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Modern Magics: Examining Occult Infrastructure

DISSERTATION

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by

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DEDICATION

To my interviewees and interlocutors

Family and friends

My deepest gratitude

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PUBLICATIONS

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Co-Author | Dr. John Seberger | Article in Membrana Journal *Forthcoming*

ABSTRACT OF THE DISSERTATION

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Infrastructures are vast, relatively obscure systems that subtend our everyday. Infrastructures are often built to be hidden from view, or become relatively invisible through familiarity. Users of infrastructural systems are unable to directly examine infrastructures and their relations to the human. As a result, adaptive and creative infrastructural imaginaries are deployed in order to render otherwise occult infrastructures relatively relatable to the anthropic. While this is an ongoing concern for users of technical infrastructures, magical practitioners of various traditions have historically dealt with occult infrastructures and their imaginaries. The purpose of this dissertation is to analyze how these practices aid users in effectively relating to infrastructural systems. This project examines conceptions of infrastructure in both technical and magical contexts through the use of manual and automated qualitative methods. Using EmPath, a neural network designed for the qualitative assessment of texts, I analyzed data from university students and magical practitioners pertinent to their relations towards infrastructural systems. I theorize that human relations towards occult infrastructures can be understood through an extension of Daniel Dennett's typology of the

perceived intentionality in relatively agential systems, and argue that magical practices aid in the this process of rendering occult infrastructures relatable to the anthropic.

Introduction

Let us consider cows: they are a good subject for analysis; humans have learned a good deal about them over the period of their becoming one of our companion species (Haraway, 2003). One of the interesting things we've learned about cows over the years is that, given their druthers, cows will tend to orient themselves along a North/South axis (Begall et al., 2008). How and why this happens is still a matter of scholarly debate, and recent research disputes the methodology used in these studies. (Weijers et al., 2018) That said, there is substantial support for claiming that cows do indeed orient themselves along the N/S axis. That is, unless the herd is grazing underneath a high-voltage powerline. Generally speaking, there is not much in the way of a relationship between cows and high-voltage powerlines. Cows are not particularly relevant to electrical infrastructures; they neither buy nor sell electricity, and are only tangentially energy producers in the sense that their manure produces methane. Likewise, electrical infrastructures are not a pressing concern for cattle; power pylons make poor fodder and worse mates. Yet despite this seeming lack of a connection, our electrical infrastructure incidentally impacts the arrangement of nearby cows, leading them to align with the magnetic field given off by the power lines, rather than the N/S geomagnetic field of the Earth (Burda et al., 2009). If, for example, the cattle in question are resting under a powerline producing an E/W magnetic field, the herd would orient itself along the E/W axis rather than the N/S axis.

This constitutes a case of incidental infrastructural impact, in which an actor is not in a direct relation to a given infrastructure their actions are still impacted by its presence. Outside of an abattoir, it may seem irrelevant how cow's need orienting, and inside an abattoir there is little need to orient cattle gently (Grandin, 2007). *That* cows are affected by magnetic fields is trivial; *how* cows are affected, and the mechanisms through which this effect occurs, are of vital interest.

The case of the compass cows is fairly cut and dry: high-voltage powerlines produce magnetic fields, and cows somehow sense these and use them as orientation. One of the reasons that the cow case is simple to parse is because we can see that the cows' orientation are impacted, and we can measure the electromagnetic force producing said impact. What we do not know, and what biologists are still struggling to ascertain, is the mechanism through which cows receive and process this data. Similarly, infrastructural studies has many times demonstrated the effects of infrastructure upon humans (Anand, 2017), and produced metrics to explain these effects (Ottinger, 2010), but the mechanisms through which infrastructural imaginaries are produced, made mobile, and implemented is an understudied area. That infrastructures, and other infrastructurally adjacent or

contingent assemblages, have an impact upon human action is trivial; it is how this impact is produced and perceived that is essential to further study of infrastructural assemblages.

Even if the cows in question were aware of their infrastructural inflection, it is rather unlikely that the herd would come up with a system through which such an inflection could be understood, explained, or made use of. Unlike our bovine brethren, humans have the mental capacity for and inclination towards forming conceptions of the occult forces of infrastructure which subtend our everyday, and do so to great effect. While the cows are merely inflected by an occulted infrastructure, anthropic relations towards occulted infrastructures are informed by these inflections; we imagine how these inflections that we feel are produced. In other words, our conceptions of the infrastructural occult are informed through the ways in which these hidden or insensible systems inflect our actions, just as our actions in relation to infrastructure are inflected by the manner in which our conception of hidden infrastructures are informed. As with cows, we are inflected by occult forces; unlike cows, we can creatively construct notional systems to explain and predict the occurrence of occult phenomena.

And we do just that; people come up with explanatory systems, notional infrastructures and cosmic concordances in order to more effectively relate to and predict the inflecting effects of the otherwise occult. These renditions of occult infrastructures need not be perfectly accurate in replicating the latent structure of the occult, but rather serve as a heuristic, an orientation that allows for exploration of the relation between the human and the occult. The formulation of these heuristic models of the occult has arguably been of prime concern for both magical and scientific epistemological traditions, and continues to be a pressing issue in the context of contemporary information infrastructures.

This dissertation project examines human relations to occult infrastructures in technical, magical, and scientific contexts in order to better understand how people relate to occult infrastructures in general, and to theorize as to the process whereby the nebulous unknown is effectively conceived as an abstractly delineated occult system.

Literature Review

Examining Infrastructure[1]

Infrastructure can be described as a genre of systemic socio-technical relationships between heterogeneous human and non-human entities that undergird and enable the processes and procedures of the context of which they are embedded. This is a necessarily capacious definition; infrastructure is a relational concept and as such is "whatever is perceived as infrastructure by its users" (Pipek and Wulf, 2009). What systemic arrangements of socio- technical relationships have been perceived of as performing the supporting work of infrastructure have shifted as scholars both expand upon and refine their uses of the term. Infrastructural arrangements can be naively understood as "that which runs 'underneath' actual structures – railroad tracks, city plumbing and sewage, electricity, roads and highways, cable wires that connect to the broadcast grid and bring pictures to our TVs" (Star and Bowker, 2006). These Large Technical Systems (Hughes, 2001) and their dependent structures have proven amenable to being described in infrastructural terms or analyzed through an infrastructural lens; the emergence and growth of railway systems (Heinze and Kill, 1988), the historical development of electrification schemes (Hughes, 1983), and the negotiated uses of air traffic control systems (La Porte, 1988) have each been approached as examples of infrastructure.

In recent times we are experiencing an unusual proliferation of infrastructural goods. Where previously infrastructure that spanned broad distance required significant investment and management of physical space and material, extant communications infrastructure provides a ground in which new infrastructure might be more easily built and integrated. The infrastructure of the Internet, for example, was largely built upon the existing infrastructure of telephone communication, which itself was partly built on the telegraph, which followed and was built alongside roadways and canal infrastructure (Castells, 2009; Edwards et al., 2007; Edwards, 2010). New infrastructures emerged out of the generic, formal http: protocol, defined largely by their role relative to particular activities - often called platforms (Gillespie, 2010). Infrastructure, as defined by Star and Ruhleder (1996) is embedded and transparent; infrastructure exists (metaphorically) within or underneath other social, technological and built worlds and does not need to be reconsidered at the moment of each task it enables. Infrastructure is learned as a part of membership and linked with the conventions of practice therein, and embodies some set of standards. It is built over the top of an installed base, becoming visible upon breakdown, and is of a scale or scope that exceeds a single 'site' – however that might be conceived

[1] This section is based in part on 'The Hearth of Darkness: Living within Occult Infrastructures', a forthcoming chapter of the *Routledge Handbook of Digital Media and Communication*. (Slota, Slaughter, and Bowker, 2021).

(Star and Ruhleder, 1996). This definition of infrastructure allows us to consider the complex plurality of social, organizational, and physical infrastructures that together inform and support our day-to-day activity - something that expansively is referred to as knowledge infrastructures (Edwards et al., 2013). It is important to remember, here, that infrastructure occupies not just a material place, but also a social, political and organizational one - hence the emphasis on knowledge infrastructures - and can in fact be almost totally immaterial (Karasti et al, 2016; Borgman et al, 2013). It is difficult to argue, for example, that the TCP/IP routing and addressing protocols are not infrastructural to internet communication, but equally difficult to understand those objects according to their material properties alone (DeNardis, 2012). One of the major methodologies for social scientists interested in infrastructure studies is the notion of 'infrastructural inversion' (Bowker et al., 2009), where the supportive technologies, standards, and material are intentionally and specifically foregrounded in order to explore their effect on work, expression, or policy.

More expansive understandings of infrastructure have required more nuanced definitions and more versatile characterizations of the phenomena studied. Infrastructure was and remains a challenging object of study, often fading into the background of the activities that it invisibly supports (Star, 1999). Moving beyond a "tubes and wires" view of infrastructure requires that we "take infrastructure as a broad category referring to pervasive enabling resources in network form" and include "more abstract entities, such as protocols (human and computer), standards, and memory" in our characterizations of infrastructure (Bowker et al., 2009; Edwards et al., 2007). A typology of these characteristics was originally proffered by Star and Ruhleder (1996) and later expanded upon by Star and Bowker (2002). Infrastructure is embedded in social arrangements and technologies, transparent in its invisible support of tasks, and has a reach or scope "beyond a single event or one-site practice" (Star and Bowker, 2002). The use of infrastructure is neither obvious nor natural, and is learned as part of a membership in a community of practice (Lave and Wenger, 1993), and has links with conventions of practice endemic to these communities (Star and Bowker, 2002). Infrastructures are the embodiment of standards, invisibly enacting interoperability, and are built on an installed base, inheriting the capabilities, limitations, and standards of preceding infrastructural arrangements (Star and Bowker, 2002). Finally, infrastructure becomes visible upon breakdown, losing the transparency of their formerly invisible support of tasks and bringing the complexity of their networked interrelations to the fore (Star and Bowker, 2002). Taken together, these eight characteristics of infrastructure work to highlight the layered qualities of infrastructural relations, "an infinite regress of relationships" wherein where the social and the technical elements of infrastructure are inextricable and always already subtended by other infrastructural arrangements (Bateson 1972). Infrastructure are "big, layered, and complex" (Star 1999), but performing an "infrastructural inversion" (Bowker, 1994) and switching our focus from the activities that infrastructure affords to the infrastructure itself

scholars have been able to more closely examine the relations that undergird metrology (Edwards, 2013) health care (Jensen, 2008), water management in Thailand and the role of rice production (Morita, 2017), sociotechnical analyses of Wi-Fi (Mackenzie, 2005), as a generative resource in the digital humanities (Kaltenburnner, 2015), and in studies of policy and development (Pelizza, 2016; Suarez-Villa, 1997; Ziek, 2012; Korn and Voida, 2015; Hetherington and Campbell, 2014). Infrastructural inversion, however, seems most comfortably applied to the area of science studies for its revelations on knowledge production practices (Mayernik et al., 2016; Georgiadou, Harvey and Miscione, 2009; Lee, Dourish and Mark, 2006).

If "infrastructure is a fundamentally relational concept [which] becomes infrastructure in relation to organized practices", then the question asked is less "What is infrastructure?" and more "When is an infrastructure?" (Star and Ruhleder, 1996). The continuous work of creating and maintaining infrastructure has been termed "infrastructuring" to indicate that any functioning infrastructure is predicated on active, directed, and on-going development. Work informed by the concept of infrastructuring or a focus on infrastructural moments has allowed scholars to critically examine "the process and practices of cyberinfrastructure creation and use" (Bietz et al., 2010), the formation of publics in participatory design activities (Dantec and DiSalvo, 2013), and ecological science (Baker and Millerand, 2010). As a concept, infrastructuring acts to "subsume all activities that contribute to a successful establishment of usages" of infrastructure, further expanding the scope of infrastructure studies to account for the myriad of actions and actors necessary for the ongoing production of infrastructure (Pipek and Wulf, 2009).

Infrastructuring is a complex affair, and can be more readily apprehended if examined as consisting of a number of vital processes. In their text 'Synergizing in Cyberinfrastructure Development', Bietz, Baumer, and Lee use the term synergy to denote "the process of creating and maintaining productive sociotechnical relationships" (Bietz et al., 2010). Their research "posits the concept of synergizing as a particular class of collaborative strategies undertaken in the milieu of infrastructure building projects" which focuses "on understanding how these interactions come into being, are maintained, and can be made productive" (Bietz et al., 2010). This can consist of "bringing two groups together in a collaborative relationship", "linking together of two pieces of software to produce a more capable system", or generally "ensuring that a common field of work exists and ensuring that work can be done at all" (Bietz et al, 2010). The process of synergizing is itself made possible through a pair of sub-processes which the authors dub "aligning and leveraging" (Bietz et al, 2010). Drawing on Strauss's work on interactional alignment (Strauss, 1988), Bietz et al. define alignment within the context of synergizing as "the work that developers do to enact a relationship in a way that enables it to produce, and to function within, the nascent cyberinfrastructure" and "expand it to include not just the fit between workers, but the fit or compatibility between any type of entities" (Bietz et al., 2010). Alignment is necessary in infrastructuring to ensure that, for example, "technology is compatible with organizational and governmental policies", or that two components of a

system are interoperable (Bietz et al., 2010). Leveraging, or "using an existing relationship with a person, artifact, or organization to build or strengthen a productive relationship with another person, artifact, or organization", is the second sub-process of performing infrastructural synergy (Bietz et al., 2010) Leveraging works through the embeddedness of infrastructure, and draws upon the presence of existing infrastructural relationships already embedded in order to forge relationships that might not otherwise have a direct connection (Bietz et al., 2010). This, in turn, "an indirect relationship becomes a more direct one and the relational structure becomes more dense" (Bietz et al., 2010). These two terms help us to see how the work of infrastructuring is constrained by the need to retain key relational alignments, while at the same time relying on those webs of relationships to create and strengthen new infrastructural relations. Synergy, and its sub-processes of alignment and leverage, help us to understand how infrastructural relationships are formed and maintained, but they can also be used to examine what happens when these alignments are altered, infrastructural relations disembedded, and the infrastructure suffers breakdown.

Infrastructure is not inviolate, and can be shut down, degraded, or otherwise broken. While infrastructural breakdowns due to events such as natural disasters can be planned for (Boin and McConnell, 2007) and characteristics of vulnerable infrastructures identified in a concrete sense (Perrow, 1999), infrastructure in moments of crisis can suffer infrastructural breakdown, which includes "a breakdown of familiar symbolic frameworks" ('t Hart, 1993). Discussions of infrastructural breakdown are perhaps best framed through what Jackson terms 'broken world thinking', or taking "erosion, breakdown, and decay, rather than novelty, growth, and progress, as our starting points in thinking through the nature, use, and effects of information technology and new media" (Jackson, 2013). Breaking, and breakdown, can be catastrophic or inconsequential, generative or destructive, but it often leads to an "opening to thought of heretofore hidden dynamics, processes, and powers" (Jackson, 2013). This is particularly true in the study of infrastructure, which attains visibility in moments of breakdown (Star and Bowker, 2002). Breakdowns in infrastructural relationships and breakdowns in the infrastructure as a whole can be thought of as a natural "infrastructural inversion", and provide incisive insights into the work of infrastructuring both before and after breakdown (Bowker 1994). This strategy has been pursued in analyses of the infrastructural role of floating rice (Morita, 2016), examinations of occult infrastructures of spirits and nature (Ishii, 2016), and in support of ontological experimentation (Jensen and Morita, 2016). Thinking about infrastructure requires thinking through breakdown, and thinking through breakdown necessitates an orientation towards repair. Repair and care are linked, as it is through "the subtle acts of care by which order and meaning in complex sociotechnical systems are maintained and transformed, human value is preserved and extended, and the complicated work of fitting to the varied circumstances of organizations, systems, and lives is accomplished" (Jackson, 2014). This emphasis on repair, and by extension breakdown, is essential to "positioning the world of things as an active component and partner in the ongoing project of building more humane, just, and sustainable collectives" in addition to

providing a useful lens through which to expand our understanding of infrastructure and its externalities (Jackson, 2014).

Studying Magic

> "When one rows, it is not the rowing that moves the boat, but rowing is only a magical ceremony by which one compels a daemon to move the boat" (Nietzsche, 1906)

As with infrastructure, magic is a capacious term for an assortment of phenomena which subtend anthropic activities. Scholarly attitudes towards magic, its practice, and its practitioners have undergone considerable shifts since the early 1900's when the sociologists Marcel Mauss and Henri Hubert put posited that "A magical rite is any rite which does not play a part in organized cults – it is private, secret, mysterious..." (Mauss and Hubert). In contrast with sociologist James Frazer's comparative study of world religions published the decade prior, Mauss and Hubert were interested in understanding magic as a social phenomenon distinct from religion, with its own particular rituals and practices (Frazer, 1905). One arguable distinction is that magic is "not directed towards the gods or sacred things" unlike religion (Durkheim, 1912). Along with religion, these early depictions of magic within the sociological literature often positioned magic as a sort of primitive science or pseudo-rational approach towards otherwise intractable problems endemic to superstitious and under-developed communities (Tylor, 1889; Levy-Bruhl, 1935; Malinowski, 1954; Evans-Pritchard, 1937). In either of these early renderings, "Magic is either prior (Tylor, 1889; Frazer, 1905) or inferior (Evans-Pritchard, 1937)"; it is either a necessary step towards science, or a lesser form of science (S. Greenwood, 2013).

While the issue of whether or not magic is science, religion, or something else entirely remains a theme throughout academic literature on the subject. In a later work, Evans-Pritchard states that magical practices are indicative of "patterns of thought that attribute to phenomena suprasensible qualities which, or part of which, are not derived from observation or cannot be logically inferred from it, and which they do not possess" (Evans-Pritchard, 1937). People have intimations as to how these occult processes work as "They do not profess to understand witchcraft entirely. They know that it exists and works evil, but they have to guess at the manner in which it works" (Evans-Pritchard, 1937). Malinowski further expands upon the practical applications of magic as a explanatory frame, suggesting that "Magic is akin to science in that it always has a definite aim intimately associated with human instincts, needs, and pursuits" (Malinowski, 1954). But this distinction does not suffice to separate the religious from the magical as "many of the religious beliefs of preliterate cultures are primarily explanatory in intent" (Horton, 1967).

Another possible distinction between magic and its foils of religion and science could be that magic is oriented around domination (Van Der Leeuw, 1963), in that "The core of the magic act is that it rests on empirically untested belief and that it is an effort at control. The first aspect distinguishes it from science, the second from religion" (Leach, 1964). In doing so, Leach highlights the presence of such magic in our everyday, and invites us to "...try to work out in detail just why you feel that the sorcerer's hocuspocus with his intended victim's hair is "magic" but that fiddling with an electric light switch is not" (Leach, 1976)

These early sociological depictions of magical practice as science in its primitive state have given way to a more trans-disciplinary approach that seeks to understand magic and its practices not as an intermediary stage in human development, but rather as a socio-cultural practice endemic to and emergent from human relations. While a number of these works eschew comparisons to science in order to focus on tracing magic and its practice across a historical trajectory (Walker, 1962; Copenhaver, 1991), the idea that magic and science are meaningfully intermingled has remained a topic of discussion (Rossi, 2009; Merkel & Debus, 1988). This remains the case as the analysis of magical practices moves away from primitivist practices on the colonial frontier to examine the role of magic and magical thought within an economically developed and culturally western sphere(Hanegraff, 1998). While Wicca (Adler, 2006; Luhrmann, 1989) and New Age religions (Pike, 2006) are the primary subjects of scholarship within this area of research, the assorted traditions that constitute western esoterica have also been examined in detail (Granholm, 2014). As magic continues to increase its penetration into popular culture (Hill,, 2010.), academic parlance (Campell, n.d.), and spiritual practice (Jones, 2004), new theories of magic have emerged. As with their predecessors, these theories of magic are transdisciplinary, and approach the topic of magic using methods that are variously linguistic (Tambiah, 1968) cognitive (Sørensen, 2007), psychological (Rozin and Nemeroff, 1989) and economic (Wood, 2010).

