the writing team to create a story that held modern relevance, while maintaining an intricate balance between the two ideologies. The amalgamation of scientific and emotional perceptions is revealed constantly throughout the piece, culminating in the confrontation between Sofia and Stephen in the final scene:

STEPHEN: *(mocking, but increasingly desperate)* "I won't support your plagiarism." Oh, is that what it is? Is that what I did? I stole

from you? My computers. My lab. I'm the one that reached down from Heaven like an angel and plucked you out of the mud. Without me, you're nothing.

SOFIA: And yet, here you are, on your knees. Are you praying, Dr. Heider?

STEPHEN: Don't be absurd. I'm looking for my---

SOFIA: The star is the only appreciable non-gravitational source of radiant energy in the universe. The star is the driver of chemical evolution, turning hydrogen into heavier elements. The star makes life possible, and sustains it.

STEPHEN: I know that.

SOFIA: No. You really don't. You don't know the first thing. But I'll teach you, if you're not too stupid to learn. There are two forces, Dr. Heider, the one that pulls us closer, and the one that pushes us apart.

STEPHEN: Gravity and pressure.

SOFIA: My mother calls one God, and the other the Devil.

STEPHEN: That's not the same thing at all.

SOFIA: Isn't it? *(she starts to walk away)*

(2.7, 91-92).

The writing balances aspects of scientific ideas with equivalent beliefs often held by artists. By introducing these principles together, the play allows and invites the audience to compare and relate them to each other in order to allow for new perspectives. The writing drives home the fact that, rather than simply using the scientific material as ornamentation, this production has actively attempted to unite the philosophies of art and science to incite the discovery of new ways to explore the world.

One of the most crucial factors in the show's success was the relevance and accuracy of the scientific content explored by the characters. The production team was grateful to have UCSC astrophysics professor Mark Krumholtz as one of the faculty advisors. Krumholtz was intimately involved from the conception of the play to the culmination of its performances; his objective was to ensure that all of the scientific content discussed in the piece would be current and accurate. Krumholtz's presence allowed the rest of the production team to focus on the best ways to create links between the human story and the scientific concepts, without needing to expend time or energy ensuring all of the information was correct. One such scene where this process was vital was the conversation between Jamie and Sofia about the concepts of gravity and pressure:

SOFIA: Yes. Me. You. We are objects in space.

JAMIE: Okay...

SOFIA: Come closer. Look. It's not hard to understand.

(She raises his hand, palm outward, then puts her own palm against his, and pushes. His hand gives gently).

Pressure.

(JAIME just grins stupidly)

They want to move apart, don't they?

JAMIE: Um, not exactly.

SOFIA: *(she links fingers with him, then pulls)*

Gravity.

JAMIE: Uh huh.

SOFIA: *(moving his hand back and forth slowly)*
 Objects in space. Gravity pulls them together. Pressure forces them apart. Gravity is, however, a very weak force.

JAMIE: Doesn't seem so weak to me.

SOFIA: It is. But it's also the dominant force in the universe.

JAMIE: Why, if it's so weak?

SOFIA: Because gravity attracts everything! Every particle, everywhere, attracts and is attracted by every other particle.

JAMIE: Really?

SOFIA: Yes!
(a moment, then her shyness returns and she takes her hand away, and looks down)

JAMIE: That's really, really cool.

SOFIA: You think?...

...

JAMIE: *(nervously)* So, you and I are particles?

SOFIA: Objects in space, yes.

JAMIE: Makes you feel insignificant, doesn't it?

SOFIA: Not remotely. On the contrary. It makes me feel part of a system. A huge and eternal system. When I look at the stars I feel...

JAMIE: Awe?

SOFIA: Kinship.

JAMIE: And when you look at me?

SOFIA: Kinship.

JAMIE: And those other guys?

SOFIA: They are also part of the system. We all are.

JAMIE: You're big-picture, aren't you?