Given that magic has been the subject of scholarly attention and analysis for well over a century, it is not a very well defined concept (Glucklich, 1997). Or rather, it does not have a singular definition; like infrastructure, magic "is being used for distinctly different purposes and to denote distinctly different phenomena" (Lee and Schmidt, 2018). What is defined as magic is contingent on both where and when we are (Kieckhefer, 1989) and "Its meaning changes as the context in which it is used changes. No single definition of magic can be absolute, since all definitions of magic are relative to the culture and sub-culture under discussion." (Segal, 1981). This has led many commentators on the subject to suggest that as with infrastructure (Lee and Schmidt, 2018) privacy (Thomson, 1975) and data (Gitelman, 2013), "The term 'magic' is an important object of historical research, but definitely unsuitable as an etic instrument for doing research" (Hanegraaff, 2014). A "generalizable category" (Lehrich, 2009), but not an absolute one (Bernd-Christian and

Stausberg, 2013) "magic simply retained too many parochial features to successfully make the necessary transformation into a synthetic, scientific concept" (Sorensen, 2013).

This form of cultural relativism is not uncommon in etic definitional attempts, as both the concept and practice of magic are difficult to formalize. Still, numerous attempts have been made, ranging from James Frazer's dismissive declaration that "Magic is a spurious system of natural law as well as a fallacious guide of conduct, a false science as well as an abortive art" (Frazer, 1905) to more nuanced definitions that position magic as "enactments expressing an underlying belief in the metaphysical connection and power between the elements involved and the efficacy of the desired outcome of the performance" (Auge, 2013). The claim that "Only emic terminology effectively captures the socially conferred meaning of a particular action" (Stratton, 2013) is also appealing , but such intimately situated definitions are inherently contextual, and have limited applicability beyond the scope of their practice. (Ankarloo and Clark, 1999) A comprehensive definition of magic remains elusive, but a comprehensive definition of magic is not a necessary prerequisite to the study of magic. It is critical to examine the ways in which "Modernity has depended upon the surreptitious – and magical – power it so denies, and the study of magic provides a vivid window onto the cultural logics upon which the modern world has been structured" (Steyers, 2013). While as a concept "magic is a profoundly unstable category.[...]This very instability, however, evident in so many contexts, makes magic a rich field of study and can even become a kind of unifying focus" (Bailey, 2006). This project does not intend to define what magic is as a concept, but seeks rather to understand how the concept of magic, whatever it may be, is effectively put to productive use.

> "We need definitions of magic. We always will. We are trapped by them, in a circle of our own drawing, drawn by everyone who has formulated the question. Submission is impossible: one cannot accept every definition except by denouncing all and proposing one's own, thereby continuing the evocation. Yet, to reject them is to pretend that they have no power, to deny others the dignity of engagement. So many quaint, exotic superstitions for our titillation. If it is not a matter of choosing, then to stop, to conclude defining, is to define conclusively. To choose."
>
> (Lehrich, 2013)

THE OCCULT

"We believe in that which we do not know, but which reason leads us to admit. To define and circumscribe the object of faith is therefore to formulate the unknown."

Éliphas Lévi - *Dogme et Rituel de la Haute Magie*

To define the occult is to formulate the unknown as such. That which is occult is unknown, yes, but the occult is a particular type of unknown. The occult is not simply a 'known unknown' in Rumsfeldian terms, but an unknown that is known to *be*, and to be unknowable. The occult, being a relative concept, is neither *the* unknown nor *an* unknown, but is always already situated and sited, a relational and subjective unknown; what is thought to be knowable is a matter of perspective. The occult can be relatively unknowable from a given perspective for two reasons. That which is occult either cannot be sensed, or cannot be made sense of; "Occult, from the Latin occultus for hidden or secret, has two different meanings [..:] insensible and inexplicable" (Sprenger, 2015). The occult may be insensible relative to the human because it is hidden or obscured from our senses; redacted by blackness, but no less present for it (Badiou, 2016).The occult may also be insensible because we lack the appropriate sensorium and thus phenomenology (Flusser, 1987). Similarly, the occult may be inexplicable relative to the human because it is too complex, pregnant with "incorporeal enunciations of abstract machinic complexions compossible with discursive realities" (Guattari, 1992), or due to a mismatch in scale between the anthropic and the occult. Relative occultation due to complexity and scale are often linked, as "Scaling up from the small to the large is often accompanied by an evolution from simplicity to complexity...", but scale is also linked to occultation through insensibility; both the cosmic and the microcosmic exceed the capacity of human senses (West, 2017).

The occult itself may be inexplicable or insensible relative to an anthropic perspective, but in order for the occult to be defined, it must produce effects that can be seen, felt, or otherwise made meaningful. The 15th century scholar Heinrich Cornelius Agrippa was arguably the first to write that such effects ''are called occult qualities, because their Causes lie hid, and man's intellect cannot in any way reach, and find them out'' (Agrippa, 1531). Later scholars, most notably Issac Newton, would contend that "These Principles I consider, not as occult Qualities...", but rather "...Truth appearing to us by Phaenomena, though their Causes be not yet discover'd" (Opticks, Query 31). As opposed to Agrippa, who considered the qualities, or effects, to be themselves occult, Newton contended that "...these are manifest Qualities and their Causes only are occult" (Newton, 1952). The effects of the occult upon the world must be sensible or meaningful, Newton implies, even if their causes of these effects remain occulted. While the occult is visibly missing, it is what "we might call present absence…[which] is used to mark and denote what is not there, what is absent" (McClanahan & Linnemann, 2018). Like the 'X' in an algebraic equation, the presence of the occult problematizes. The concept of conspicuously uninterpretable systems and their 'occult qualities' was later taken up by the field of

cybernetics, which examined the role of perspectivally occulted "black boxes ...which performs a definite operation [..], but for which we do not necessarily have any information of the structure by which this operation is performed" (Ashby, 1984; Wiener, 1948). Similarly, infrastructural studies has many times demonstrated the effects of infrastructure upon humans (Anand, 2017), and produced metrics to explain these effects (Ottinger, 2010), but the mechanisms through which infrastructural imaginaries are produced, made mobile, and implemented is an understudied area.

The sociological turn of the late 70's ensured that the sort of analysis that furnished past examinations of occult forces or misgivings regarding "a machine that cannot be inspected" could be productively applied as an interpretative frame in both the social and the scientific spheres (Weiner, 1990). This extends sociological examinations beyond to include the sociotechnical, ""the missing masses [...which…] are to be found among the nonhuman mechanisms" (Latour, 1992). That which is occult extends to include not only the insensible or inexplicable, but also that which we do not feel the need to sense or explain. Bruno Latour describes the manner in which this form of occultation occurs, in which "...paradoxically, the more science and technology succeed, the more opaque and obscure they become" (Latour, 2000). If a machine or method works well, or "When many elements are made to act as one…", it acts as a "...black box" that is unlikely to be critically reexamined either in part or in whole (Latour, 2015). The results presented emerge from a trusted infrastructure, and as such do not need further visibility in order to be acted upon. Like in the Star and Ruhleder (1996) depiction of infrastructure, this knowledge infrastructure (Edwards, et al., 2013) serves to confirm trustworthiness and epistemologically stands in for ongoing inquiry and investigation. However, the effects of this infrastructure become more negative upon its breakdown - particularly when the results of science become politicized according to social agendas distinct from those that produced the science to begin with. This is perhaps the end result of the deletion of modalities (Latour and Woolgar, 1979) - immutable mobiles so thoroughly distant from the contexts of their creation that they are indistinguishable from outright falsehood.

It is this rendering of black boxes as culturally constructed and critically underexamined sociotechnical assemblages in line with the tenets of Actor Network theory that laid the groundwork for later examinations of the occult in the technical and infrastructural. Infrastructure, being *infra*, or beneath structure, is designed to invisibly subtend and support actions. Wires are hidden, pipes buried, and connections are concealed; "We conceal infrastructure physically when we can, but it becomes invisible in other ways as well" (Edwards, 2019). This concept is enunciated in Star and Ruhleder's typology of dimensions with which infrastructure emerges, one of which states that "Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks" (Star and

Ruhleder, 1996). In other words, infrastructure can be considered occult not only by dint of being hidden, but it can also become occult through transparency. The invisibility of infrastructure has been discussed in reference to hidden pipes (Anand, 2011, 2017) ethereal media technologies (Larkin, 2013), as well as more esoteric networks such as sacred sites (Ishii, 2016) or spiritualist practices (Geoghegan, 2015). These examinations of proliferating infrastructures and their interconnections calls attention to "The concealment of inherent complexity as a trend of both technological and cultural artefacts [which] makes it more difficult to seize the complete picture of how things work, and how exactly we happen to know the things we know" (Huvila, 2016). As infrastructures grow in scale, complexity, and transparency, they become ever more occult in their relation to the human.

We do not consider our unconscious responses to be a part of infrastructural systems; we prefer to believe that we interact with systems agentially (Luhmann, 2000). But people's reactions, their unconscious, reflexive, immanent responses are perhaps much more relevant to the builder of infrastructural systems than anything else (Tosa, 2010). These are perhaps the most vital elements of infrastructure because they cannot be easily changed by either users or designers, but still invisibly inflect all forms of human-infrastructural relations. In many ways, the unconscious, reactive human is itself an infrastructure of relevance to system designers, particularly in the field of Human-Computer Interaction (Zafar, Randoph and Martin, 2017; Van House, 2011; Karashima and Ishibashi, 2007). Now, we characterize the influence of the 'machine' on the human in terms of the characteristic ability of infrastructure to 'fade into the background' of our daily lives in terms of the *occult*. This is not (just) the occult in the sense of the magical, the unexplained, or the ineffable, but also in the sense of that which is hidden, unseen or blocked from view. In various ways, we find particular infrastructural relations both fading from view in daily practice as well as actively occluded.

"[O]ne of the best ways to determine someone's politics is to see what they don't consider to be political." (Holkins, 2018) One could argue that the same is true of infrastructure. Bowker and Star discussed how we see infrastructure - they argued that by and large we do not; infrastructures are perspectivally invisible (2000). We tend to abstract infrastructural systems through representations or discourses, which Knobel (2010) argues could always be otherwise; infrastructures are perspectivally representational. A defining aspect of human-infrastructural relations in that infrastructures are, in their relation to their users, differentially perspectivally occult.

New infrastructures are built upon their elders, a *matryoshka* of obsolescence and path dependence (Edwards, et al. 2007). Infrastructures, then, do not arise *de novo*; similarly, human-infrastructural relations are built upon precedent. While a user introduced to a novel infrastructure learns how to use the system as part of assimilating into a community

of practice, (Star and Ruhleder, 1996) these community practices have lineages of their own, and how one relates to a given infrastructure is formed and informed by how one has related to past instances of infrastructure.

Of course, how one has related to past instances of infrastructure is formed and informed by how your parents related to infrastructures, and their communities of practice, and their parent's practices, all the way down the line. This sort of infinite regress, in terms of theory, generically cannot go very far - "Prehistorians must resign themselves to doing without the evidence that would have been most significant" (Leroi-Gourhan, 1993), and even the most nimble of researchers are left groping in the dark, imaginatively constructing explanatory frameworks to account for what little concrete evidence remains. It is rare to talk with one's parents or elders about their own relationship with infrastructure - one infers it on slight evidence. Assembling some sort of constructive abstraction is a natural response towards systems that we must grapple with but are unable to understand, and we argue that such a stance also characterizes how humans approach and relate to the infrastructural systems that undergird their daily lives.

The first infrastructures were the first assemblages that humans recognized as systemic. They were certainly not man-made: the weather, the cycle of seasons, and the natural rhythms of growth and decay predominated and defined the field of primal systems (Peters, 2012). Humans made use of these systems, as they needed in order to survive. Crucially, users of these systems did not understand how they worked. While users of primal infrastructures necessarily had some mytho-poetic representation as to how these systems functioned, the mechanics of the weather were esoteric to these early humans as they are for most of us. Little has changed, "how much of society is already homeostatically regulated by machines that are ultimately under human control, but practically speaking, are almost never meddled with?" (Mckenna, 1999) Centrally, we have retained a commonality with our primal ancestors, in that we do not understand most of the systems that we use in our daily lives. Digital communication media are in general occult.

It is in this context that we wish to point to the *occulting* of infrastructure. Rather than being invisible, infrastructure is "visible upon breakdown" and "embedded in practice" (Star and Ruhleder, 1996). Not something entirely unseen, but, like a celestial body, it is occulted. Where the occulting of distant stars gives us information not only on the makeup of the star itself, but also that which moves across its path to our perspective, (Simon, et al., 1995) infrastructure is occulted by the work that is done upon it, and in that occulting is something revelatory about both that work and the infrastructure itself. That work that does not need to consider particular systems, organizations, and material at the moment of action reveals, through its assumptions of availability, a particular infrastructural relationship. And as in astronomy, the nature of how infrastructure is

occulted in practice is revelatory of its nature. Labeling infrastructure as occult extends Bowker's concept of infrastructural inversion; if you can see an infrastructure working, something has gone awry - if you need to deeply reconsider the infrastructure when acting, it is no longer infrastructural to your work, but rather the site of it. Infrastructures can only be captured when dead, never alive; a freeze-frame cross section of a functioning infrastructural assemblage is a virtual impossibility, much in the same way it is difficult to extract a functioning nervous system for clinical examination. Dissection is far easier than vivisection, as any surgeon will readily attest; "Death is a great revealer of infrastructures" (Peters, 2012). Thus we consider the nature of the infrastructure as *occult,* as *occulted*, and discuss what is *occulted into* the infrastructure behaves and acts upon us.

I consider infrastructure as present in and relevant to studies of digital media and communication along two axes. The first is in its representation and narrative, and the second is as a technological substrate that enables certain activities, communities, networks, and representations. In the narrative mode of infrastructure we see infrastructural goods presented as political pathways towards idealized futures (Larkin, 2013) and as a character in narratives of technology development and social formation.

What would it mean, analytically speaking, to consider the internet as infrastructurally occult, and how does doing so serve the field of infrastructural studies? First, this perspective privileges the relationality of infrastructure, reinforcing the argument that infrastructure are defined through their relations to the human. This is not to say that infrastructural systems are intrinsically occult, or ultimately ineffable, but rather that we act towards these systems as if they were. We view infrastructure from the perspective of the human; the system, regrettably, is silent. Second, examining infrastructure through an occult lens emphasizes the abstract and representational nature of our infrastructural imaginaries, the notional constructions that inform our understandings of and interactions with infrastructural systems. This anthropocentric approach is unconcerned with how infrastructures actually function; the lower mysteries are always an object of faith. Rather, an occult perspective on infrastructure is more concerned with how infrastructures are *imagined* to operate, the routinized rituals of a modern-day mythos. According to Larkin, infrastructure presupposes a particular future and presents a pathway towards that future. Politically, infrastructure speaks closely to how we understand our own capacity, capability, and room for growth (Larkin, 2013). Representations of infrastructure growth are tied to notions of expanding that capacity, and represent not only a pathway towards an idealized future but also present an image of what it is that enables important work. Investment, time, and resources spent building the first American cross-country railroad, for example, was presaged on the imagined future of a large, connected country capable of rapid transportation from the Atlantic coast to the Pacific (Cronon, 2009).

The question is not 'How can we build a better infrastructure?', but rather 'How are our imaginaries of infrastructure informed?'. More than any technical constraints or cultural norms, it is these imaginaries that shape how we relate to infrastructural systems. A superior infrastructure is a poor replacement for a deprecated system when it is used in the same fashion, just as the computer is a poor typewriter, and the electric turbine a poor steam dynamo (David, 1990). Establishing an understanding of how infrastructural imaginaries are formed is useful for scholars looking to apply an infrastructural lens to systems seen as outside the ambit of the field. It can be difficult to examine the infrastructural imaginaries that undergird one's everyday. However, our perceptions, interpretations, and performances of infrastructural and infrastructural goods enacts a particular ordering of the world, presents us with certain choices that would not exist outside that infrastructure, and operate upon us in significant ways, often through the work of a system 'black-boxed' into the platform, underneath the structure of our interaction. Increasingly, it is important to not only consider the world of media that is presented to us, but also to consider the operation of media upon us, and provide some accounting of how to interpret an increasingly curated life - one that presents us with a performance of ourselves as mediated through a technology platform and provides a ground for interaction with that performance.

Infrastructure is more present and pervasive than it is generally considered - even in terms of infrastructural studies. A variety of infrastructural relationships exist in natural cycles, the operation of our bodies, and in objects of policy, agreement and technology as well as in the more traditionally accounted material forms.

It is important to consider and account for the ways these infrastructural relationships work to structure our interactions with ourselves, each other, technology and groups. This importance is especially highlighted when the infrastructure itself is occluded from our attention: There exists design and technology that operate upon us without our being aware in a variety of ways in order to produce particular, predictable behaviors. This is significant work that is often not considered within the media space. Science and Technology Studies (STS) in the broad sense, and infrastructure studies in particular, provide the tools and perspective to assess, understand and reconsider these infrastructural relationships, primarily through the notion of infrastructural inversion, but in a broader sense by considering the networks of people, policy, technology and other actors attendant to most engagements with large systems.

Considering and drawing attention to infrastructural relationships is a worthwhile and important activity despite the fact that nearly anything can at some time be infrastructural to almost any activity. Pointing out infrastructural relationships, and working to invert the infrastructure in terms of particular activities, serves to highlight the occult in our lives,

and draw attention to those things that are meaningful, impactful, and invisible. It is arguable that much of scholarship - particularly in the media space - inverts infrastructural relationships in practice in order to better understand their mechanics and dynamics towards particular goals (often defined politically or socially more so that attendant to an isolated progress of that scholarship).

Human Relations to the Occult

Critical reflection on the design of information systems and other artifacts shows that humans embody their values and morality, often unconsciously, in the things that they create (Winner 1980; Latour 1992; Nissenbaum, 1998). These values may be intentionally designed into the physical state of the artifact or system (Flannagan, Howe and Nissenbaum, 2008; Friedman, Howe and Felten 2002) or be observed resulting from a myriad of social factors. (Pinch and Bijker, 1987). These values can produce bias (Friedman and Nissenbaum, 1996) or otherwise be seen to have and carry politics of their own (Introna and Nissenbaum, 2000). Successful infrastructures serve those with a variety of values, but may prioritize certain values in their design (Knobel and Bowker, 2011). For example, mobile technology that automatically reports your location through GPS to your friends and family values connectedness and intimacy above privacy. Though these value propositions are evident in the objects themselves, often they are the result of unconscious assumptions on the part of the designer, making it quite difficult to avoid their potential negative impacts on quality of life (Introna and Nissenbaum, 2000).

Though these systems are very closely tied to the anthropic, they are not fully determinate in relation to the human; there remains a gap, a "margin of indeterminacy", or "a zone of undetermination that is opened in the functioning of a technology" (Simondon, 2017; Fisch, 2018). Machines must be partially unpredictable in order to be functional, as "A fully determined mechanism would no longer be technological; it would be an inert object, or junk" (Mackenzie 2006). In this reading, we understand our devices, technical systems, and infrastructures as partially occult and incompletely determinate assemblages. As with magical or cosmic systems, these assemblages are difficult to see and even harder to predict, but are wholly amenable to conceptualization, particularly in the form of intentional agents.

The concept of 'intentional agency', first formulated by cognitive scientist Daniel Dennet, addresses magical attempts to render anthropically occult and indeterminate systems amenable to prediction. He suggests that in magical practice the occult or indeterminate "is treated as an agent of sorts, with beliefs and desires and enough

rationality to do what it ought to do given those beliefs and desires" (Dennett, 1971). This is not simply the case of a child treating their toys as living things, as even "objects bearing little resemblance to people or even animals may be identified as agents" (Barrett, 1996). People are hyperactive in their detection of agency (Boyer, 2001), and have "developed an oversensitive reaction to the presence of [non-human] agency in the environment" (Czachesz, 2007). This "intentional stance" towards systems can be effective, as in the case of a chess-playing computer, which is most effectively predicted not through reverse engineering of its complex programming, but rather "...just think[ing] of them as rational agents who want to win, and who know the rules and principles of chess and the positions of the pieces on the board" (Dennett, 1998). If, as Dennett suggests, treating a system as though it were an intentional agent is effective, then you ought to do so; "Anything that is usefully and voluminously predictable from the intentional stance is, by definition, an intentional system" (Dennett, 2014). Such approaches are effective and arguably endemic to human nature (Boyer, 1996; Guthrie, 1993), so we may as well understand them. Or, to quote noted occultist Aleister Crowley "Why should you study and practice magick? Because you can't help doing it, and you had better do it well than badly." (Crowley, 2001).

Whether these approaches should be categorized as an 'intentional stance', a magical method, or a simply an effect of human cognitive processes are interesting options, differing methods with which to subjectify the occult. Only that which is partially undetermined, as in the case of the occult, can be ascribed this form of intentionality; "A thing or a state of affairs that is not amenable to subjectification—to determination of its social relation to the knower—is shamanistically uninteresting" (DeCastro, 2019). In our ascription of agency to what Dennett refers to as "non-selfy selves", it is suggested that "We are forever attributing to others "mental states" (intentions, desires, beliefs, and so on), no matter whether the other is a human being, an animal, a machine—or a group of human beings" (Dennet, 1971; Dupuy, 2011). This subjectivist epistemology departs from early anthropological readings of magical practice which "...considers our commonsense intentional stance as just a shorthand that we use when the behavior of a target-object is too complicated to be broken down into elementary physical processes" (DeCastro, 2019).

Magical practices provide a way of conceiving the occult that allows it to appear more predictable relative to the human, but "Beyond, or rather implicated with, risk management lays magical practice as an empowering agentic" (Auge, 2013). Our conceptions of the occult, technical or otherwise, are creative though critical constructions, and 'The process of working creatively with non-human entities forces us to take responsibility for these fear complexes by putting us in a situation where we must adapt to a radically alien concept of the universe in order to operate effectively" (Evans, 2004). Examining the occult requires that take such creative conceptualizations of the occult as occasionally effective heuristics rather than holistic theories, as "Knowledge of occult

forces is characterized by indeterminacy of meaning and an inbuilt resistance to interpretive unity" (Lindhardt, 2012). We may have partial explanations for occult phenomena, and notional models, but "...we do not feel obliged to understand how we end up knowing what we know..." (Huvilia, 2016). Our relations towards technical infrastructures and other occult systems have taken on the character of faith, and "It is this mundane geography of spirituality – of all the myriad things people have faith in and how these faiths weave in and out of their lives – that is most absent in current discussions of secularity and postsecularity" (Tse, 2013).

Technical infrastructures and their adjacent technologies are arguably occult in their relation to the human by dint of their non-anthropic scale, sensibility, complexity, and infrastructural transparency. How we relate to these infrastructural systems as occult systems is understudied, and "As the processes and interactions of our society continue to be accelerated by electronic communication, (and they will) and as our problems become more complex, chaotic, and technological in nature (and they will), these issues will only become more egregious" (Valovic, 2000). The infrastructuralization of elements (Peters, 2012) and the state (Easterling, 2016) has served to productively problematize our conceptions of the infrastructural and the underthought. Though it would appear at first that the infrastructuralization of the occult is a retrenchment towards pre-Enlightenment values, it can also be argued that "the expansion of the occult is not a contradiction of modernity but in fact an outcome of it" (Anugwom 2011). As with infrastructure, the occult is a relational concept, and can only be found where it is recognized as such. In this sense, we align our understanding of the occult and occultation as it relates to infrastructure and the infrastructural with Bernard Geoghegan's definition of occultation, which holds that:

> "Occultation is less a particular mode of thought or visibility than an unspoken, structural condition of relation. While explicit invocations of occult forces may be less on display in public expressions of Western religious life today, they perpetuate a problematic in every subject sitting in front of a computer screen, or at the end of a telephone line" (Geoghagen, 2015).

There are systems which, while not amenable to close technical examination for reasons of scale, scope, or speed, are nevertheless affectively and phenomenally present in its capacity to inform and inflect human actions in relation to said system. The occult is that which cannot be examined, but only surmised, deduced, abducted, or otherwise hypothesized. It is that which, effectively speaking, is unknowable, or prohibitively difficult to learn. The occult is that which resists inspection or aspection, but which, in its relation to the human, produces the phenomenal impact of infrastructure in its imagined or apparent systematicity. It is with this understanding of the occult, and with the understanding of

occulation as a structural condition of human relations towards the occult in both technical and magical infrastructures, that I conduct the following analysis. I argue that both technical and magical relation towards infrastructure can be understood as occult relations, which due to the structural similarity of their shared relation to the human, can be meaningfully examined as analogical approaches towards the occult. Our relation towards the occult is naturally structured to find effective aspects of an intentional stance towards the occult, whether it be supernatural or infrastructural. This dissertation examines these relations towards the occult in order to theorize as to how conceptions of the occult are formed to effectively use the intentional stance.

Methods

This project is oriented towards examining human relations towards infrastructures and other systems that resist anthropic aspection for reasons of visibility, complexity, or scale. This research draws upon the analysis of five corpuses: student answers to assigned questions, interviews with magical practitioners, literature and texts within the occult genre, a synthetic corpus of texts on programming and computation, and a control corpus. I analyze these corpuses with a combination of automated and manual qualitative methods. I analyze these corpora through distant reading methods by using an automated qualitative processing technique made possible through the use of EmPath, a text-analysis tool which "extends a deep learning skip-gram network to capture words in a neural embedding" (Moretti, 2015; Fast et. al., 2016). EmPath allows for the automated coding of vast bodies of text that are not amenable to manual qualitative methods. I analyze the corpus of student answers and the corpus of magical practitioner interviews using manual qualitative methods, and analyze these corpuses using open and axial coding in line with aspects of grounded theory.

Corpora Content and Data Collection

Student Answers Corpus

The data contained within the student corpus consists of 10 questions answered by 122 students enrolled in the course Informatics 3, *Internet, Technology, and Society* during the 2019 Fall Quarter at the University of California, Irvine, over a period from September 28th to December 3rd. This course, ICS 3, was an introductory level course in the Informatics Department at UCI, and was designed for either Freshmen Informatics majors, or as an

upper-division elective for students majoring in other fields. The course as designed "Examines current Internet technologies and social implications at the individual, group, and societal level", with the intent of encouraging students to think and write critically about their personal relationships with technological systems. The course met for three lectures a week over ten weeks, and covered content pertaining to the history of the internet and the development of surveillance/information infrastructures, as well as political, social, and technical strategies for resisting such systems. A full syllabus of the course is available in Appendix A. I was the instructor of record for this course, and crafted these questions for the express and explicit purpose of using the student responses as research data in this project. I was granted IRB approval to conduct this research on 9/18/2018.

Students were required to answer the assigned questions in order to receive a grade for the assignment, but were given the choice to anonymously opt out of their answers being collected as data. The mechanism through which the students could choose to opt out was through contacting the director of the UCI Teaching and Learning Research Center, provided to them through the Study Information Sheet handed to each student in the course. Students were also verbally informed as to the opt-out process at the beginning of the course, and reminded of the option at both mid-quarter and the final class. Had any students had chosen to opt out, I would have been made aware of that fact only after grades had been submitted for the quarter. None of the students in the course made contact to decline their participation in this research.

For each week of the ten-week quarter, the students were assigned a short prompt, and asked to write a minimum of 100 words in response to the prompt to submit via the course website. These weekly assignments were graded for completion, not content, and no feedback was offered to the students in regard to the content of their responses.The ten prompts are provided below.

1. Have you ever had a time when your computer 'fixed itself'? What do you think happened to cause the problem in the first place, and what do you think caused the problem to be resolved?
2. What is the deepest, or most fundamental, aspect of your own computer that you know how to use or otherwise manipulate? Are there any levels more basic to the functioning of the computer, and what do you think that they are and do?
3. Without either looking it up or asking someone else, how do you think Wi-Fi works? I'm not interested in the technically correct answer; I am interested in how you think it works, without doing any research.

4. Using the internet competently means knowing how to perform an internet search well. If a colleague wanted to perform better searches, what would you suggest that they do? What sort of 'tricks' or non-obvious search strategies, would you suggest?
5. The science fiction author Arthur C. Clarke once suggested that "Any sufficiently advanced technology is indistinguishable from magic". What is your response to this quote? Do you believe this is the case, and why or why not?
6. You have had ample experience with the internet throughout your life. You have gained skill in using the internet. What would you consider to be your most well developed internet skill, and what parts of the internet are still somewhat confusing? Why do you think you have developed certain skills, and not others?
7. Name a device or technological system that you care about, or that you have an emotional attachment towards. Explain how you express this care. Do you use, maintain, or approach this device or system differently? Describe your attitudes surrounding this artifact, and the actions you take due to your attitude.
8. Last time you had a computer problem, walk me through the steps – especially what you were thinking, as you solved it. Do not be too concerned about the technical answer – I'm interested more in what went through your mind. How did you feel? Annoyed, frustrated, unfazed? What or who was at fault, and what or who did you blame?
9. When, if ever, do you talk to machines? On what occasions might you verbally address a computer or a device, and why? What forms of address do you use, and what do you say? Are there certain types of technologies you are more likely to talk to than others? Why?
10. Choose a technological system or device that you use, but do not fully understand how it works. Describe at least two things that you believe about this system or device, without knowing whether or not this belief is true.

These questions were crafted with the aim of reducing the degree of bias introduced due to my dual roles as researcher and teacher. Though the questions assigned did cover the same general area of inquiry as the course they accompanied, I designed these prompts so as to minimize the overlap between course subjects and research data. The open-ended nature of the questions and their emphasis on personal, phenomenal experience is also oriented towards encouraging students to look beyond the course content for answers. Finally, the mandatory but ungraded nature of the assigned prompts was aimed at ensuring that students were not overly motivated by professorial approval, as might be the case if the student submissions were graded or given feedback. Over the ten weeks of the course, the 122 students enrolled produced 1,162 responses, with 58 prompts left unanswered.

Once grades were submitted, the responses to these ten prompts were collected, stripped of personally identifying and demographic metadata, and stored in a secure location.

It is entirely likely that the student responses may have been in some way biased towards examining infrastructural concepts through a magical frame, though care was taken throughout the course to avoid explicit mentions of magic, magical practice, or general esoterica. The one exception to the moratorium on magic occurred in Week 5 of the course, when I provided students with a prompt that asked them to comment on a quote by science-fiction author Arthur C. Clarke, who famously quipped that "Any sufficiently advanced technology is indistinguishable from magic." While student responses to this prompt were understandably focused on concepts related to magic, many students made interesting observations about their relations to the various infrastructural systems that subtend our everyday. Students were aware that I was studying human/infrastructural relations in both magical and technical contexts, and thus may have spoken more freely on esoteric subjects. Students often wish to please their professors, either for reasons of grades and assessments or simple prosociality. Many of the students had some inkling of the data I was seeking, and sought to provide such data. This does not necessarily invalidate my findings, but it should encourage readers to be cautious of uncritical uses of either my data or the resulting discussions.

Magical Practitioner Interviews Corpus

The data contained within this corpus consists of fifteen semi-structured interviews of at least an hour in length with magical practitioners from a variety of magical disciplines. Their experiences with magical practice range from self-taught novices and aspiring initiates to leaders and luminaries of their respective communities. Some, like Dani, are theurgic neonates, who are engaged in the long process of working out their numinous relation to the divine. Others, like Oberon Zell-Ravenheart, have professionally engaged in wizardry and magical pedagogy for the last several decades. There is also a considerable range in terms of magical traditions, and the specificity with which they define their practices. For example, Kerry and Terry are two university professors who consider themselves to be generally pagan but not particularly magical, whereas Titus is a syncretist reconstructionist polytheist who focuses exclusively on cults of the Classical world. Some of these practitioners, such as Alice and Hazel, are both leaders of their own covens and professionals in their own right, whereas Dieter, one of the more critically minded interviewees, is a lapsed pagan who studies the use of magical practice within musical arrangements. Finally, we have Mark, who is both a well-respected academic figure and occupies an exalted position within his magical community. This is a rather disparate but focused set of interviewees; while no two interviewees share the identical magical

traditions or practices, they have all spent a considerable amount of time and effort on similar issues related to the elemental, numinous, or otherwise occult systems which subtend magical practice. The interviews were conducted both in person and via video-call, and were recorded with the express verbal permission of the interviewees. The interviewees were asked questions pertaining to their professional work, their magical practices, and intersections between these two areas. This interview protocol asks participants about their relation to the internet and other information technologies, such as the metaphors they used to describe the Internet, or asking what aspects of information technology they felt they had a good grasp on. The questions then shifted to discuss the participant's magical practice, and asked how they conceptualized said practice. The interview protocol was designed to elicit correspondences between the interviewee's professional and technical practices and their magical or ritual practices. For an example, here is an interview question about the interviewee's professional practices.

> "Is there any aspect of your profession, such as the workings of a system or the relationship between systems, that you find impossible to fully understand? Or, to put it another way, what aspect of your profession still doesn't make sense to you? What works but shouldn't, or should work but doesn't, and is difficult to explain in either case?"

This interview question is followed in the interview protocol by several other questions about the interviewee's professional practices, before transitioning into a discussion of their magical practices. Though these two sections of the interview are asking about different subjects, the questions in each section are designed to encourage interviewees to draw correspondences between the two. For an example, here is an interview question about the interviewee's magical practices.

> "Is there any aspect of your practice, such as the workings of a system or the relationship between systems, that you find impossible to fully understand? Or, to put it another way, what aspect of your practice still doesn't make sense to you? What works but shouldn't, or should work but doesn't, and is difficult to explain in either case?"

As you can see, the questions about the interviewee's professional practices and their magical practices mirror each other, a pattern that is followed throughout the protocol. A full version of the semi-structured interview protocol is available in Appendix B.

Once collected, this interview data was transcribed, stripped of personally identifying metadata, and stored in a secure location.

Occult Corpus

The data within this corpus consists of nearly twelve million words sourced from texts belonging to one of eight subcorporuses. Each of the subcorporuses within the Occult Corpus contains text from a specific magical tradition or genre: alchemical texts, grimoires, Kabballahistic texts, western occult texts, Thelemic texts, Wiccan texts, Theophysical texts, and texts on general esoterica. The texts within this corpus were downloaded from the website of the Internet Sacred Texts Archive. The eight magical traditions which form the core of my corpus of occult texts are briefly outlined below.

The first sub-corpus consists of alchemical texts, early essays on the then-obscure science of chemistry and its desires to unpack the esoteric systems of transformation. These alchemical texts are supplemented by a second sub-corpus of grimoires and spellbooks, how-to guides for the manipulation, care, and repair of supernatural relations. While many of these grimoires are oriented towards the practitioner, nearly every text includes instances of theoretical conceptualizations of the systems through which magic operates.

The third sub-corpus, the Kabbalah, is particularly refined in both its practical applications and theoretical richness. The Kabbalistic tradition is one which has produced a fantastic array of scholarship, and supplemented with works from the Talmudic and Midrashic traditions, serves as the third sub-corpus in the occult corpora. The divine order of the Kabbalah provides a nice counterpoint for the fourth sub-corpus, which is a more general collection of Western mysticism and mystery traditions. Hidden meanings and indescribable relations abound within these discourse on the relation between the human and the divine, or the place of the human within nature.

The fifth sub-corpus derives from texts on the philosophy of Thelema, many of them penned by the noted occultist Aleister Crowley during his time as a member of Ordo Templi Orientis. This two-thousand page tome ranges broadly from instructions on ritual practice to allegorical stage-plays on the nature of consciousness. These Thelemic texts are slightly more contemporary than their predecessors, with most extant versions being dated to the late 70's and early 80's. They are not, however, nearly as widespread as the texts in the sixth sub-corpus. Wicca and Neo-Paganism are, without a doubt, the most popular contemporary magical tradition in the West. Though consisting primarily of texts sourced from the Gardnerian and Feri traditions of Wicca, this collection is supplemented with Victorian texts on witchcraft and 18th and 19th century works on Druidry. While by no means a comprehensive collection of Wiccan and Neo-Pagan writing, this selection of texts

is intended to be reflective of both historical and contemporary practices related to nature magic.

The seventh sub-corpus are a collection of Theosophical texts, primarily from the Bohemian and Blavatskian traditions. Theosophy seeks to understand the systems that subtend religion, philosophy, and science through uncovering the secret doctrines of a lost age; a sort of reverse-engineering of ancient sciences. The eighth and final sub-corpus that makes up the larger corpus of Occult texts is intended to fill in any gaps that the other seven sub-corpora might have left, and to give a more generalizable and well-rounded character to the corpus as a whole. These texts can be loosely categorized as generalized esoterica, and include samples from as early as the mid-1600's to the present day. These include texts central to a number of different traditions, from classical Hermetic and Rosicrucian teachings to internet-based chaos magic and feminist cybercraft. This extremely eclectic assortment of texts is intended to act as the 'long tail' of occult literature; while none of the traditions in this last sub-corpus appeal to a majority of magical practitioners, they all have their own, equally valid followings.

Taken together, these eight sub-corpuses form what I refer to in this project as the Occult corpus (OCC). The purpose of this corpus is to act as a large-scale, macrocosmic version of the less extensive, microcosmic interviews with magical practitioners.

Informatics Corpus

The data within this corpus consists of roughly 80 million words sourced from three online sources: selected Bulletin Board System (BBS) textfiles from 1980-1985, the entirety of the Microsoft Word help forum from 2005-2018, and the entirety of the Stack Exchange forums, 2014-2019. Taken together, these three sources constitute what I refer to in this project as the Informatics corpus (INFORM).

The 1,086 BBS textfiles were downloaded from three categories of textfiles.com: BBS, Computers, and Programming. These categories were concerned with the owning and operation of a BBS, early treatise on programming and programming styles, as well as" all files of a 'computery' nature" (Scott, n.d.). These files are primarily concerned with the early history of civilian internet activity and the novel uses to which these systems were put. The 12,121 Microsoft Word help forum posts were downloaded from the forum (www.msofficeforums.com, n.d.). These posts were concerned with understanding, navigating, and effectively using Microsoft's Word application. The Stack Overflow forums contains roughly nineteen million questions, twenty-nine million answers, and seventy-three million comments on programming and programming related topics. These files were downloaded from The Internet Archive, where they are freely available (Internet Archive,

2014). Taken together, these three sub-corpuses of answers and questions on technical subjects form what I refer to as the informatics corpus. The purpose of this corpus is to act as a large-scale, macrocosmic version of the less extensive, microcosmic answers from the student questions.

Control Corpus

There are a number of institutions who offer access to substantial corpora of textual data, sourced from both the spoken and the written word. Of these, the Open American National Corpus (OANC) is particularly well suited for the purposes of this project. The OANC is a "massive electronic collection of American English, including texts of all genres and transcripts of spoken data produced from 1990 onward" consisting of some fifteen million words of contemporary American English (American National Corpus Project, 2002). The OANC's transcripts of spoken conversations come from two primary sources: The Charlotte Narrative and Conversation Collection (CNCC), and the Linguistic Data Consortium Switchboard Corpus (LDCSC). While the CNCC focuses primarily on narratives and interviews conducted in North Carolina, the LDCSC is over two-hundred and fifty hours of transcribed conversations between individuals from every major dialect of American English. These topics of these conversations were similarly diverse, running the gamut from rather uncontroversial subjects, such as woodworking and the metric system, to more divisive topics, such as gun control and capital punishment. Each of these 2,430 conversations were recorded and transcribed into roughly three million words of text, forming the core of OANC's speech-based corpus.