SOFIA: The biggest.

(1.4, 71-74).

By ensuring that the science behind the script was factual throughout the process, the actors and production team were able to place more focus on the human lens the

content is examined through. This framing allowed for the production and audience to investigate the ideas discussed within a new context, providing the ability for greater understanding and deeper scrutiny. The precision of the science made it possible for the ideas to be explained in more than one way throughout the show, allowing for multiple complex viewpoints.

Once the production team had determined the project's goals to assimilate art and science, by exploring the aforementioned concepts through the frame of a human story, they had to decide how they wanted to deliver the import of their message. One of the ways this was accomplished was through the incorporation of both the teaching of science and the labor of science as integral performative plot points throughout the show. The show is full of teachable moments, some of which directly reach out to the audience, and others that subtly pervade the piece. There are points when the audience's attention is purposefully drawn to the larger themes being explored, such as in act 1 scene 4 when Sofia endures cyber bullying from her peers:

SOFIA: Out of Nothing: Episode#23. Welcome back. I'm Stargazer. So we were talking about the mass of stars. The mass of a star is the most important characteristic in determining its evolutionary path and brightness, and how long it lives.

MEGAN: @ stargazer23. watchin ur latest channel post now. Saw it cumming out of my dog's @\$\$. brwn, and chnky, and reeks. Jst. lke. U. [sic]

SOFIA: Of course it's important to remember that very small stars have lifetimes that are longer than the current age of the Universe, so none have actually died yet.

NICKI: @stargazer23. Hi Sofia. U r a retard, and NO ONE watches ur dumb channel. #truthhurts. :)

SOFIA: While a star is alive, its internal nuclear fusion keeps it from collapsing. But if it's too big, it burns much brighter and dies much more quickly.

(1.4, 75).

In this scene, the audience is directly exposed to two of the concepts the production was attempting to discuss: the teachability of science, and the struggle one must go through when learning how to communicate and associate with other individuals. The intertwining elements of both learning and social interactions within one scene implies a correlation, creating the potential for new relationships and concepts surrounding these ideas to emerge and be explored.

Birth of Stars also examined its content with more subtle methods, such as the effort individuals put into aspects of their work and lives. The labors of science and human relationships are so integral to the forwarding of the action in the play that the intentional highlighting of certain facets makes the subtler topics more apparent. Act 1 scene 6 illustrates this design through the relationship of Stephen and Lacey:

STEPHEN: *(up and pacing)*
Before you say another word, Lacey, I want you to remember something. I built this department. They *brought* me here to build it. What were they? A cluster of second-rate physicists with a huge dump truck full of state funding and no *clue* what to do with it. It was my presence here that turned us on to the Big Names. I raised the bar. I got rid of the dead wood. I created *your* job, Lacey. When I was your age I had already won the Sloan and Macarthur Fellowships, the Heinemann Prize, and been elected to the National Academy.
(stands still. Pause)

LACEY: Are you done reciting your vita?
(pause)
It's also your grad students. Look, I'm worried.

STEPHEN: What about them?

LACEY: There've been some, um.... complaints.

STEPHEN: Complaints?

LACEY: That you're... absent. That you don't reply to emails. That you're not reading their dissertation chapters. That you have what looked like a HEART ATTACK in class yesterday.

STEPHEN: You know, I have *real* work to do. I'm not a handmaiden for incompetents. When I was their age I already had *two* doctorates.

LACEY: I know, Stephen.

STEPHEN: I graduated from MIT when I was *fifteen*. That used to mean something.

LACEY: And yesterday in class?

STEPHEN: Fine. Put me out on the iceberg. I'll go quietly. "Thanks for devoting the best years of your life to science and service to humanity...."

LACEY: Stephen-

STEPHEN: "..... we don't need you anymore so just fuck off. Here's a watch!"