The remaining twelve million words in the OANC are sourced from an eclectic mix of texts from a variety of genres, all written in American English. A sampling from this category might include travel guides from the Berlitz publishing company, the official congressional report on the 9/11 terror attacks, an assortment of biomedical publications, articles from Slate magazine, or chapters from a serial novel. In this project, the OANC plays the role of a 'control' corpus of general English-language text, against which the other corpuses can be measured.

Limitations in Corpora and Data Collection

Each of the corpuses in this project are limited both in their scope and utility. In this section I aim to acknowledge and address the most pertinent of these limitations, while understanding that the limitations discussed here are not the only issues with the corpuses, their collection, or their analysis.

The data within the corpus of student answers has undoubtedly been influenced by the fact that I designed and taught the course in which this data was collected. There are two main sources of bias in this case: the student responses may be influenced by what they are taught in the course, or influenced by their desire for professorial approval. This opportunity for bias was understood as an unfortunate but unavoidable feature of this research. The assigned questions were designed to avoid explicit references to class concepts, and though mandatory for the course, were not graded or otherwise provided feedback. Despite these efforts, I acknowledge that this data source is biased due to my dual roles as both teacher and researcher.

The corpus of student data is also limited in terms of its generalizability. The relatively small sample size of one university classroom makes it difficult to argue claims as to the general nature of the codes and categories which emerge from the data. The informatics corpus, which has its own limitations to be discussed below, was crafted for the express purpose of arguing for the possible generalizability of the student data. If, for example, the student answers corpus used concepts and categories at proportional rates to the comparatively vast informatics corpus, then it is possible to argue that the phenomena present within the students answers is proportionally present within the larger discourse on computers, programming, and information technologies. While this does not, strictly speaking, enhance the generalizability of the data within the corpus of student answers, it does allow for an argument to be made as to the general applicability of the resulting analysis.

The corpus of magical practitioner interviews is limited in scope and generalizability as well. There are three primary limitations to this corpus: the extent of the interviews and the breadth of the interviews, a focus on western magical traditions, and sampling biases due to logistical and geo-cultural constraints.There is also a similar issue of bias, as was the case with the student responses. The interviewees were all informed prior to meeting that the subject of our discussion would be related to their magical practice, but that I was also researching infrastructural relations. I believe a fair number of my interviewees adjusted their answers to fit my infrastructural interests, a source of bias which I admit but cannot ameliorate. As with the student responses, any uncritical use of this data or findings likely to be ineffective; there is a degree of bias inherent to the methods I have chosen for this project.

An hour-long interview is not enough to accurately characterize a practice, particularly one as intricate and subtle as the practice of magic, and fifteen interviewees is not enough to characterize a community, particularly one as multifarious as magical practitioners. Of those practitioners I did interview, all of them engaged in what I would refer to as western magical traditions, derived in whole or in part from historically western

mythological or esoteric practices. This was a conscious choice in the selection of interviewees and the construction of the corpus; restricting data collection to practitioners of western magical traditions limits the generalizability of the corpus in favor of enhancing analytical focus.This focus on western magical traditions was also due to logistical issues in sampling due to the geo-cultural constraints of my location in Southern California. My lack of fluency with languages other than English and my lack of familiarity with the tenets of non-western esoterica also limited my capacity to meaningfully engage with non-western magical traditions. While this is an unfortunate blind-spot in my data collection, it does highlight a path for possible future research.

These issues limit the generalizability of the magical practitioner interviews. The occult corpus, which has its own limitations to be discussed below, is intended to enhance the generalizability of the magical practitioner interview corpus in a manner similar to the way in which the informatics corpus was designed to argue for the generalizability of the student answers corpus. For example, by examining what concepts are comparatively used at proportionally different rates within the data, I can also argue as to what aspects of our smaller data set, the microcosm, is reflected in the larger, macrocosmic data set. The occult corpus is meant to operate as a more generalized example of the genre of topics discussed in the magical practitioner interviews, which, through comparison of the proportional rates through which they use shared categories of terms, can be argued is a reflection of the more limited magical practitioner interviews.

The informatics corpus and the occult corpus are synthetic corpuses, macrocosmic constructions created for the purposes of enhancing the generalizability of their more naturalistic microcosms. The two limiting factors for these corpora were logistical constraints in data collection and computational constraints in data processing and analysis. The occult corpus has similar limitations to the magical practitioner interviews corpus, in that it is restricted to western esoterica and magical traditions. The occult corpus is further limited to eight selected western magical traditions, a small subset of all western magical traditions. While these traditions were preferentially chosen based on the temporal and geo-physical range over which their practices are found, they by no means constitute a comprehensive overview of western occultism.

The informatics corpus is more eclectic in its construction, and is intended to act more as a demonstrative bellwether for discourse on topics related to informatics than a precise depiction of any particular community of practice. As I am principally interested in how people describe or otherwise relate to infrastructures, informatical or otherwise, I focused this corpus on questions and answers pertaining to computational and informatical infrastructures. This corpus focuses on forums where people who have problems with a program, application, or device seek information, solutions, and

camaraderie. This does mean that the content of these discussions veers disproportionately towards discussions of entry-level problems and their solutions; experts appear to prefer to ask expert questions directly to other experts, rather than posting on a public forum. While any help forum related to technical subjects would have been suitable for the purposes of this corpus, not all help forums were able to be downloaded in a format that was amenable to processing and analysis. This further limited my capacity to expand the scope, and therefore generalizability, of these corpuses.

The final constraint for the occult and informatics corpuses pertains to the computational resources available. EmPath, as a textual analysis tool, is highly extensible and was effective at processing the data required, regardless of size. My computational hardware, on the other hand, was unable to interface with text files of over a gigabyte in size. As all five corpora were processed simultaneously in order to ensure comparability of processing, this placed a hard computational limit on the extent of the data I was able to collect and analyze. Increased computational resources and processing power could theoretically extend this analytical method to the limits of EmPath's robust and efficient neural-net framework. This project, however, is limited in the scope of the data it can collect and process, further limiting the generalizability of these corpuses.

The Open American National Corpus (OANC) is a limited but focused corpus. While its predecessor and inspiration, the British National Corpus, is considerably more capacious at a hundred million words, "Corpus-analytic work has demonstrated that the BNC is inappropriate for the study of American English, due to the numerous differences in use of the language" (American National Corpus Project, 2002). Certain other English-based corpora, such as the Corpus of Contemporary American English, would have also been suitable, but were rejected in favor of the OANC's superior accessibility in terms of both format and cost.

There are, however, certain limits to the OANC. The OANC is a collaborative, community endeavor, and is committed to producing open data that is free to use. This does restrict the content of the corpus somewhat, as copywritten works are excluded unless contributed by the author themselves. These practical concerns also restrict the extent of the OANC. The fifteen million words that constitute the OANC are but a subset of a larger, fifty million word data set that remains unpublished due to a lack of funding.

Even within these limits the OANC is a substantial corpus, and more importantly, a suitably diverse data set. The OANC is divided into two principal categories. The first, transcripts of spoken conversations, consists of more than three million words. The second category, which contains written texts from a variety of contexts and genres, contains the other twelve million words of the corpus. These categories are then broken down by their

sources, a brief overview of which is necessary to evaluate the suitability of the OANC for the purposes of this project. It is a highly diverse corpus, especially given its restriction to American English and its preference for American authors. Though the bulk of the corpus is devoted to technical and journalistic writing, other forms of writing such as correspondence and non-fiction are also represented, making the OANC a relatively well-rounded choice for the purposes of this project.

Automated Qualitative Processing and Distant Reading Methods

Each of the above corpora were similarly processed and analyzed using EmPath. EmPath is "a deep learning skip-gram network" which " learns word embeddings from 1.8 billion words of fiction, makes a vector space from these embeddings that measures the similarity between words, uses seed terms to define and discover new words for each of its categories, and finally filters its categories using crowds" (Fast, Chen, Berenstein, 2016). In essence, what EmPath does is take every word of a document, and sort it into one of 200 categories ranging from 'achievement' to 'zest' (Ibid). Researchers may use these pre-built categories, or create their own categories for experimental purposes: "For example, using the seed terms "twitter" and "facebook," we can generate and validate a category for social media" (Fast, Chen, Berenstein, 2016). The 200 prebuilt categories that EmPath includes in its analytic package are emergent categories built in just this way. Fast et al. provided EmPath two or three seed terms, such as Twitter and Facebook, and then let the neural network decide what other words from the corpus belonged in the same category. Once these 200 categories had been seeded with terms and associated terms have emerged from the corpus, these categories were manually verified using crowdworkers. The prebuilt categories of EmPath were trained on a diverse range of fiction and nonfiction sources published in the last century. The testing categories in this project, however, are trained on a different set of corpora built for the purposes of this project; namely esoteric and occult magical texts. The testing categories are seeded with terms, but are not pre-built; all of the terms from the testing categories are fully emergent from the occult corpus. For example, the category of 'secret' is a testing category that was seeded with three initial terms: 'secret', 'hidden', and 'concealed'. From these seed terms, EmPath created a category of terms, emergent from the occult corpus, which shared a similar vector space within the neural network's map of the corpus. Each concept or term within EmPath is encoded as a vector, and with "enough training, the network learns a deep representation of each word that is predictive of its context" (Fast, Chen, and Berenstein, 2016). Or, in other words, EmPath does not know what words are, but it does know which vector spaces share a sinusoidal similarity, which when mapped onto the related concepts, can tell us which words share a category. This project uses both EmPath's 200 prebuilt categories, which are emergent from EmPath's training set, as well as a handful of experimental categories, emergent from the occult corpus and created for the purpose of analysis. While both sets of

terms are manually seeded by humans, each category has been emergently built out by EmPath's neural network.

A full list of all pre-built and experimental EmPath categories is available in Appendix C.

The results of processing these corpuses through EmPath are understood as a form of automated qualitative coding, such as those used in Distant Reading practices. Moretti's practice of Distant Reading is a method whereby large bodies of literature or other texts are turned into data, which can then be analyzed for patterns using statistical or informatical methods (Moretti, 2015). Distant reading methods are particularly well suited for cases in which the corpuses are too large for close reading, such as the corpuses in use in this project.

EmPath and other similar tools are an essential aspect of distant reading, which emphasizes the graphing and visualization of large bodies of text as data. In comparison to close reading, which works "thorough interpretation of a text passage by the determination of central themes and the analysis of their development", distant reading provides an abstract way to view disparate texts and their interrelations on a larger scale (Jänicke et al., 2015). This is critical for the purposes of this project, which seeks to understand relations between the texts, rather than to unpack the content of texts themselves.

Prior to their analysis in EmPath, each corpus was processed to remove all images and non-ASCII characters from the text files. As these corpuses contain millions of lines of text, each corpus had to be broken down into smaller files that could be feasibly analysed with the available computational resources. These smaller files are then read into EmPath, which processes the text and outputs both the number of words in each pre-built or experimental category as well as proportion of words in each category relative to the text as a whole. These proportional and absolute word-count categorizations are then graphed for comparison and analysis.

Manual Qualitative Processing and Close Reading Methods

Two of the corpuses, the Student corpus and the interviews with magical practitioners, were analysed using manual qualitative methods as well as the automated qualitative methods described in the above section. In this study, I began my analysis with careful and repetitive reading or each student's answer and each interviewee's transcript. In contrast to the pre-built categories used by EmPath, the categories used in the analysis of the student and magician data were iteratively crafted through a process of open coding in line with aspects of grounded theory to examine anthropic depictions of infrastructural

systems (Strauss & Corbin, 1998). The technique of open coding is the iterative process of forming codes, or meaningful descriptions of concepts that occur and recur in the data. Through this systematic open coding two of these codes, depictions of the infrastructural and depictions of the occult emerged as axial codes (Charmaz, 2006). Following that, these axial codes were developed into three main categories which group related codes together: depictions of the infrastructural, depictions of the occult, and relational stances derived from or immanent to these depictions. These categories are then deployed in my theoretical formulation of human stances in relation to occulted infrastructures.

Limitations to Qualitative Processing and Analysis

Both the automated and manual qualitative processing and analytic techniques in use in this project have limitations inherent to the tools and methods used. In regards to EmPath, the authors of the tool express their concern about the applicability of the 200 pre-built categories into which texts are sorted, asking "Do they offer the right balance and breadth of topics? (Fast, Chen, Bernstein, 2016). These categories are driven by what is known as 'seed terms'; for example, Twitter and Facebook might be suitable seed terms for the category of 'social media'. This project created one experimental category that of 'secret' from seed terms for the purpose of analysis. While EmPath's 200 pre-built categories were validated using crowdsourcing, the experimental category in this project was validated by myself (See Appendix C for all EmPath categories). Though I consider this experimental category to be valid for its purpose, I recognize that it has not been independently validated.

The automated qualitative processing of these corpora produces results in the form of proportional rates of occurrence of terms associated with one of EmPath's categories. For example, the sentence 'I hurt my hand' would return a result indicating that 25% of the text fell into the category of 'pain'. Unfortunately, the sentence, 'Man, what a pain!', would return a similar result. These are not the same sentiments, and are not about the same subject, but they both fall into the category of concepts related to 'pain'. Simply because two different corpuses use terminology that fall within the same category at similar rates does not mean that they are discussing the same exact things, but it does indicate that they are discussing similar concepts, at similar rates. This does introduce a degree of interpretative looseness into the ensuing analysis, but I hold that the advantages of using EmPath on large-scale corpuses outweighs this reduction in interpretative transparency.

I have endeavored to ensure that the larger, macrocosmic corpuses of the occult and informatic data are reflective of their smaller, microcosms in the form of the student answers and the magical practitioner interviews. I argue that by using this

macrocosmic/microcosmic lens towards the data, I can more effectively argue that it is possible for specific phenomena to be understood as a generalizable phenomenon. This is intended to be illustrative that the phenomena I analyze *could* occur more generally, and is not intended to prove that such phenomena do occur on a larger scale. The automated qualitative processing and analysis in use in this project are suggestive of possible implications, not evidence of verifiable proofs. This is a significant limitation, and greatly reduces the theoretical efficacy of these automated qualitative methods.

The manual qualitative processing and analysis of the student answers corpus and the magical practitioner interviews corpus used in this project face methodological issues as well. Transcriptions of the interviews were required for qualitative analysis, which reduced nuance and introduced errors in interviews that used esoteric terminology. In terms of analysis, the use of open and axial coding is a highly perspectival and situated technique, which is not necessarily replicable across sites. As such, the generalizability of the codes, concepts, and theories derived from the use of open coding and other grounded theory techniques is not guaranteed, and cannot simply be applied without regard to context.

Chapter 1: Student Data

This project examines human relations to the occult, or less-than visible systems that produce visible effects. Our ability to effectively use a given system, occult or otherwise, is predicated on our ability to predict the effects of said system. Occult systems are difficult to predict because their inner workings are perspectivally hidden from the human, either through being physically hidden, infrastructurally transparent, or of non-anthropic scale, scope, or complexity. The invisible, the very small, the very large, and the very complex are rather difficult to examine from a human perspective. Many technical systems and infrastructures have the quality of being relatively occult to their human users. These users still need to use the system, however, and as such require a way to predict what an occult system will do with a given user input. In my examination of student relations towards occult systems, I have seen that many students construct creative conceptions of the occult in order to make the occult appear more predictable relative to the human. These creative conceptions of the occult utilize metaphorical and analogical reasoning in order to better predict certain aspects of their relations towards occult systems. While highly creative and arguably effective, these metaphorical constructions of the occult are not infinitely extensible. In cases where the occult is particularly difficult to predict, either due to the complexity of the system or the novelty of its effects, the students

tended towards conceptualizing the inner workings of the occult in terms of 'magic'. Though the students realize that technical systems and infrastructures are ultimately knowable and not derived from magic, these relatively occult systems are magical in their relation to the human, in that they produce surprising effects through occult means. This section examines student conceptions of and relations towards systems that they perceive as relatively occult, with particular focus on instances when predictive failure leads a student to classify a given occult system as relatively magical.

The data produced through the student survey did not show any evidence of strange relationships between the students, their technologies, and enabling information infrastructures. There is nothing deviously perverse or stunningly ignorant in their responses. By and large, the students have working functional relationships with the information infrastructures that undergird their technologies. Their relationships towards infrastructures are, to categorize broadly, normal, in that they reflect reasoned responses given the information available. While all of the students' relationships towards infrastructure are normal, in the sense that they are reasonable, that does not mean that every human/infrastructural relationship is the same. Normality can be a broad continuum; to paraphrase Orwell, all human/infrastructural relations are normal, but some are more normal than others.

Our examination of human/infrastructural relationships within the student data begins with arguably the most 'normal' sorts of relations. Perhaps normal is a misnomer; a certain strangeness is endemic to any relationship between the human and the non-human. So, let us briefly set aside the quality of normality, and instead deal in quality of quantity; what form of human/infrastructural relationships are most widespread, most ordinary, most quotidian? Infrastructures are technologies, and arguably "The most common view of technology is that it is an artefact, tool, or system that is designed to be available for humans to achieve their objectives and outcomes – to e-mail, to write, to store, to manipulate, to interact, and so forth" (Introna 2006). In other words, infrastructures and other technologies are understood through what Introna refers to as "tool view" of technology, wherein "tools are seen as objective and neutral 'technical things' (separate from us) that we can draw upon, or not, to achieve our particular ends" (Introna, 2006). This is, as Introna has argued, a rather widely expressed attitude towards information infrastructures and their adjacent technologies; that these devices and their antecedent support systems are simply tools to be used for good or ill according to human whims.

As this tool-based and anthropocentric view of technology is rather common, it is unsurprising that many of the student responses fall into this category. This is, broadly speaking, the 'default' view of technology, especially novel technologies; in the face of novel technological arrangements, it can be difficult to discern where agency ought to be allocated. As we are always already phenomenologically agential entities ourselves, a little

anthropocentric sophistry isn't unusual; if we are agential, and nothing else in this technological assemblage looks or acts like us, then perhaps we humans are the only meaningful movers in the context of technology. In addition, this is a fairly pragmatic position, within a sociocultural paradigm that prizes pragmatism. This is the popularized perception of technological use in the 'hard' sciences; men and women tasked with wringing secrets from nature with the iron fist of Science. Therein lies a certain appeal to this position, beyond its ontological primacy; an anthropocentric and tool-based view of technology is often associated with rationality, dominance, and power. To cite a bumper sticker popular in my Texas hometown, "Guns don't kill people; people kill people". When all agency is allocated to the human, then all power is as well, making this view of technology surprisingly seductive. This tool-view of technology can be so attractive that it is aspired to, with individuals professing an anthropocentric view of technology in order to rhetorically occupy these subjectivities of apparent power and knowledge. While it may be more accurate to state that 'Guns don't kill people; people and guns form an assemblage which, for reasons as much social as technical, is destructive of life and productive of death', it is a comparatively less impactful than the initial bumper sticker, or even Oppenheimer's "Now I am become Death, the destroyer of worlds" (James, 2000).

As we can see, understanding even the most commonplace human/infrastructural relations can be a tricky affair. That the "tool-view" of technology is a 'default' position for many people in a variety of fields can make understanding how one comes to such a position difficult; in many cases, it is not an understanding that one comes to, but a basis from which one begins. To further complicate matters, there are entirely valid reasons to espouse a "tool-view" of technology, even if one does not approach technology from an anthropocentric perspective. Ascribing all agency to the human is a move that empowers, albeit illusorily; but then again, what is the illusion of power if not simply a cheaper form of power? In other words, there are compelling reasons for the students surveyed to describe their relationships towards information technologies and their adjacent infrastructures in anthropocentric terms of tool-use, outside of their relations with/towards a given infrastructural assemblage. There are confounding factors, uncontrollable variables, issues of power and instances of performance. With that in mind, I suggest you take the students' responses to the survey questions with a grain, or perhaps a ring, of salt.

While many of the students surveyed share a similar anthropocentric perspective on information infrastructures and technologies, these perspectives are not monolithic; individuals may deploy similar frames in dissimilar ways. That is not to say that the student's relationships towards information infrastructures defy categorization; on the contrary, these relations are amenable to being categorized in a panoply of ontological schemes. Generally speaking, such classificatory endeavors seek to elicit commonalities between the phenomena under examination, and this project is no different. In this section of the chapter, we will be examining three different types of relations between the students

and their information infrastructure technologies. These relations are categorized together because of what they share in common; that is, these relations are held in common because they are the most common types of relations in the data. Each of these perspectives espouses a particular view on the role of the human in human/infrastructural assemblages, but none stray far from an anthropocentric understanding. While some students ascribe to a classical "tool-use" view of technology, others paradoxically figure infrastructure as an 'unimportant necessity', while still others decline to conceive of infrastructure at all! The following sections examine each of these perspectives in detail, but be forewarned; while these perspectives are common, they are by no means comprehensive.

The most common of these anthropocentric perspectives on infrastructure and technology can be broken down into three maxims. First, that technology is instrumental; it is a tool to be used by the human, nothing more, and nothing less. Second, all technologies and technological advances are produced solely through the continued efforts and knowledge of mankind. Third, that when anything breaks, it is always the human at fault, and not the brute machine.

While there may be a relationship between these students and their infrastructurally adjacent technologies, their responses indicate that many relationships are not viewed as such. Information infrastructures, such as Wi-Fi, telecommunications, or the internet are not seen; they are seen *through*. Several of the student responses attest to this view, stating that "Wi-Fi is the tool that allows people to access the internet. The internet is the tool that allows people to access websites" (Research Data. *Week Three Writing Assignment*. 19 Oct 2018). Here the 'tools' of Wi-Fi and the internet are figured as methods of access; Wi-Fi is a tool to access the internet in much the same way a key is a tool to gain access to the home. It is of concern for but a moment, and then swiftly forgotten when its purpose is completed. Of course, there are instances where the intervening technological infrastructure is momentarily recognized, if only as a medium. In these instances the students were quick to aver that it is the human to which they are relating, and not the machinic; machines are only ever talked *through* and never talked *to*. The machine, in this perspective, is non-agential, or as one student put it: "Although taking [a] phone call is also considered talking to [a] machine, but I'm still interacting with human not machines" (Research Data. *Week Eight Writing Assignment*. 23 Nov 2018). Technologies can be interactive, certainly, but it is never *real* interaction, as "They're never actual conversations and I don't think I like the idea of having an intellectual conversation with a technological device" (Research Data. *Week Eight Writing Assignment*. 23 Nov 2018). In this figuring, technological infrastructures are simply tools, and "Humans [have] the ideas and tool[s] to create these technologies to improve life for themselves and for those around them" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

For many of the students, technologies and their adjacent infrastructures don't *do* anything. Rather, it is always the human that is the active component, and always the human who is agential. Even in cases where a computer or infrastructural assemblage *appears* to do something, this is simply an illusion, a fig leaf for human action. Technology does not arise *de novo*, or as one student put it "I think it's important to remember that anything that a computer or machine does has to be put in by someone" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Likewise, technology does not lend itself to self-improvement, as "Without people, technology cannot improve or implement its use by itself" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018. Infrastructures and their adjacent technologies might be difficult to fully grasp, but they are still human projects, and while "They are complex to understand and even more complex to build, but they have been built by amalgamating technologies developed by humans over the years with direct human touch" (Research Data *Week Five Writing Assignment*. 2 Nov 2018).

If all agency within human/infrastructural relationships resides with the human, then so too does all fault. Many of the students appear to ascribe to the adage that it is a poor craftsman who blames his tools; that is to say, all technological faults are in fact human errors. More specifically, the students were quick to claim that it was *their* fault in particular. As users of these devices and systems, it is apparently incumbent upon them to use these systems flawlessly; anything less is reason for self-censure. This theme recurred throughout the data, with several students echoing sentiments such as "I knew I only had myself to blame for the problem", or "Of course, it's always my fault" (Research Data. *Week Eight Writing Assignment.* 23 Nov 2018). While not castigating themselves for failure, the students also considered other human elements that might be to blame for a given technological predicament. While the problem might be technical in nature, the mistake is always human; "In my head I blamed my professor for assigning us homework on a website that is not up to date with the most current version of Mac/Windows operating systems" (Research Data. *Week Six Writing Assignment*. 9 Nov 2018). This sentiment extends to the incorporated human as well; ascribing responsibility for technical faults to "Apple" or "the company who made the game" rather than to the device itself is another common theme among the student responses that espouse a 'tool-based' perspective on technology. While from this perspective the human is the only valid subject for blame, the inverse is also true; any credit for fixing technological issues is also abrogated to the human. For these folks, computers have no regenerative capacity; all error recovery is done by and for the human. "There is no such thing call[ed] 'Fixed itself'", one student relates, "I'm always the one to fix it, rather than the computer 'fixing itself'" (Research Data. *Week One Writing Assignment*. 2 Oct 2018).

Machines don't fail people; people fail people. The mechanistic sanctity of the technological is complete; it is only the flawed users and fallen designers that have dragged our machines from their natural state of grace. While a rather practical perspective on

technology, it is not particularly nuanced; technological phenomena adjacent to information infrastructures are often bewilderingly complex, and problematize a univocal ascription of agency to the human.

> "It is interesting to see how I automatically thought I was at fault. Not being aware that there are so many components beyond me that could be the cause of the issue baffles me. I guess I have no human to blame for my technological problem; machines are fallible and the only way we could solve problems like that would be to work together and utilize all the powers and tools we have in regards to technology" (Research Data. *Week Eight Writing Assignment*. 23 Nov 2018).

This altogether understandable ignorance of the complex systems that undergird the contemporary can be understood in terms of Star and Ruhleder's concept of "Infrastructural Transparency", wherein "Infrastructure is transparent to use, in the sense that it does not have to be reinvented each time or assembled for each task, but invisibly supports those tasks;" (Star and Ruhleder, 1996). To paraphrase Star and Ruhleder, a functioning infrastructure is one that does its work invisibly, and once learned "through membership" becomes "transparent in use"; in other words, good infrastructures are neither seen nor thought about by their general users (Ibid). The more effective and robust the infrastructure, the less visible it is. This renders many infrastructural systems essentially unfigured relative to their users; out of sight, out of mind. Information infrastructures that are 'naturally' invisible, such as Wi-Fi, are doubly distant; rather than simply unseen, they are unsought. "I have not deeply thought about Wi-Fi since I never questioned how it worked", one student related in their survey response, "I do not even know what Wi-Fi stands for if it stands for anything" (Research Data. *Week Three Writing Assignment*. 19 Oct 2018)[2]. Once again, this is reflective of a highly pragmatic approach towards technology that is centered upon the human. Engaging upon complexity is a luxury that many of the students simply did not have; "I have never gone out of my way to search how Wi-Fi works because I never had a reason to. This mentality applies to most technology I own. If I don't need to know about it, I won't put in the effort to learn" (Research Data. *Week Three Writing Assignment*. 19 Oct 2018). In truth, this is unsurprising; one does not need to be a mechanic to drive a car, or be a chemist in order to take an aspirin. Understanding how to use infrastructural systems is a much more pressing concern than understanding how such a system operates.

> "I have always just used the internet but I never questioned until now how it really functioned. I have developed all the skills I

[2] Complicating matters is the fact that Wi-Fi doesn't 'mean' anything; it's simply a genericized brand.

> have needed to know to this point in my education but I think I have not been curious enough to look into learning different skills because I feel like I do not need to know them at this point" (Research Data. *Week Six Writing Assignment*. 9 Nov 2018).

Learning new skills takes time, and the capacity to examine infrastructure is not trivially acquired. Acquiring the skills to use Wi-Fi and the internet is *de rigueur* for the contemporary university student; to quote Star and Ruhleder, "Strangers and outsiders encounter infrastructure as a target object to be learned about. New participants acquire a naturalized familiarity with its objects as they become members" (Star and Ruhleder, 1996). Infrastructures are relational; if the activities that a given infrastructure subtends have no interest to you, then such systems recede from visibility. As one student put it in their discussion of the 'dark web', "Not learning how the dark web works makes sense in my case, since I am not linked to any illicit activities or agenda. It was not necessary for me to know such dark skills since my community never needed me to learn them" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). In other words, there are wholly valid reasons that the students surveyed were uninterested in how the information infrastructures they use actually function. In some cases, they know enough to get by; in others cases, such as the dark web, they know only that they don't need to know. For many of the students who responded to the survey, this is less than problematic; "We use it without thinking too much about it; we simply connect and use the connection it provides for whatever we desire" (Research Data. *Week Three Writing Assignment*. 19 Oct 2018). That is not to say that the students are wholly unaware of the issues at stake; the power of information infrastructures is apparent, even if the infrastructures themselves resist aspection. Quite neatly put, "This is dangerous because we rely on the internet so much, but don't understand it. The internet is a black box system for many digital natives, including myself (Research Data. *Week Six Writing Assignment*. 9 Nov 2018).

This conception of information infrastructures as a powerful yet unexamined force within everyday life has, at times, been productive of attitudes towards infrastructural that appear *prima facie* paradoxical. The Internet, Wi-Fi, and other information infrastructures are necessary for contemporary life, certainly, but it is not incumbent upon us users to manage, maintain, or understand these systems. Information infrastructures are, to paraphrase a student's response, unimportant necessities; required *for* work, but not the site *of* work. For the student responses discussed here and above, infrastructure has no interiority; infrastructure is not a subject, and there is no 'there' there. Whether this is due to an anthropocentric view of technology or the effects of infrastructural invisibility is not particularly relevant from a phenomenological standpoint; both cases lead to an elision of the machinic

and the infrastructural, leaving the human as the sole subjectivity capable of sustaining agency. Machines, infrastructures, assemblages; all of these are merely mediums for human agency, without a ghost of poesis, auto or otherwise. But, as I wish to remind you, this is but one perspective voiced in the student survey responses. While the anthropocentric, tool-based view of infrastructures as invisibly important necessities is the most common perspective within the student data, it is by no means the only one.

What is a relationship with infrastructure like? Touching the Elephant

> "A group of blind men heard that a strange animal, called an elephant, had been brought to the town, but none of them were aware of its shape and form. Out of curiosity, they said: "We must inspect and know it by touch, of which we are capable". So, they sought it out, and when they found it they groped about it. In the case of the first person, whose hand landed on the trunk, said "This being is like a thick snake". As for another person, whose hand was upon its leg, said, the elephant is a pillar like a tree-trunk. The blind man who placed his hand upon its side said the elephant, "is a wall" (Goldstein 2010).

Infrastructures are difficult to grasp in their entirety. Given issues of scale and infrastructural invisibility, we are never able to see the entirety of a given information infrastructure. We may notionally visualize information infrastructures, produce conceptual models and metaphors, but these maps are not the territory; these analogies are not infrastructures. They do, however, inflect and inform the ways in which we relate to information infrastructures, which in turn impacts how we use such systems. As with the elephant, infrastructures are *like* many things because they *are* many things. An elephant is, relative to each blind man, only what the relationship affords. For the third blind man, the elephant "is a wall". It is not like a wall, or is something analogous to a wall; in the relationship formed between the blind man and the elephant, the human/elephant assemblage can subtend such diverse actions as blocking, leaning, shading…anything that a wall is capable of. If this blind man rests in the shade of the elephant, who are we to tell him he is using the elephant incorrectly?

Many of the student survey responses relied upon the use of metaphor and simile in order to convey the phenomenological experience of using and relating to information infrastructures. Infrastructures are both relational and multiple, so a relationship with infrastructure can be akin to many different types of relationships, without there being some unitary metaphor that forms the core of

human/infrastructural relations. None of these students have 'seen the elephant', as it were, but all have touched it and been touched by it in return. How students analogize infrastructural relationships, and the terms with which they do so, are highly instructive to unpacking the phenomenology of human/infrastructural relationships. Let us join the students in metaphor now, and stretch out our hands to touch the elephant of infrastructure.

Legs like a Tree: Natural Metaphors in Human/Infrastructural Relations

Many of the metaphors students used to describe information infrastructures and their relationships with said systems derive from the natural world, and use references to plants, animals, and other natural forces as explanatory rhetorical devices. Just as an elephant may be described as having 'legs like a tree' without having any other arboreal attributes, information infrastructures and their adjacent technologies can also be described through piecemeal reference to the natural.

The question of which came first, the chicken or the egg, has long been an entertaining thought experiment in the biological sciences. My colleagues in the information sciences have no such similar quandary; in our field the web came first (1989), and spiders followed after (1994). Webs and their subsequent spiders have remained an enduring metaphor for the network that is the internet. Based upon examination of the student data, this metaphor continues to be of use in describing the form and organization of the internet.

"It is like a big spider web that connects people in this area, also, there are other webs that link each other, connecting everyone's phone or computer. In the center of a spider web, there is a terminal (mother spider), and she control[s] the whole net in this area. In one web, we can transmit or receive any information we want, including game data, pictures, news, etc" (Research Data. *Week Three Writing Assignment*. 19 Oct 2019).

The Web and webs are a highly naturalized natural metaphor; it can be difficult to conceive of the form of the Internet as anything but web-like. Even the fairly far-ranging theoretical duo of Deleuze and Guattari lean upon the natural world for metaphorical support, though they take their inspiration from rhizomatically networked root systems rather than arachnid snares. These rhizomatic metaphors deployed by Deleuze and Guattari have a history as well; these roots have roots. In their exhortation to "…Make rhizomes, not roots, never plant!", Deleuze and Guattari are resisting what they describe as "arborescent" or hierarchical conception of knowledge (Deleuze and Guattari, 1987). To a certain extent, this critique of hierarchical thinking makes a good point; many networked phenomena resist being rendered in terms of teleological causality. But, simply

because the rhizome might be more suited as a metaphor for the information infrastructure of the Internet does not mean that one cannot usefully describe networks in reference to arboreal forms. One student offered an extended metaphor in which "the internet, or how its access is distributed, is shaped like a tree. What I mean by that is that there is a central 'internet seed' where everything is taken and contained, with several 'branches' such as satellites and internet providers to distribute it further to individual devices, such as PCs, video game consoles, and smartphones" (Research Data. *Week Ten Writing Assignment*.3 December 2018). While Deleuze and Guattari explain the robust nature of rhizomatic systems through reference to their concept of asignifying rupture, wherein "a rhizome may be broken, but it will start up again on one of its old lines, or on new lines" (Deleuze and Guattari, 1987), the student who has chosen to think with trees has a different way of accounting for the Internet's indestructibility. "The Internet cannot be killed", the student relates, "I believe that the 'seed' in which all of the internet is contained can be moved from the 'internet tree trunk' to its individual 'branches'" (Research Data. *Week Ten Writing Assignment*.3 December 2018). In other words, the essential core or 'seed' of the Internet is out there, somewhere; this particular 'tree' could be regrown from said seed if it is ever chopped down, metaphorically speaking.

Do either of these metaphors perfectly explain the resiliency of networked forms of information infrastructure? Certainly not. What they do provide, however, is insight into how these systems are perceived by their users. Whether or not these metaphors are accurate in their representational reference to infrastructural systems is beside the point; we are interested in how users understand these systems, not whether they do so properly. Do antivirus programs in computers work in a similar manner to our own immune systems, "like a macrophage engulfing and eliminating a pathogen" (Research Data. *Week One Writing Assignment.* 4 Oct 2018)? Does Wi-Fi work "by emitting some kind of noise [that] cannot be heard by humans, just as dogs can hear some noises humans cannot" (Research Data. *Week Six Writing Assignment*. 9 Nov 2018)? Well, yes and no; the processes in question may very well be analogous, even if the comparisons break down under closer analysis. The point here is that framing infrastructural systems such as Wi-Fi or the Internet using biological metaphors has consequences for how we perceive those systems, and informs and inflects our relationships with infrastructure. Organisms do not break down; rather, they get hurt or tired, and require rest and healing rather than maintenance and repair. "Computers", one student relates, "need to rest because of all of the work and data they handle", which requires "A process of releasing, regenerating and regrouping resources on the platform would need to occur to solve the faulty problems like unresponsiveness and get the computer

running efficiently" (Research Data. *Week Four Writing Assignment*. 26 Oct 2018). Computers, and other technologies adjacent to information infrastructures, are depicted as requiring rest in a manner that one would not attribute to, say, a wrench, or any other brute tool. One could even consider these qualities as reminiscent of the human; if so, then you are in good company.

Trunk like a Snake: Anthropomorphic Metaphors in Human/Infrastructural Relations

While natural metaphors offer an accessible and relatable way to describe infrastructural relationships, few comparisons are as near to hand as the self. Looking out into the world we see things which, upon reflection, often appear similar to ourselves in either form or function. Anthropomorphically attributing human attributes to non-human devices and assemblages allows for the abrogation of agency to the non-human, without necessarily losing the anthropocentric perspective on technology that predominates the student accounts of their relationships with information infrastructures. In this rendering technologies might still simply be tools, but they are tools that act in an agential manner best described with reference to the human. For many of the students, these information infrastructures and their adjacent technologies are, if not human, at least endowed with certain human characteristics.

"When I lose my cell phone," one student relates, "I feel as though I have lost a part of myself" (Research Data. *Week Six Writing Assignment*. 9 Nov 2018). I can empathize with this sentiment, and I am certain that many of my colleagues share this attitude. From a distributed cognition perspective, my phone is an extension of my self; the self who can remember phone numbers, do long division, and recall appointments. For the students, this extensibility of cognition allows for a similar extensibility of metaphor; if a device's function is analogous to a similar cognitive function, it makes sense to describe it in terms of biological metaphor. Within the student data there are no less than seven different students who referred to the CPU as the "brain" of the computer, most suggesting that in some form "The CPU controls the computer to fix itself as the human brain controls the body to heal itself" (Research Data. *Week One Writing Assignment*. 5 Oct 2018). This deployment of the human nervous system as a metaphor for assemblage also shows an understanding of the infrastructural elements at play, asserting that "the motherboard is like the spine of the computer, holding all the crucial elements together" (Research Data. *Week Two Writing Assignment*. 12 Oct 2018). These piece-meal renderings of information technologies in terms of dismembered organs have the potential to allow for analogical reasoning as to why devices suffer malfunction; "Just as how

students break down and cry around final exams because they have too much to study for, computers/laptops break down because they're given too many instructions and don't know how to handle them all at once" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018). Brains and spines are never unaccompanied; where one perceives a mind, the perception of agency is sure to follow. The question, then, is what sort of agent are information infrastructures and their adjacent technologies imagined to be?

One of the prompts from the student survey questionnaire asked the following question: "When, if ever, do you talk to machines? On what occasions might you verbally address a computer or a device, and why? What forms of address do you use, and what do you say? Are there certain types of technologies you are more likely to talk to than others? Why?" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). There are a variety of entities who can be talked to; individuals talk to pets, gods, and ourselves on a regular basis. The most common target for speech, however, is other people, other human beings with whom we can converse. When we talk to machines, we do not talk to them as if they were machines, discussing machine topics in machine language. Rather, we talk to machines as if they were human, and discuss human topics in human terms. In addressing machines in this manner, the students have tended to notionally construct a human to use as metaphorical reference. Or, in other words, they describe the ways in which they talk to machines through human metaphors. This reveals an interesting facet of the students' relationships with their technologies; as will be discussed later, there are some tools that one talks to, and some tools one does not. In terms of metaphor, however, the object of inquiry is not that students talk to their devices as if they were humans, but rather in examining what *kind* of humans the students use to describe these relations. One talks differently to a beggar than to a king because one relates differently to beggars and kings; similarly, how the students choose to metaphorically represent the devices that they talk to is indicative of how they understand their relations with their devices. Devices, infrastructures, and technologies are not people; but if they were, what sort of people would they be?