LACEY: Stephen-

STEPHEN: You know, that is the most asinine tradition, even in an institution as generally asinine as academia. Give a watch to someone who's retiring. What the hell does he need a watch for? He's retiring!

LACEY: Stephen!

STEPHEN: Lacey! Why don't you just give me that envelope you've been turning around in your hands like you're afraid it's filled with anthrax?

(1.6, 30-31).

While it cannot be expected that everyone will pick up on everything, the concepts discussed are so intrinsic within the conversation that many are able to pick up on parallels they would not notice in other contexts. The painting of Stephen as a flawed and relatable character, struggling to merge his intellect with his humanity, demonstrates to the audience that the notions examined can, and are, explored in congruent manners that hold the potential to create new discourses.

The execution of the production attempted to disseminate scientific content, some of which is still new enough to not be confirmed or widely accepted as fact. The production experimented with the content through the performance, and it allowed the audience to enter into a dialectic with them concerning the content and what it meant, what they knew and understood, while simultaneously challenging several social and cultural constructs surrounding the discussed content.

Robert Crease expressed succinctly that “experimentation is performance, with the former term understood in the first of the two senses, and... science is experimentation, with the latter term understood in the second of the two senses” (178). *Birth of Stars* may be a performance in name and appearance, but it is also an experimentation involving relationships between people in comparison to the systems, patterns, and cycles that we are subject to through nature. If one were to consider the previous quote to be true, then it can be said that the labor of science itself is a type of performance. Continuing the legacy of plays that explore art/science relationships, such as Bertolt Brecht’s *The Life of Galileo*, Caryl Churchill’s *A Number*, Durrenmatt’s *The Physicists*, and many others, *Birth of Stars* attempted to illustrate that performance is also a type of science, through a unique examination of current scientific content in an attempt to cultivate new methodologies towards learning.

One of the fundamental characteristics of performing arts is the inherent dialectic between the performer and the audience. They go through a journey together, entering into a process of giving and receiving information and energy. *Birth of Stars* aimed to create a dialectic with its audience by re-conceptualizing what was

sometimes quite complex information to make it more understandable. One of the most powerful approaches to learning is

discovering and uncovering what we know... it goes deep and resonates for a long time. Homemade knowledge directly reconstructs our understandings in ways we apply the next chance we get. And an optimum learning situation provides a chance to practice that new way of seeing, to experiment with it right away (Booth, 134).

It's a matter of the way that the information is delivered, and how one examines and processes the information, that determines whether or not understanding is achieved.

After re-conceptualizing the ideas in question, the production compared them with larger, more human, less scientific ideas that are relatable to current issues within modern society such as religion and bullying. "Performance art has a powerful immediacy and challenges notions of cultural and social [philosophies]," writes Horn, "Despite their rarity within secondary education, performance and live art has tremendous potential for challenging... people's responses, ideas and understanding. Its direct and confrontational approach ensures active engagement from the spectator. It allows the viewer to engage directly with the work as it unfolds" (28: 160–173).

This direct engagement is what sparks curiosity and inspiration, which develops into wonder and yearning for better understanding. Without that desire for more knowledge, the process of learning is undermined and significantly diminished.

Through the intrinsic dialectic between the content, the performers, and the audience, *Birth of Stars* successfully explored the nature of the scientific content while simultaneously paralleling it with several social constructs. Through the talkbacks following some of the performances, hearing things via word-of-mouth, and by way of other discussions and events related to the show, it was made clear, during and after the run of the show, that many people felt it was successful in its goals to combine the arts and sciences through an artistic examination of scientific content while also making the concepts discussed more relatable and understandable.