For these university students, one's position in society is understood as being nominally meritocratic; the more advanced one's capabilities are, the more honored their role will be. Likewise, machines with limited capabilities are often talked to as if they were subordinates, such as underlings or children. Open to influence, these devices can be convinced and persuaded, reprimanded and cajoled, all with the intent (if not the expectation) of changing their behavior. Within the student data this phenomena occurs most often in the context of technological breakdown and the student's subsequent attempts at repair. At times, the students phrased their

speech towards their devices in terms of a business relationship "The emotion when I was doing these talk[s], I believed, was criticizing a servant or an employee who made a mistake. I would talk to the machine just like it was a real person while I was trying to fix it" (Research Data. *Week One Writing Assignment*. 5 Oct 2018). Taking an underling to task is a particularly univocal dynamic; there doesn't tend to be a good deal of back-and-forth in a typical dressing-down. Similarly, the student in this case does not expect his computer to respond, but to 'simply' fix the problem. Some devices, it seems, can be talked to, but are not expected to talk back. Or, at least not intelligibly. Several students described speaking to their devices as though they were children, unable to adequately communicate their needs and desires; "I speak in encouraging or gentle tones, as if speaking to a child, unless something is horribly wrong, which is when I either panic or become frustrated" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). Once again, these devices are not supposed to answer back; either their capacities to communicate are limited, or we simply do not care what they have to say. So, what is the point of talking to someone who does not talk to you? "I suppose I talk to my devices because I expect them to either—if they make me happy—feel great about themselves and feel appreciated or—if they are behaving badly—get put on a warning and fix themselves" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). Of course, the students understand that computers don't *really* have the capacity for self repair; the student in question goes on to relate that "The fact that I expect them to fix themselves is very funny to me, now that I mention it" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). From a certain perspective, the idea that any device could fix itself may well be laughable. But, there was another aspect of their relationship that was not quite so comically farfetched; the idea that a machine could "feel great about themselves and feel appreciated" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018)..

This *quid pro quo* between the human and the non-human, or the sense that if you take care of your tools they will likewise take care of you, is neither novel nor exceptional. Ask a fisherwoman about her ship, or a hunter about his favorite firearm, and chances are you will hear something akin to 'I take care of her, and she takes care of me'. The dynamic in this sort of relationship is similar to the superior/subordinate metaphor discussed above, but with a greater degree of parity or equality between the human and the nonhuman. These students metaphorically describe their relationships with their devices in terms of dependable partners or reliable friends, even in cases when such reliability is tested.

> "Although machines aren't able to understand, there's this feeling that if I give it encouragement-perhaps it will not crash on me and get in the way of completing work that I have to do. I would address it like a friend that needs to help me out and stick with it. I

> once did it for my old phone when it was working really really slow and I had to just tell it that it can do it." (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018).

Constant companions who stick with you through thick and thin; these are the ideal qualities of a friend. It is natural to have an attachment, even a loyalty, to our friends. Is it then any surprise when we develop a similar attachment to devices that exhibit friend-like characteristics? One's friend group, or support network, undergirds much of our social activity. To be rendered friendless is to be cut off from one's most reliable networks; likewise, to be cut off from one's most reliable infrastructures is to be rendered friendless. "Unlike other devices or technological systems, the mobile phone stays with me all the time. It is like a friend who can meet all [the] demand[s] I need, so I treat the mobile phone also like a friend. I cannot leave it in any situation [or] any time" (Research Data. *Week Seven Writing Assignment.* 7 Nov 2018). A friend who can meet any need is a friend indeed, the student seems to suggest. A friend is a peer, an equal, competent and reliable. Unlike the metaphors of clumsy subordinates and unintelligible children previously described, positioning information technologies as friends suggests a degree of parity between the human and the non-human. Student descriptions of contemporary voice-assistant technology show a degree of friendly play in their conversations with friends.

> "Whenever I feel tired and bored, I would like to ask some questions to Siri. As time goes by, the technology is improved a lot and Siri can understand more questions and have more new functions. I am still curious about how many problems it can answer and solve. So, I just talk with it back and forth, like communicating with friends, just to see if it cannot answer me" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018).

As Siri becomes more capable of answering questions, the more friend-like she becomes. As information infrastructures and their adjacent technologies become more powerful they become more human, in their relation to the human. As one student aptly puts it, "I find myself more likely to talk to my computer and phone than the television or my rice cooker" (Research Data. *Week Nine Writing Assignment.* 30 Nov 2018). But, if the students in this survey conceive of reliable resources as friends, how do they metaphorically anthropomorphize devices and systems with capacities that transcend the human? If faulty devices are subordinates, and competent devices friends, then how are powerful devices conceptualized?

Siri, Alexa, Cortana…is it a coincidence that all of the most popular virtual assistant are women? Research has shown that the general public prefers to have

their virtual assistant gendered as women (Payne et. al., 2013); likewise, the survey data suggests that students prefer to conceptualize their more powerful devices as women as well. Strong and capable devices, it seems, evoke strong and capable women. For at least one student, the most applicable metaphor for these devices was *mother*.

"I started using the Echo's AI assistant, Alexa. At first I used it mainly as a Bluetooth speaker for music streaming and to check the weather. But one day, Alexa flat out said to me "You know I have a lot more things I can do, right?". After talking (and I do mean talking to Alexa) I realized that there was more [to] it than a weatherwoman. I was asking it for the news in the morning and it would read me off headlines while I got ready for class. I'd ask if I would need a jacket for the weather and *it'd respond just like your concerned mother would*. I was conversing with a person that wasn't there" [Emphasis added] (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018).

The students surveyed did not often gender their devices, and virtually never gendered the adjacent information infrastructures themselves. When they did gender their devices, however, it was usually as a way of analogically accounting for the device's reliability. "I refer to all of my tech devices and my car as women", one student relates, "because they always get the job done no matter what"(Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). The same student goes on to explain that, since she can trust in her device, "most of our 'conversations' are more along the lines of 'Girl, please stop glitching, I have a paper due in 32 minutes' or "I need you to charge so I can figure out how to get to the freeway." (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). This conceptualization of her devices as strong female allies is indicative of the power of these systems and the trust we place in them, certainly, but it also speaks to a certain recognition of similarity between the human and the nonhuman. Do we recognize virtues in the machinic that we also see in ourselves? Or are these idealized female figures aspirational, platonic forms of stalwart (yet servile) femininity?

That is not to say that all devices gendered as women are flawlessly aligned with the students, or even benign. The students who metaphorically gendered their devices as female described them in terms of power first; other attributes, such as reliability or kindness, were often secondary, if mentioned at all. These figures may be negotiated with, but at a price; "It's a take-and-give-back situation. Just as Ursula, from The Little Mermaid, gives Ariel the ability to walk in exchange for her voice, my Trello and MyHomework app give me the ability to store the due dates for my assignments in exchange for a part of my memory" (Research Data. *Week Five Writing Assignment.* 2 Nov 2018). The reference here is to a Faustian bargain made

by the eponymous *Lille Havfrue*; she is given the legs she needs to be with her beloved, but has to give up the voice he fell in love with in return. A deal has been struck, as it were, between this student and the network of devices that subtend her intellectual work. It is particularly interesting that the student chose Ursula, a powerful and villainous sea-witch in *The Little Mermaid* story, to represent this assemblage of devices. Does this suggest that the student is apprehensive as to what her relationships with this information infrastructure is costing her? At the very least, it reveals an aspect endemic to any relationship, human or otherwise; a relationship is always a game of give and take.

From matriarchs to mermaids, the female archetypes that the students have chosen to metaphorically describe their relationship with information infrastructures and their adjacent technologies have been attributed no small degree of power. These are not friends to chat with, nor subordinates one can upbraid; in comparison to the two other classes of anthropic metaphor displayed, these female-figured devices have hidden depths of competence. That the students deployed a range of anthropic metaphors to describe the relationships to their technologies is unsurprising; befriending and begendering one's devices is hardly eccentric. Quirky, perhaps, but such quirks may ultimately prove the key to understanding how humans relate to information infrastructures and their adjacent technologies. Are these characterizations of infrastructure wholly rational in their implementation? No; but it may be that our relations toward infrastructure are not wholly rational either.

Side Like a Wall: Architectural Metaphors in Human/Infrastructural Relations

Humans and other biological metaphors are understandably well suited for describing interpersonal relationships. They are, however, less well-suited for describing *spatial* relationships; stating 'She is like a mother to me' says much about *who* she is in relation to me, but says very little about *where*. Where an infrastructure is located is not as simple of a question as it sounds. Infrastructure, being a relational concept itself, is located where it is recognized; a light switch you do not know about plays no infrastructural role, whereas one you can locate does. Relative to your point of view, the lighting infrastructure is located where it is recognized. In terms of metaphor, where students decide to analogically locate infrastructure and how they describe it in spatial terms reveals aspects of how they conceive of human/infrastructural relations.

In the parable of the blind men and the elephant at the beginning of this chapter, one man touches the side of the elephant and declares that it is a wall. We are familiar with walls, arguably more so than trees or snakes. While natural and

biological metaphors are excellent for describing relationships, they are less well suited to describing the spaces in which we live and move. The natural world suffuses all, certainly, but in the contemporary even our natural spaces are often designed. When we talk of spaces, particularly designed spaces, architectural terms understandably predominate. The responses to the survey questions in this project include a number of instances wherein students deployed architectural and spatial metaphors to help explain how they understood the complex relationships between themselves and their information infrastructures. As before, we are not interested in the fact that the students used architectural metaphors, but rather in examining what the choice of a particular metaphor reveals about the student's relations towards infrastructure.

Certain infrastructural arrangements, it seems, are best described in terms of other, more concretely spatialized infrastructures. Wi-Fi, the invisible aetheric weave that subtends wireless networking, appears to be particularly well suited to being described in this fashion. A quick sampling of the students surveyed shows a considerable degree of overlap. "Wi-Fi is essentially our gateway to connect to routers", one student suggests, while a second states that "Routers serve as a gate of entry for other devices", and yet another student concludes, "When you device connects to a router, this will now open a 'gate'…" (Research Data. *Week Three Writing Assignment*. 18 Oct 2018). In this figuring, it would appear as though the process of connecting to the Internet is nothing but gates all the way down.

Gates, like other portals, afford two actions; they let things in, and they keep things out. It takes a strong gate to keep things out, and it takes a wide gate to let things in. When discussing Wi-Fi, we are not talking about spatial width, but rather *bandwidth*[3]. The metric here is not how many pilgrims we can push through a gate at once, but rather how many discrete signals can co-occur at a particular electro-magnetic frequency. This can be quite a crowd, and very public; "Everything you do Wi-Fi is visible to others on that same network, so using a publicly available Wi-Fi *is like shouting for the entire room to hear* what you're looking up and what you're doing" [Emphasis added] (Research Data. *Week Three Writing Assignment*. 18 Oct 2018). One's fellow networkers constitute a crowd, and only so many people can pass through the metaphorical gate at once. Some of the students chose to metaphorically address issues of bandwidth using a particularly imaginative spin on the gate, stating that Wi-Fi "…is like a taco truck trying to get many orders at once" or "…like a safe which contains lots of money…with a multi-door mechanism which allows a set of people to share the money for fun" (Research Data. *Week Three Writing Assignment*. 18 Oct 2018). In each of these examples, the students in

[3] Which, in a delightful turn, is now a commonly used metaphor for attentional bottlenecking in humans

question have chosen to spatialize the concept of bandwidth through the use of metaphor. But, in each of these cases, the students have had to propose their own spatialized rendering of how they believe bandwidth problems are solved by the network. Are wireless transmission bands more like taco trucks, in which it works best if the customers politely line up one at a time? Or are they more like a room, where shouting is sure to get you heard (as well as overheard)? Or are these infrastructures best understood through analogous references to other infrastructuralized spaces, such as the notional multi-doored safe suggested in the prior example? If so, then the task of understanding human/infrastructural relations becomes all that much more pressing; infrastructures, once naturalized, have a tendency to fade from view. This can be clearly seen in the last example of this section, wherein a student uses infrastructure as a simile for a process that, once learned, is henceforth unproblematic; "Furthermore, upon visiting a website, I can navigate through the page without much trouble and find what I am looking for even if it is my first time on that website. These pages *are like infrastructure to me*, in the sense that after learning how to navigate one page, the rest [are] easy to figure out [Emphasis added] (Research Data. *Week Six Writing Assignment*. 9 Nov 2018).

The Elephant in The Room: Metaphors in Human/Infrastructural Relations

Infrastructure makes a good metaphor for infrastructure, certainly, but how does the examination of these analogies give us a deeper understanding of human/infrastructural relationships? When one describes a thing metaphorically, we are describing it in reference to something else. More importantly, we are describing it for ourselves, from our own uniquely situated and sited self. Metaphors do not simply say what something is like; they say what it is like to *me*, from my perspective. Metaphors are also imaginative, in that they require analogical thinking and creative conceptualization. How, and more importantly *why*, these imaginative conceptualizations of infrastructure are necessary for human/infrastructural relations will be discussed later. The issue here is to showcase the relationality of infrastructure; that first, humans and infrastructures are in relationships and second, that the appearance of infrastructure is always relative to the human. In other words, we have relationships with infrastructure, but what that relationship constitutes is highly relative, depending on the human and infrastructure in question. While there are a number of thematic congruences within the student response data, there was little in the way of simple agreement; everyone, it seems, has their own personal rendering of infrastructure, and thus their own unique relationship.

Information infrastructures and their adjacent technologies are evocative in relation to the human. They conjure forth spidery webs and maternal overseers, gated portals and crowded taco trucks. They bring forth relations, notional perhaps, but no less impactful for their lack of actualization. These virtual entities and imagined individuals may not act agential in and of themselves, but our use of these systems is informed and inflected by the manner in which we conceptualize them. In this way, these virtual entities can be considered agential; we may have made them, but through using them as conceptual reference we are ourselves remade. This project aims to understand how we conceptualize of information infrastructures, true, but ancillary to this goal is the intent to unpack why such imaginative efforts are necessary in the first place.

Once again, the student data examined here has been the most prosaic examples of infrastructural conceptions, common metaphors used throughout the survey responses. These are, for lack of a better term, 'normal' ways of relating to infrastructure, neither ill-informed nor eccentric. In the following sections of this chapter we will explore certain human/infrastructural relations which, in comparison, appear considerably more strange, or even downright bizarre. As we do so, however, I ask that you keep these more pedestrian examples in mind. For these students at least, it would appear as though infrastructural relations can only be described with recourse to metaphor. What about the relationships between humans and their infrastructures prevents the human from describing infrastructure directly? What are facets of this relationship that resist human conceptualization? And finally, is there some aspect endemic to information infrastructures that precludes examination and description in anthropic terms?

Infrastructural Fantasies: **Imaginative Conceptions of Systemic Mysteries**

> A map *is not* the territory it represents, but, if correct, it has a *similar structure* to the territory, which accounts for its usefulness.
>
> — *Alfred Korzybski, Science and Sanity*

How we representationally conceive of infrastructural assemblages necessarily inflects our use of such systems, just as a map inflects our travel across a territory. An eclectically drawn map, such as one using novel notation and marking obscure landmarks, might not be of much use in navigation. It would, however, tell us a good deal about how

the cartographer in question sees the territory. The presence of the phrase 'Here be Dragons' on a map reveals a good deal more than simply where the dragons be; how we choose to represent *terra incognita* and other known unknowns is a reflection of our relations towards these murky areas of the map. How we approach the unknown is always already informed by imaginative constructions of hope and fear, creative renderings of what we might find. This section examines the conceptions and beliefs that inform their use of information infrastructures, and analyzes the eclectic maps with which they navigate these assemblages.

As this project focuses on information infrastructures rather than geographical topologies, it may be more effective to talk in terms of'"black boxes' rather than dark continents (Ashby, 1956). The students surveyed were acquainted with black boxes, both practically and conceptually. When asked for examples of black boxing in information technologies, the students could readily provide examples such as their smartphones, internet transfer protocols, or Google's search algorithm. Inputs go in, outputs come out, and an occult process occurs in between. But these boxes are not black; rather, they are blank, open spaces to doodle dragons and other mythical marginalia. How the students choose to fill these blanks, and what imaginaries they conjure, is critical to understanding human/infrastructural relations in a broader sense.

Not all fantasies are particularly fantastic. For the students surveyed, truly imaginative imaginaries appear to be reserved for information infrastructures and their adjacent technologies. Non-networked technologies were often rendered in rather mechanistic terms, even if they were digital devices; "I believe that digital clocks do have gears inside, but instead of moving the clock hands, it pushes a button after its cycle to advance the display of the time" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018). A digital clock is not a particularly complex device, but, as you can see in this imaginary inventory of its insides, it can still be rendered in simpler, more relatively relatable terms. This proves to be a recurring theme in the student responses. These infrastructural imaginaries, these sense-making stories, are similar in one regard; they are all attempts to make hidden or complex systems relatable.

Why bother making something more relatable? To form a relationship with it, of course! Humans have a peculiar relationship with the unknown. We will tolerate mysteries insofar as we are allowed to name them, mask them, and make them more personable. We anthropomorphize and ascribe agency, creating characters of characteristics and inferring purposive designs from design. In other words, where users find black boxes, they build agents. What sort of agent is imagined plays no small role in determining the affective valence of the ensuing human/infrastructural relationship. Are these relationships towards the infrastructural unknown characterized by fear and mistrust, conservatively hedging against unseen threats? In some cases, yes, in others, no; as we will see, the intentionally

invisible operations of infrastructure leave much to the imagination. Fear is a perfectly appropriate response to the covert movements of unknown forces, but it is by no means the only possible one.

Many of the students see these black-boxed systems as having deleterious effects on the human not through malice or mischief, but simply as a cost endemic to using such devices. In these occult imaginaries, our tools subtly sicken us, malign energies leaking out to poison unsuspecting users. In many of the student responses, this fear of contamination is couched in terms of radiation.

> "My iPhone is a black box I use almost everyday. When I go on my phone, I believe iPhones emit large quantities of radiation, may[be] resulting in cancer . I saw many articles and studies supporting this, but everyone around me still uses their iPhone everyday putting it up against their legs or their faces" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018).

This is a recurring theme in the student responses; smart phones are suspected to emit cancer-causing radiation, but students are willing to use them anyway. The cost to one's health is often rationalized, but remains a concern; "Although it does not harm a lot, it still influences my health in [the] long run" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018). Radiation, as an invisible emanation from an occulted black box, is understandably difficult to understand; "Although thinking about it, I'm really not sure exactly how microwaves work. I know that they use microwave… waves to heat up food?" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018). Different forms of radiation are often conflated in the student data; both harmful and non-harmful forms of radiation are lumped together as equally suspect. Power, it would seem, has a price in terms of internal enervation, but it is a price that everyone else is apparently always already prepared to pay.

As a rule, the students surveyed were less concerned about what infrastructures and adjacent technologies were doing to their health, and more concerned with impacts on their privacy. This is for good reason; to quote *Catch-22*, "Just because you're paranoid doesn't mean they aren't after you." (Heller, 1961). Still, while narratives portraying devices as snitches or spies were rampant, they were often couched in ambivalent terms with anecdotal proofs, much as if defending a queer local superstition to a skeptic. "I hate to be part of the deranged group who thinks their devices pay attention to what their owners do", one student relates, "but I firmly believe Apple products, including the Apple watch, capture data through our voices. Why is it that every time I practice my portuguese out loud different platforms start giving me portuguese ads?" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018). Listening, like radiating, is an invisible act; there is little way to know whether a given device is recording, processing, or sending audio data. If a

device has a capacity to invisibly listen, it is safe to assume that it is always listening. Or, rather, it is never safe to assume that the device is *not* listening, which amounts to the same thing.

> "I have an Echo Dot, but I keep it unplugged unless I'm using it because it's unsettling to know that it's listening to every word that comes out of my mouth just in case I say "Hey Alexa, do [blank]." Not to sound like a conspiracy theorist or anything, but I truly do believe that there is some truth to all of the Big Brother-esque rumors about the government, and I'd rather be safe than sorry" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018).

What is the difference between an audience and an eavesdropper? Simple; we are aware of the presence of the audience. Awareness of a surveilling presence is as important in this case as it was in Bentham's Panopticon (Bentham, 1791). And these devices are present, increasingly so; even the claim that there are fifty billion internet-capable devices in the world today understates the interpenetration of these devices into our lives (Nordrum, 2016). While some of the students discussed previously characterized their relations to Alexa, Siri, and the rest of their brood as positive, even maternal, other students were considerably less sanguine.

> "I'm very paranoid, so I don't use services that require constant audio monitoring like Okay Google or Amazon Alexa, but my boyfriend does. When I'm at his house or in his car, I will frequently talk shit about [them] for being dirty listening devices to their digital faces" (Research Data. *Week Six Writing Assignment*. 9 Nov 2018).

These omnipresent listeners are given a mask, "digital faces" which one can "talk shit about". Whether Alexa and OK Google are actually listening for is ultimately unknown, at least relative to this student as a 'user' of the infrastructure. But as long as the device is perceived of as listening, it is perceived of as present, and conceived of as an entity. The threat to privacy that these listening devices represent is personified, anthropomorphized, and the student's actions and attitudes towards the infrastructure in question are colored by these perceptions.

Students fear that these devices are always listening, but there is little visible indication as to whether this is the case. Students wishing to confirm the presence of an eavesdropping device conducted their own small experiments, testing the devices' capabilities and probing for a response. The difficulty, it seems, lies in the infrastructural invisibility of these devices' surveillance capabilities. Designed to be unobtrusive to the point of invisibility, these Things in the Internet of Things may very well always be listening, but how does one go about proving it? How can we certify that we are the focus of

these devices' attentions, if their acts of attending are hidden or invisible? How can we make invisible entities visible in their relations towards us, to summon them into our presence? Chanting has long been a popular method of summoning, and it would appear as though little has changed.

> "There have been so many instances where I really feel as though there are targeted ads on my social media strictly because of conversations I have had. I have actually tested this out with my friend when we repeatedly said, "cat litter" out loud to see whether we would get ads targeted for it; we did" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018).

'Cat litter, cat litter, cat litter', the student intones, and swiftly she receives a reply. In addition to advertisements for kitty litter, the student gets confirmation that, yes, the device is listening, the infrastructure is working, the system is functioning. While the students are no closer to understanding what is going on inside the ad-serving process, they neatly managed to correlate certain inputs with certain outputs. Or so it would seem, at least. Perhaps the student's location history included a newly opened bakery, which was formerly a pet store and still currently listed as such on Google Maps. That could have triggered cat litter ads to appear. Or perhaps this experiment coincided with a local cat fanciers convention. Perhaps one of the student's relatives recently adopted a cat, posted a photo of it on social media, and tagged the student. Perhaps a predictive algorithm has projected that, given the student's demographic details, she is statistically likely to own a cat. Perhaps…perhaps the relation is as simple as the student suggests, and perhaps it is not. But that is altogether beside the point. The students have formed and tested a hypothesis, which their results confirmed to their satisfaction. They might not be able to see the devices listening, but now they have evidence. If the act of listening cannot be made visible, it can still be made evident. And evidence is important, particularly in instances when authorities can be less than reliable.

> "Sometime when I was in middle school, my computer suddenly disconnected from the internet, and for a few weeks I had no internet to do anything. I was angry at two things: everyone in my neighborhood and the router itself. I was angry at the neighbors because I grew up with my parents telling me that the internet kept timing out because other people are using it (and for some reason they have higher priority than I do)" (Research Data. *Week Two Writing Assignment.* 12 Oct 2018).

Not all of the students' stories of infrastructural imaginaries were formed on an evidential basis. Authoritative accounts play a role in how we imagine the working of information infrastructures, and where we fit into the overall picture. This narrative from

the student's parents presents internet access as a shared and limited resource distributed according to an unknown hierarchy. Where exactly the student falls among the ranks of internet users was unknown to him, but based on the evidence at hand it was rather low. The system appeared to be rigged against them, invisibly discriminating against the student in particular. That they were angry at the other internet users as well was understandable; in this infrastructural imaginary, it was their greed that was the cause of the issue. How we imagine an infrastructure to be arranged is a large factor in determining who to blame for breakdown. In this case, a community is imagined to re-enact the Tragedy of the Commons. The personification of the infrastructural is still present in this formulation, though it is less an invisible entity and more a conspiracy of convenience; others, rather than the Other. Whether or not this conception of infrastructure is accurate is immaterial; beliefs don't need to be true to be consequential, especially when the truth is relatively inaccessible.

Fear, anger, and resentment; all are reasonable reactions to the unseen machinations of, well, unseen machines. Invisibility is frightening, and those that operate invisibly doubly so. If Einstein referred to action at a distance as 'spooky', then the students' leeriness of phantasmagoria is in good company. Radiation harms invisibly, as does surveillance and systemic discrimination. Invisible harm, or even the specter of its possibility, ensures a degree of constant anxiety. Or rather it would, had the students not taken it upon themselves to conceptualize of these systems as, if not amenable to the human, at least relatable in human terms.

But fear, anger, and resentment are not the only possible approaches towards the infrastructural unknown. Awe, wonder, and excitement were also evident in the student data, along with a sense of pleasant surprise when devices and their adjacent infrastructures surpass our expectations and understandings to perform baffling feats of transformation and coordination. These need not be miraculous events; even an everyday alchemy is wondrous if you don't know the trick of it.

> "One thing that I believe about earbuds or headphones is that electronic signals are somehow translated into sounds. This assumption might be true, but the thought of electricity turning into sound astounds me" (Research Data. *Week Ten Writing Assignment*. 7 Dec 2018).

The student in this quote is both delighted and baffled by the transmutation of electricity and data into audible music. The student *believes* that speakers translate such signals into sound; this is not stated as a fact, but rather offered as an article of faith. This process happens invisibly, hidden within the circuitry and hardware; if one cracks open a pair of headphones, there is no location where one can see electricity becoming sound. How and where sound is produced remains a mystery, relatively speaking, but it is a

mystery that invites investigation and encourages speculation. If a few bits of metal and plastic can produce music, what else is possible? The mind boggles; as one student puts relates "It reminds me of when I was a kid and was first introduced to the search engine. I was dazed for days thinking how it would be possible that typing in a question could get answers just like that" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Search engines and their proprietary algorithms are notoriously opaque; an attempt to reverse-engineer their inner workings is a difficult task for even a seasoned SEO veteran, let alone a first-time user. But the urge to understand, to make the infrastructurally invisible anthropically relatable, remains. How *do* these systems function? What is inside of the black box?

> "How does wifi work? I used to think that there is a cute fairy liv[ing] in the ugly box and was punished by some Greek god. The punishment is not to sleep since it should be awake all the time whenever people needs it.
>
> Then I found all the wires behind the small box in the wall, and I realized there is no fairy in the box and wifi works because of these wires. And I found that because I ripped out the wires" (Research Data. *Week Three Writing Assignment.* 19 Oct 2018).

This mythology of the machine is a mash-up of Pandora and Prometheus. In the classical rendering of the myth, Prometheus steals fire from the gods to give to mankind. In revenge, Zeus gifts Prometheus's brother's wife, Pandora, with a jar or box that she is instructed not to open. After the pyxis of pandemonium has been opened and evil loosed upon the world, only one thing was left behind: Hope. Pandora then releases Hope as well, to help humanity cope with her brothers: pestilence, war, and death. For his part in the affair Prometheus is chained to a rock, where an eagle makes a daily dinner of his liver. In the student's rendering of this myth, however, the fairy of Wi-Fi conflates multiple roles. Unlike Hope, who was loosed from Pandora's Box to comfort mankind, the Wi-Fairy suffers a Promethean fate, eternally bound to sleepless service by the whims of an uncaring deity.

This is a child's story, and conceptualizes unknown elements of the information infrastructure of Wi-Fi in a manner that is relatable to a child. In a world where Santa Claus and the Easter Bunny are going concerns, the idea that the invisible provisions of virtual gifts is being carried out by an unseen but fantastical agent is not too far-fetched. But as the student investigated the "ugly box" which confined her magical friend, ripping out whatever wires were in the way, she found that there were no fairies at the bottom of the garden, no nixies in the modem. Wi-Fi "works because of these wires"; or rather, does not work in the absence of these wires. But does this explanation satisfy? Saying that Wi-Fi works because of wires does not erase the fantastical nature of Wi-Fi, nor does it provide a relatable conception of how this infrastructural unknown operates. Fantastical imaginaries

of infrastructural arrangements may play an important role in forming early conceptions and systemic renderings of how the world operates, but what part do these creative approaches towards the unknown play in the students' adult life?

> "Sadly, as we grow up we realize that what we understood and thought of as magic when we were younger is not real; magic does not exist. The closest resemblance we have to magic as adults is not knowing, or rather to be blunt, ignorance in how technology works, which leads us to believe in the magicalness that surrounds new and vastly improved technology" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

There is no magic for adults, no meaningful make-believe or silly self-deceit. What appears as awesome and fantastical at first brush is actually quotidian and commonplace, poorly apprehended and misunderstood. The student appears to be making a case against the use of the term 'magic' in reference to technology, insisting that such relations towards technology are indicative of an ignorant and superstitious mindset. But no one knows everything; the unknown is always already present, the devil always already in the details. We are all ignorant of *something*, even if we aren't aware of our ignorance. If "The closest resemblance we have to magic as adults is not knowing…how technology works", then we are all magicians of the highest order (Research Data.*Week Five Writing Assignment*. 2 Nov 2018).

This association of magic and wonderment with the poorly understood workings or unanticipated affordances of information infrastructures and their adjacent technologies proves to be an enduring theme in the student responses. While formal magic in the sense of spells or rituals never makes an appearance in the student texts, the affective experience of magic in the face of the unknown was a recurring refrain.

> "The first time I had these sorts of thoughts [..] is when I tried a virtual reality helmet. I always thought that the technology we had for VR was always behind and it never seemed possible [for it] to be so sensory and visually realistic as I hoped; however, I recently tried VR again and it gave me that magical feeling I had growing up. I wondered, 'How is this even possible?' This reaction I had is what I constitute as magic*, the idea of the unknown and the feeling of not knowing which comes with it* [Emphasis Added]"(Research Data.*Week Five Writing Assignment*. 2 Nov 2018).

"How is this even possible?" Surprise and the Infrastructural Unknown

To paraphrase the above quote, magic consists of two separate phenomena. First, "the idea of the unknown", the conception that there are things unconceived of; that "There are more things in heaven and Earth, Horatio, than are dreamt of in your philosophy" (Research Data.*Week Five Writing Assignment*. 2 Nov 2018; Shakespeare, 1676). Second, "the feeling of not knowing", which is ancillary to the apprehension of the unknown "(Research Data.*Week Five Writing Assignment*. 2 Nov 2018). One feels ignorant when they are conscious of their ignorance, just as one feels naked only when conscious of their nakedness. But there is a moment prior to the conception of the unknown and the "feeling of not knowing", the irruption of the unknown, the sudden appearance of unanticipated forms or surprising functions. There is a moment of ontological rupture as the system in question exceeds expected and even imagined categorizations and presents the user with unforeseen vistas of possibility, heretofore unknown. There is, in other words, a moment of surprise.

> "People always try to explain things based on the [understanding] of what they experienced. If a technology can do things they never heard of before, it is not [a] surprise that people will be shocked. Just like the first time human[s] saw fire, human[s] were scared, but after they know how to use it, fire is not a magic anymore" (Research Data. *Week Four Writing Assignment*. 26 Oct 2018).

The irruption of the unknown is a shocking event. While fire may have been one of the first technologies, it was not a technology first; wildfires are uncontrollable destroyers, a literal force of nature. But natural forces obey natural laws, and through observation and experimentation the Promethean feat of taming the wild fires can be performed. Many technologies, such as fire, follow the same general trajectory in relation to the human. While initially disruptive and even frightening, novel technical arrangements soon become familiar, and formerly mysterious processes a matter of routine. Even if we do not understand precisely how to build a fire, we can still conceive of how a fire might be built; while perhaps not practically able, we are theoretically capable of firemaking. As long as we can conceptualize of the process at play in a given technology, the ensuing and expected outputs are significantly less irruptive, less surprising, and less magical. While we may not personally understand each step in the process, we can be confident that it is explicable. Or, at least for now.

Many of the students have expressed concerns that technology may be advancing to the point that it is no longer explicable in human terms, or at least on a scale amenable to human understanding. That is not to say that students fear that future technological arrangements could not be understood, or will not follow underlying physical laws, but rather that "Eventually, technology would do things that [are] beyond people's capabilities

of understanding. It would be similar to magic as it would surprise people with it's unexplainable process" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018.).

Surprising results of inexplicable processes; that does sound like magic. But then again, we live in a world filled where unsurprising results are regularly produced via technical means that we do not personally understand. What, practically speaking, is the difference between the two?

> "Technology is now a black box for most of average people. The only difference between magic and daily technology is that daily technology does not surprise people. But imagine a world full of wizard[s], people do a spell, and get things done without understanding how exactly it works. I suppose no one is going to be surprised by magics either" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018.).

Magic that fails to surprise, the student seems to say, isn't magic; it is technology. But is the production of this surprising affect essential, or an epiphenomena? In the world of wizards that the student proposes, no one is surprised to see spellcraft. They might not know exactly how their spells function, but they do function, and people manage to "get things done" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018.). A novel, shocking, or surprising technology may appear magical at first brush, and being complex and difficult to understand can substantially extend this mystique.

> "The further technology advances - and the more advanced the use of a technology becomes - the more surprising and almost magical occurrences happen. Already a marvel for it's time, Super Mario 64 constantly threw new surprises and worlds at me that I did not even know were possible. In fact, it felt like I had accidentally created something new within the game. I do think that is something that can happen with any technology, such as discovering a new function on your calculator, coding a new and revolutionary program, or even using something as simple as [using] a magnet to attract a metallic object towards you" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018.).

All technologies, it seems, have some capacity to surprise, to act in an unpredictable manner. But experience dulls surprise, and familiarity aids in understanding; even the most complex of rituals soon become routines, technical or otherwise. What, then, is the difference between how the students view these two systems? One student suggests that "In order to create magic, it has to remain unpredictable. However, the development of technology is never unpredictable" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The key to making magic, it seems, is not creating systems that surprise, but rather systems that continue to surprise, that predictably produce unpredictable outputs through

indeterminate means. While the student goes on to state that "...the development of technology is never unpredictable" and thus not magic, many of their classmate's responses do not share the same confidence in the ultimate explicability of their technological devices and adjacent infrastructures.

> "There is an unexplainable factor that underpins even the most-explained technology that leaves humans, like me, in awe of such man-made creations. If I blink, perhaps even out of the screen, a magician's bunny will pop out. Magic is magic, after all" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

Ability and Inexplicability

Explicability is a relational, relative, and perspectival concept. There are things that I am not able to explain, and then there are things which have no explanation. Explicability is relational in the sense that it defines the relationship between you and the unexplained unknown. Explicability is relative in the sense that some things are relatively inexplicable, while others are absolutely inexplicable. Explicability is perspectival in the sense that, depending on your perspective, what is considered to be absolutely or relatively inexplicable can shift.

Many of the students who chose to describe their relations towards technology in terms of magic appeared to be conscious of the distinction between absolute and relative inexplicability in their relations towards technology. One particularly succinct response states that "Essentially, there are parallel perspectives: some who view the 'Magic" as complex systems, and the majority who interpret magic as an unexplainable phenomena" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). A complex system may be difficult to understand, while an unexplainable phenomena is, relatively speaking, absolutely inexplicable. The systems themselves do not change, but the ways in which they are perceived does. As we change and our perspectives shift, what technologies we consider to be absolutely and relatively inexplicable shift as well.

"For example, when I was very young, every technology seemed like magic to me. I thought that cars are able to move because of magic. Now, after I learn more about science, I have a pretty good understanding of why cars can move. However, now I would consider some more advanced technologies as magic such as quantum computers, and have no idea about how they work. Therefore, I think that whether one treats technology as magic is dependent upon that person" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

It is important to note that the students who wrote these responses are not deluding themselves. They know that man-made technologies are absolutely explicable; that

someone, somewhere knows exactly how Wi-Fi works. Students may wistfully fantasize about magical infrastructures with evocative sentiments such as "Half of me would like to believe that their is magic in airwaves that bring over their lovely Wi-Fi to all my devices no matter where I am in the world" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). But, while such infrastructural imaginaries are enjoyable, the student confesses that "I know that this is not the reality of the situation..." (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The student recognizes that no, there are nothing magical about Wi-Fi; it is simply technology, wholly explicable and understandable. But, while she acknowledges that technology is explicable in an absolute sense, she concludes her recantation of "I know this is not the reality of the situation..." with "...but to an extent technology itself is magical. Its magic is in its mystery of innerworkings unknown to many of the hoi polloi- like myself" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

Hoi Polloi

Students are confident that the technologies that they use are explicable in a general sense; they just don't believe that they are explicable to a general audience. In many of the student responses, that general audience, hoi polloi, includes the student themselves. They may not know how these technologies work, "Yet, not knowing doesn't mean that we can assume that advanced technology is magic because each of them is actually bound to fundamental principles in which their mechanisms can be explained scientifically" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The students know that someone out there understands the inner workings of their technologies, but also recognizes that they themselves are not that person. Moreover, they express doubts about their capability to ever be such a person:

> "My whole life I have grown up understanding how some simple mechanisms work inside pretty basic machines. But, if a person were to ask me to explain how a computer does half of what it does, I would be at a loss for words. An educated man or woman that knows the ins and outs of a computer could explain to me how a computer operates, and that information would gloss right over my head. To me, computers will remain mystic and magical [Emphasis Added]" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

This sentiment is echoed a number of times throughout the student responses, from "*To me,* an uneducated and technologically inept person, many of the technologies we consider mundane and ubiquitous are magical to me" and "Technology never ceases to amaze me, and I am sure that if I were to sit down and try to understand how it all works, it would never make sense *to me* [Emphasis Added]" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Technology is explicable to others, perhaps, but not *to me*. And this incapability is thought to be

shared by the populace at large; while "Obviously, there are individuals that have done research or even designed these systems and understand how they work, but most society is unaware of the inner-workings of these devices" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). There are, essentially, two classes of people in their relation towards technology; "Regular people are unable to identify how the computer could provide such accurate results, but technicians and programmers are able to identify and improve the system by providing additional information (techniques) to advance the technology" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Once again, these aren't hard-and-fast categories; becoming technically expert is possible, but difficult. While the general public may have a rather magical view of technology, "I wouldn't say it is due to a lack of intelligence or them being ignorant, but rather the misinformation or lack of information given to the public by developers which creates the facade and mystery connotated with magic" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Neither the students nor the general public are seen as at fault here; "After all, any black box technology is just as inexplicable as magic if its consumers aren't aware of how it functions" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). In other words, "If one does not understand how the piece of technology works, then it is basically magic, but when one understands how it works, they get to become the technology wizard" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). To summarize somewhat, the students recognize that the explicability or inexplicability of a given technological assemblage is relational; a phenomena may be explainable to some while remaining inexplicable to others.

Time is Relative

Students described the relationality of inexplicability in the context of technology by contrasting their relationships with the sort of deep technical understanding that they imagine programmers, engineers, and designers possess. In comparison to the rich and rewarding technical relationships imagined for this elite set, their own 'magical' relations with technology lose some of their lustre. While the students may not see their own relations towards technology as being particularly advanced, they recognize that their place in such a hierarchy of tech-savvy is relative. Entertainingly enough, most of the students who chose to engage on this point did so using time travel as a rhetorical device. While the students do not believe that they understand their devices better than the average person today, they are very confident that their grasp of technology is superior to that of a 12th century peasant.