Following the opening performance, I led a special talkback featuring UCSC Chancellor George Blumenthal (himself an accomplished astrophysicist) and the three faculty members advising the production: Michael Chemers, James Bierman, and Mark Krumholtz. Many of the audience remained after to ask questions in regards to making scientific concepts more understandable through an artistic lens. Audience members also responded with many positive comments and compliments

towards what the show had accomplished successfully. Many stated that introducing the scientific content as an integral part of the story made it easier to comprehend, and that they felt they were learning alongside, and in collaboration with, the characters. There were also critiques such as concerns regarding the clarity of the media, and whether it furthered or weakened the content being discussed on stage, which prompted great discussions between the cast and audience. This successful combination of the two disciplines provides a useful and essential sample of the potential to be found in utilizing performance art practices within a pedagogical context. So much so that in the following academic quarter, the director of the UCSC Institute for the Arts and Sciences, John Weber, organized and hosted a special fundraising event surrounding an academic discussion panel focusing on the integration of art and science through the show. The panel speakers included all three faculty advisors as well as the director, graduate student Joan Raspo, and myself. This opportunity was not only an incredible learning experience for me (as I had never been on a panel like that before); it drove home the fact that *Birth of Stars* managed to successfully intermix aspects of both artistic and scientific models through the use of theater.

4. RECEPTION: Furthering the Discourse

Theater has been a very important influence on my life, and I wished to share that positive influence in a dynamic and cohesive manner. I wanted to find a way to illustrate the potential theater has to be a positive influence in a person's life, and the ways in which it can successfully disseminate information. When choosing what project I wanted to focus on for my thesis work, as a dramaturgical student, my options were limited to the productions being put on by others. As soon as I was offered an opportunity to work on *Birth of Stars* I jumped on it. I have always had a fascination with the stars; I actually wanted to be an astronomer when I was younger. The concept of finding connections between the new script and the ideas I wanted to explore became that much more personally important to me, and I was very anxious to begin my work.

When initially proposing and beginning my thesis work, I knew that I would be working as a dramaturg on *Birth of Stars* and that I would need to find a connection between the show and the larger discourses I wished to explore. I knew from the start that I wanted to find a way to illustrate the importance of including the

arts in primary education. As Klaus P. Jantke writes in his 2015 article *Dramaturgical Design in Digital Games*, “the way in which knowledge about events comes up is an issue of dramaturgy” (*The Routledge Companion to Dramaturgy*, 372).

As I began my work on the show, it was easy for me to find many ways in which I could do this; I began to develop my dramaturgical concept for the piece that, in and of itself, had the goal of making scientific content more digestible for general audiences.

Through *Birth of Stars*, the production team was able to directly explore the potential melding of arts and sciences by producing an artistic medium that represented both scientific and human emotional concepts. This thesis has found that art is just as necessary a component of education as science; they are compatible enough to be combined very successfully, and are more similar than one may initially believe. This thesis argues that these similarities make it crucial for art and arts practices to be reincorporated into primary education, that it will improve the quality of learning, and help to make education accessible to more people.

Diving in, I knew that the goal of the dramaturg is to prime the cast and audience to more actively engage in and explore the content presented to them, as

well as record and create a physical representation of that exploration throughout the process. I tried to find an active balance between meeting the specific needs of the production and my own personal research. Ultimately this balance was not difficult to find, as the materials I compiled can be utilized in both contexts. I found that what I internally struggled with more was ensuring that I stayed within the role of dramaturg: I have history with the theater department as a stage manager, and people often still approach me with this information in mind. There were times when someone would ask something else of me that would not fall under my duties, and I needed to determine if it was reasonable or not for each case. I also became a close advisor to the director, as she had little theatrical directing experience before working on the show. Being in this position offered me some fantastic insights into the director's vision for the production.

This insight alongside my other experiences has helped me to further expand upon the ideas I am exploring in my personal work. As argued by Odendahl-James: “a dramaturgical perspective makes a piece's intermingling of performance and science visible and largely understandable” (385). As I became more comfortable within my role as a dramaturg, it grew apparent that I should aim to make my

dramaturgical perspective of the show as understandable as possible. This plan allowed me to successfully put into practice the very models depicted by Odendahl-James, Crease, and Booth. All of the dramaturgical materials created throughout the production were presented to the production team and audience as teaching materials aimed towards an easily-obtained general understanding that would be cohesive towards greater exploration of the show's themes.

While I had some very specific ideas when I began the project, the aspects of what I personally wanted to explore in my thesis continued to develop as the show went through its production process. By the time the show had opened, the overall focus of my thesis, while staying the same in principle, grew and transformed in ways I could not have foreseen. I maintained my examination of my own work, and the overall resulting production, to investigate the pedagogical potentials of theater. What I did not anticipate was my inevitable exploration into the similarities of art and science as disciplines of thought and innovation, one of the most prevalent themes of the play. They often search for answers to the same types of questions, just in different ways. I believe that this production has succeeded in its aim, and has helped me to conclude my argument, by provoking thoughts of the cultural and societal

significance of performing arts; and the potential it holds to revealing and cultivating a better understanding of the human condition and the circumstances of the universe we live in. *Birth of Stars* was very well received, and the audiences expressed an interest and joy in the combination of medium and subject materials. Many of the audience participated in the post-show discussions, wanting to ask more questions and discuss the content and characters in greater detail. As the dramaturg I aided the production team and cast as they developed their own contexts for the play, while creating an easily understandable context for the audience to explore before watching the performance. The cast thanked and complimented me for helping them with their contextual analysis continuously during rehearsals, and the patrons confirmed that the lobby display and dramaturgical notes included in the program enhanced their understanding of the content discussed during the course of the play. I believe that I was successful in supporting *Birth of Stars* as a dramaturg, and that the goal of the show to merge art and science was, as much as any show's goals can be, realized.

5. REFLECTION: Moving Forward

A desire to pursue the arts often leads to constant exposure to criticism and doubts regarding one's future employability and success. This can create an internal sense of stigma – if an individual decided to pursue working in theater s/he wouldn't be in a position of great power or esteem; wouldn't one's potential be better suited towards a more vigorous, beneficial, and valuable profession or line of work? Many underprivileged children do not have the necessary resources available to them to make the pursuit of the arts or other things considered to be “extracurricular activities”. As revealed by Booth and Odendahl-James, it is increasingly being proven that anyone who believes in this ideology is following a way of thinking that is outdated.

In spite of being surrounded by these types of comments, as well as being told repeatedly that it was difficult to succeed in the arts even if you accept the downsides, with the support of my family I was able to pursue my dream. The ability to continue pursuing my passion enabled me to be a better student, encouraging a healthy desire for general knowledge and respectable daily practices which have helped me to become a successful adult – in the very same manner suggested by Booth. Those who think that art and science are wholly discreet fields will be astonished by recent

collaborative innovations between artists and scientists that have enriched both fields. The reasoning behind putting on theater varies greatly from person to person, as well as from production to production. A piece of theater can be political, satirical, cathartic, educational, emotional, restricted only by the imaginative forces of the production team, the audience, and the physical limits of the stage. It can be used to disseminate ideas and introduce concepts in new ways to make them potentially more understandable. Scientists can also use artistic ideologies to examine data with a different perspective, enabling them to interact with their experiments in more creative ways.

6. CONCLUSION: A CALL TO ACTION

This thesis has found that art is just as significant as science in the establishment of a person's education; they are compatible enough to be combined very successfully. The two are more similar than one may initially believe, easily revealing the potential and importance of the arts as a viable method of exploring the world, and of science as a source of inspiration and enrichment, not just of data. This thesis argues that these similarities make it crucial for art and arts practices to be

reincorporated into primary education; that it will improve the quality of learning, and help to make education accessible to more people. In the article *Creative Teaching: Collaborative Discussion as Disciplined Improvisation*, R. Keith Sawyer describes teaching as a type of creative performance: “Conceiving of teaching as improvisation highlights the collaborative and emergent nature of effective classroom practice, helps us to understand how curriculum materials relate to classroom practice, and shows why teaching is a creative art.” The American education system focuses heavily on test scores, encouraging teachers to teach students how to memorize content rather than actually learning and understanding it. This reduction of not only learning – but also teaching – significantly reduces the amount of passion and creativity present within the educational atmosphere.

The increasing amount of importance that is given to standardized testing throughout the American education system, in combination with the academically perceived disparity between art and science with a preference for the latter, has led to a significant decline in the availability of arts education programs throughout the country. A summary of a report from the U.S. Department of education revealed:

The percentages of schools making [performance] art education available went from 20 percent [15] years ago to only 4 and 3 percent, respectively, in

the 2009-10 school year. In addition, at more than 40 percent of secondary schools, coursework in arts was not required for graduation in the 2009-10 school year... Most troubling is an “equity gap” between the availability of arts instruction as well as the richness of course offerings for students in low-poverty schools compared to those in high-poverty schools, leading students who are economically disadvantaged to not get the enrichment experiences of affluent students.

These statistics are extremely troubling; education in the arts is vital to the development of an individual’s world-perspective as well as promoting improved academic tendencies in other areas. Even the Department of Education has called for a “strengthen[ing of] the arts in all schools, not only to replicate the advantages in life and careers that the arts provide, but principally for the knowledge and skills that the arts uniquely embody as academic disciplines and that they impart on developing minds, bodies, and personalities.” There is a growing awareness of the need to be able to appreciate and communicate through a diversity of cultural and artistic expressions; that a solid education must include lessons on how to interact with the art of the world and society.

The idea of bringing performance and art into teaching practices is not a new idea. Only recently, though, has it begun to make a comeback into the classroom and methods of educators across-the-board. The concept is still unfamiliar enough for

many teachers to be blown away by the ramifications of the results when it is implemented. As online journal *EdSource* writer and teacher, John Schwartz, describes:

Only... when I started bringing music into my classroom, did I realize that rather than being a diversion, the performing arts can be a tool to unify the different strands of academic learning into a cohesive theme that students can easily digest and eagerly embrace while enhancing learning... By using [content-rich music and other visual and performing arts] as thematic teaching tools, we're not squandering learning opportunities, we're enhancing, enriching and creating them (Schwartz).

Introducing art and related concepts into primary education can only serve to improve the already poor conditions found in many classrooms – the less served who are offered the least opportunities to explore the arts are often the ones who benefit from it the most. This unnatural divide will likely not be able to sustain a successful educational model for much longer, as the improvement and deepening of public teaching practices become more and more apparently vital to successful learning.

This enhancement and enrichment is very similar to what the theatrical dramaturg does, and what I did during *Birth of Stars*. Studying dramaturgy looks to find the best way to share theater, while continuing to explore one's own personal connections with theater. In *Ghost Light*, Chemers describes the responsibility of the

dramaturg very succinctly. A dramaturg “determine[s] what the aesthetic architecture of a piece of dramatic literature actually is (analysis), discover[s] everything needed to transform that inert script into a living piece of theater (research), [and] applies that knowledge in a way that makes sense to a living audience at this time in this place (practical application)” (3). A dramaturg needs to have a well-rounded education in all aspects of theater. The more a dramaturg knows about theater, the more she can aid a production in reaching its full potential, just as students who have a well-rounded education in *both* the arts and sciences will be more equipped to engage with the world around them.

APPENDIX

I. Casebook – not appended to this document: archived at UCSC Theater Arts

1. Letter to the Director
2. Production History with Critical Commentary
3. Historical and Contemporary Research
4. Visual Research
5. Production Stills, Designer Renderings, and More.
6. Program and Program Materials
7. Lobby Display
8. Outreach at UCSC
9. Post Show Talkbacks
10. Production journal [need to make scans!!!!]
11. Media coverage
12. *Birth of Stars* Script
13. Script Changes

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