"If you were to show a person from the medieval ages a piece of technology from today such as an iPhone", a student muses, "They would be incredibly astounded and shocked by the abilities of such a small device" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Such shocking developments would need some sort of explanation, and "If you used [X-Rays and MRIs] on a human a couple hundred years ago, it is almost guaranteed that they would believe you used magic to somehow be able to see everything going on inside their body" Research Data). Another student echoes this point, suggesting that "...if we were to bring a smartphone back to the medieval era, we'll probably be perceived as a wizard with a glowing tablet" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

But wait; nothing has changed about the students' relationships with their technology. These smartphones, X-Rays, and other silicon sorcery are not any better understood by the students in this speculative trip to the past than they are in the present. That said, they do now understand how the technology works better than anyone else living. Relative to the brightest minds in an imagined mid-century Lindisfarne they are unparalleled experts, and "get to become the technology wizard" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). As we leave the past approach the contemporary, however, this relative advantage fades.

> "I know for sure that, if I had the ability to go back to the 1980's and took an iPhone X, people would probably [be] amazed at the evolution of blocky phones. In addition, if I were to take back a 15' MacBook Pro to the 1950's, then people would be in great astonishment at the exponential growth of personal computers. However, if I were to travel back to the 1900's with wireless-Bluetooth gadgets, then people would probably really be in disbelief. To a certain point, I would imagine people, from the past, would think it was magic" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

From modern, to marvelous, to downright magical; the further we imaginatively transport ourselves into the past, the more miraculous our knowledge becomes. Relative to the company they keep, our time-tripping students fall somewhere between sublime savants and minor gods. For many of the students, this appeared to be an empowering exercise; while they might admit that they do not know much about how the internet works, they at least know more than someone who has never even heard of a computer. For one student, however, the victory rung a little hollow. While "if we were to take only a little of the technology we have now back to the 1800's, they would think we were witches and wizards and try to burn us at the stake...", the inverse would be equally alienating; "...but If I was frozen right now and was thawed out in a century, then I'm sure I would be seeing things that I

could only dream of or consider to only be possible in movies" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The relative nature of inexplicability is a double-edged sword; in one context, the students are superpowered wizards, while in another they are flabbergasted gawkers, without any change in the students' capability to explain the technologies in question.

Magic and Legerdemain

Time travel is an interesting rhetorical device with which to explore the relative nature of explicability in technological relations. It is not altogether unprecedented in popular culture either. One student notes that "This is actually commonly used in science-fiction novels as a trope to explain the magical abilities of some characters" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). He goes on to explain that "... in DC comics, the villain Abra Kadabra was a stage performer from the future. He traveled back in time taking tools from the future and using them in the past to perform magic tricks and torment the Flash" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).). It is interesting to note that this vaudevillian villain is not casting magical spells; rather, he is performing magical tricks[4]. This distinction was also made in many of the other responses; students were quick to differentiate stage magic from 'real' magic, sorcery from legerdemain. They suggest that most, if not all, magic is a perspectival illusion; "In other words, from the audience's perspective magic seems like our traditional notion of magic; while from the magician's perspective, it is only an elaborate set of tricks used to give off the perception of the impossible" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The parallels between the performance of stage magic and the student's perceptions of information technologies is further explored in a strikingly similar response from a different student.

> "Similar to magic, there is often a magician and an audience. The average user is considered the audience in this case and the people who create and maintain this technology can be seen as magicians. And similar to how the audience can learn the secrets behind a magic trick, if the average person looks hard enough and does some research, they too can find out how their technology works" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

Both legerdermein and technology are described as complex but ultimately knowable systems which the average person is capable of investigating. Of course, the capabilities of the 'average' person are a matter of some dispute, as the student

[4] He actually receives magical powers in a later issue [Underworld Unleashed #1], but that's neither here nor there]

data indicates. There are certain students who are confident that, given the privileged perspective of an engineer or an illusionist, all will be made clear; after all "A deck of cards wouldn't suddenly disappear on its own in the hands of a magician, it is plotted and there is always a theory behind it, but just that we are unaware of it as an audience in the crowd" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). But, as discussed above, there is a considerable contingent of students who believe that "Just as I would not be able to explain the solution to a magic trick, the average individual would be unable to explain how computers, electricity, or telephones work" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). There is a difference between understanding that there is a trick, and understanding how the trick is done. While the students understand that technology is not really magic, in the sense of spells and sorcery, they still contend that "Technologies are just *like* magic, right after an input is made, a desired output is generated, like the rabbit out of the magician's hat" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). The students' recognize that a rabbit does appear, and recognize that such an appearance is accomplished through practiced sleight-of-hand, but from their limited perspective can make few further claims.

> "The idea of magic is that only the magician knows what is really happening with their magic and that the audience has no idea how its done. This shows true in that the only one who truly understands how a program works is to study it and the common user simply just knows that it does work" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

Students are rather capacious in their use of the term 'magic', alternately using the term to refer to a wildly disparate set of activities. This is not surprising, as the term 'magic' has been applied to such a broad range of phenomena that, "When hearing the word "magic," people think of a magician show or fairy godmothers or magic weapons, those kinds of things" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). It would be difficult to propose another way in which these dissimilar concepts could be reasonably related; only with reference to the ontological category of magic can Siegfried and Roy's Las Vegas stage show and Beowulf's ancient sword, Hrunting, be sorted into the same class. While these examples are less than instructive in determining what is and is not magic, definitional approaches prove to have their own challenges.

> "But what is it that defines "magic"? Card manipulation, levitation, spoon bending… These so-called magic tricks that often blow our minds with the use of mysterious force exerted by the supernatural? Or is it just a matter of optical illusions that can be

> explained by theories that we, as an audience, are unaware of?" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

Once again, the students do recognize the difference between an illusionist's practiced tricks and supernatural spellcraft, just as they recognize that technology does not work on magical principles. At the same time, however, the students also identify a common thread between their relations towards magic and technology, a common affect engendered by their subjective and perspectival perceptions and conceptions of these obscurely complex systems. "When something is referred to as being “like magic”, it is understood that it means it is something fantastical. Aside from just being an incredible feat, something being like magic also means that it works in a way that is nearly impossible to grasp" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). In terms of explicability, there is little difference between a supernatural force that works through mysterious means and an effective illusion produced through unknown processes; both cases leave the uninitiated audience in a state of relative ignorance. Whether or not technology is magical is not the question here, but rather whether or not the students relate towards technology as if it were magic. If magic is a frame through which students concieve of and understand obscure and occulted information infrastructures, then this magical frame will inform and inflect their relations towards said systems.

> "My definition of magic is an action or event that is incredible and unexplainable. The rate at which technology is advancing in our time and age is mind boggling. It is practically impossible to keep up with the inner workings of every single new piece of technology. Without knowing the ins and outs of the technology, its use and function is practically magic. For me, any type of technology that I can place into the “black box” category is sorcery" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

While theoretically speaking most information infrastructures and their adjacent technologies are explicable, their "use and function is *practically* magic [Emphasis Added]" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Or, in other words, it is pragmatic and practical to not investigate the inner workings of each and every black box, and to simply accept the ensuing outputs. While there is a serene appeal to this untroubled approach, other students expressed concerns that "...people act as if complex technology is no different than magic, and these ignorant attitudes could leave us victim to technology rather than as the masters and creators" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). Other students echoed these concerns, suggesting that while we may not understand these

black-boxed processes, we are still subject to their effects; what we do not know can very well hurt us.

> "Magic is classified as influencing the course of events using "mysterious" or "supernatural" and is usually entitled to sorcery, witchcraft, dark magic or voodoo, all of which contain dark properties. Advanced technology is the same. Technology strips us of our privacy, has implied connections with depression and loneliness on social media, made users have a short-term memory, and brought laziness and disability to read a book" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018).

How technologies accomplish these admittedly deterministic feats of enervation and oppression is not detailed by the student, but this is to be expected; the black arts are always already black boxed. While the inner workings of the technologies remain hidden, the personal anxieties of the students are on full display. While they recognize that they are not knowledgeable on every aspect of their infrastructural relations, they also recognize that others who are more knowledgeable could use this disparity to take advantage. How students relate to the implicit threat and promise of perspectivally occulted information infrastructures is vital to understanding how their behavior in relation to these infrastructures is informed and inflected. Within the student data, the concept of 'magic' has proven to be a robust rhetorical device for examining and unpacking student relations towards information technologies. Even students staunchly opposed to the idea of relating magic and technology recognized that there is something inexplicable and overwhelming in their relations towards technology, arguing that "There is no such thing as magic, but only the mind-blowing reality that cannot be accepted normally" (Research Data. *Week Five Writing Assignment*. 2 Nov 2018). When the complexity of our environment exceeds our capacity to explicate, perhaps we can be forgiven for invoking magical explanations.

Chapter Conclusion

This chapter has sought to examine how students relate to the unknown, the hidden, the inexplicable, and the occult within the context of their relationships with information infrastructures and their adjacent technologies. The majority of the students who responded to the surveys expressed some variant of the position that information infrastructures and technologies are simply tools, and that all agency in a human/infrastructural assemblage derives from the human. In their description of these relationships, however, technologies and infrastructures are described as

sensing, acting, and thinking agentially. This appears to occur most often when the notional infrastructural or technological agent is invisible or otherwise hidden. Students deployed a broad range of metaphorical approaches towards depicting information technologies and infrastructures drawn from the designed, natural, and human aspects of their lived environment. These metaphorical renderings were used to make the relatively unknown aspects of these sociotechnical assemblages more explicable and relatable from a human perspective. Information infrastructures and their adjacent technologies are exceedingly complex, and operate through means that are not well understood by or easily explained to a general audience. In certain cases the inexplicability of these systems can appear to be total. When the students are confident that they cannot understand a certain technological aspect of an information infrastructure, they often describe their relation in terms of or in reference to magic. This invocation of the term 'magic' is not an abrogation of rationality, but a description of their own relative, perspectival relation towards the phenomena in question. Students are aware that the outputs of these processes are due to hidden actions occurring through occult but ultimately explicable means; it is only in their relation to the student that these outputs are inexplicable, and thus magical.

It may seem odd that technically proficient and university educated informatics students would choose to use magic as a way to describe the inexplicable character of their relations to information infrastructures and their adjacent technologies, but it is by no means unprecedented (Turkle, 1984). Given that such relationships are conceived of as populated by notionally agential entities engaged in manipulating invisible networks of knowledge and meaning, however, the rhetorical use of magic seems sensible. Or, if not sensible, at least practical; treating these information infrastructures as if they were magic has certain consequences, some of which are beneficial. If magic is the concept through which these students have chosen to relate to the unknown, then in order to better understand the dynamics of this relation we must investigate what a magical relation towards the unknown entails. The field of magic and its practitioners have long dealt with issues of occult action through indeterminate means, and though centuries of craftwork have detailed a number of approaches for dealing with and relating towards unknown and possibly agential forces. The next chapter contains excerpts from interviews with magical practitioners from a variety of magical traditions. The subsequent examination and analysis of these interviews is intended to explore how these magical practitioners approach issues of inexplicability and indeterminance within the context of magical information infrastructures, or the notional systems of knowledge and meaning through which magic occurs. This project aims to theorize as to the role of informatical occultation, or the hiding of

informatical processes, within the context not of technological or magical information infrastructures, but rather information infrastructures in a general sense. A better understanding of traditional practices in relation to the infrastructural unknown will likely be instructive for future implementations of infrastructural assemblages, technical or otherwise. While we cannot know in advance what our next encounter with the infrastructural unknown will be, through examination and analysis we can better predict what form our relations will take.

CHAPTER 2: HERMES, NEWTON, AND WEINER

The students discussed above were not the first people who found themselves having to deal with the occult, and their tactics and techniques are not without precedent. Hypothesizing the presence of a heretofore hidden system based upon examined evidence is one is a common response to the occult, and one that is often relatively effective in spite being less than entirely accurate. In this section we examine three arguably scientific endeavors that sought to render otherwise relatively occult systems amenable to prediction by humans. While the manner in which the occult is most effectively conceptualized is highly contextual and dependent on our relation to the occult system in question, human relations towards the occult have historically utilized analogical logic wherein the macrocosm can be effectively understood in microcosmic terms. In other words, human relations to the occult rest upon an assumption that the occult is alike to something else in its effects upon the human, if nothing else. This section examines how such an assumption is practical in relation to effectively predicting, if inaccurately depicting, the occult.

In order to properly address the manner in which the magical practitioners interviewed use magic in their relations towards infrastructures of non-anthropic scale and intensity, a brief digression is necessary. In the preceding pages I have variously referred to infrastructures that are less-than-visible in their relation to humans as 'occult' infrastructures. These are infrastructures which function, but do so in a manner that is difficult or impossible to see. This can make it difficult to conceptualize such systems; difficult, but not impossible. Magic grapples with occult systems, postulating imaginative conceptions as to how phenomena might be insensibly connected, and providing a heuristic framework with which to orient action. It could be argued that science is engaged in a similar pursuit, at least in its relation towards the occult forces of the physical world found in the study of

magnetism, microbiology, or quantum mechanics. Gravity, to pick an exemplar, was historically considered a particularly occult force.

> "During the 1680s the notion of attraction and repulsion was still seen as 'occult' - it implied that some kind of force was operating at a distance without the involvement of an observable medium or mechanism. Descartes's mechanical philosophy still prevailed, which described gravity as arising from the behavior of clusters of matter and spinning vortices acting like whirlpools within the ether" (White, 1999).

Of course, we are all firm Newtonians in our understanding of gravity; while Cartesian Mechanism is still a valid metaphysics, its materialist approach is no longer valid physics. The Cartesian claim that all phenomena in the universe is the result of the motion and collision of matter is understandably beguiling in its determinism; like the bouncing of billiard balls of the ticking of a clock, the idea that things must be touching in order to impart movement makes sense. But, what is touching the planets, in empty space, that makes them move, through empty space? For Descartes, "it is contrary to reason to say that there is a vacuum or space in which there is absolutely nothing" and "hence we hazard the guess that above the air exists nothing but a very pure aether, which is much rarer that air itself" (Descartes, 1644). Space, in other words, is full; planets are pushed along invisible currents of aethereal flows. Everything abuts everything else; there is no action at a distance, spooky or otherwise. The idea of gravity, an invisible force that operates via unknown means through an unseen medium, was seen as gross retrenchment towards Aristotelian mysticism.

> "Such occult (hidden, secret, nonphysical) qualities and forces were exactly what the seventeenth-century mechanical philosophers had hoped to eliminate with their aethereal explanations, where matter operated on other bits of matter by impact or pressure. Human beings can understand those sorts of contact mechanisms, for it is ever so easy to envision them; we see such contact forces around us every day. But it is impossible to imagine an attractive force of gravity, without physical contact, reaching across millions of miles of empty space to hold a planet in its orbit. So in a sense the Continental philosophers were quite correct in saying that Newton had reintroduced occult qualities into natural philosophy; Newton really was no longer an orthodox mechanical philosopher in the seventeenth-century meaning of the term." (Teeter and Jacob, 1995)

Newton was not alone in his concern about the occult nature of gravitational forces; many of his contemporaries protested the very concept of gravitation. While Descartes "objected to the idea of an invisible occult force extending its powers *as if by magic* [Emphasis added]", he was by no means the only one; "Another opponent of Newton, Gottfried von Leibniz, was suspicious of Newton's entire concept of gravity, referring to it mockingly as 'the rebirth in England of a theology that is more than papist and a philosophy entirely scholastic since Mr Newton and his partisans have revived the occult qualities of the school with the idea of attraction" (Fara, 2002; White, 1999). Yet, it was these occult qualities, these seemingly magical forces that allowed science to have a clearer understanding of the universe's physical laws.

> "As every historian of science 'knows', the essentially unworkable mechanical philosophy was transformed by the genius of Newton who re-introduced 'occult qualities' into natural philosophy. [...] The brilliant stroke of incorporating 'occult qualities' into the mechanical philosophy has frequently been cited as further evidence of Newton's supreme genius" (Henry, 1986)

The difficulty in dealing with occult forces meant that while Newton had ample evidence *that* gravitation worked, there was no similar surfeit in regards as to *how* gravitation worked. Newton recognized that there was a systemic regularity in how gravitational force affected people, planets, and (apocryphal) apples. While he was not able to directly observe gravity reaching out and pulling things down, nor explain how the occult qualities of gravitational forces accomplish such feats, Newton was able to demonstrate that gravitation exists:

> "Hitherto we have explained the phenomena of the heavens and of our sea by the power of gravity, but have not yet assigned the cause of this power [...]To us it is enough that gravity does really exist, and acts according to the laws which we have explained, and abundantly serves to account for all the motions of the celestial bodies, and of our sea" (Newton, 1728)

In describing his position on gravity and other occult qualities, Newton reiterates his view that one need not know the exact causes of a phenomena in order to have knowledge of it; even if one cannot surmise a cause from various effects, it is still possible to understand what the effects are. Newton's most cogent defense of this claim can be found in his *Opticks*, wherein he states that "These Principles I consider, not as occult Qualities,[...], but as general Laws of Nature, by

which the Things themselves are form'd; their Truth appearing to us by Phaenomena, though their Causes be not yet discover'd. For these are manifest Qualities and their Causes only are occult" (Newton, 1728). This has been usefully reframed for contemporary parlance as "Gravity, therefore, is an occult quality which is not hypothetical because it can be shown that it 'does really exist '"(Henry, 1986). A much pithier and decidedly more quotable version of this sentiment is also present in Newton's theological work, which argues that; "A man may imagine things that are false, but he can only understand things that are true" (Newton, 1950).

Today, we take the occult nature of Newtonian gravitational physics as a given. "Occult this may have been to the early-eighteenth-century mind, but almost 200 years later...", the idea of invisible forces acting at a distance is no longer controversial. (White, 1999). Though enormously influential, Newton's work was incomplete, as was Einstein's; both formulations falter in the face of extremities of scale.

> "The two major theories of twentieth-century physics are relativity, which applies to light as it streaks across the great expanses of trackless space, and quantum mechanics, which seeks to comprehend invisible worlds of micromatter. *The great problem is to forge a principle that combines both realms - the vast and the infinitesimal.* Newton was the first to attempt it; Einstein was the second. Neither was successful and both men, despite their marvelous achievements, went to their graves disappointed at failing to do so" [Emphasis Added] (Christianson, 2005)

The prodigious influence and continued relevance of Newton's work can make it difficult to understand how his studies were shaped, and what literature influenced his ideas. "Even though we may not realize it, we view the universe through Newtonian spectacles. This makes it hard for us to imagine older ideas and take them seriously. Newton was born in a time when traditional views still survived" (Fara, 2002). In addition to being a chemist, Newton was also an *al*chemist, though at the time the distinction between the two was blurred at best. Alchemical practices did not simply inform Newton's work, and were arguably central to his project of understanding the laws that governed matter. Though picturing the Father of Modern Science as an occult alchemist poring through ancient texts may seem strange at first blush, it is central to understanding his work.

> "While our understanding of Newton has undergone massive changes during the past fifty years, our understanding of alchemy has undergone a reworking no less profound [...] Of course, we cannot understand Newton's alchemy if we do not understand alchemy itself" (Principe,2004).

Hermes

In order to "understand alchemy itself", and more critically Newton's alchemy, it is useful to examine the alchemists and occultists from whom we can draw a direct connection to Newton's work. Of all the alchemists that Newton mentions in his published works and unpublished notes, the apocryphal figure of Hermes Trismegistus is perhaps the most prominent, and certainly the most preeminent.

> "Hermes Trismegistus (his surname meant "Thrice Greatest"), the supposed author of the Hermetic Corpus, was not a real person, although the thinkers of the Renaissance believed him to be not only real but also very ancient [...]. His supposed antiquity gave Hermes great authority in the eyes of Renaissance scholars, and Hermetic doctrines supported all sorts of magical, astrological, and alchemical enterprises in the sixteenth and seventeenth centuries" (Teeter and Jacob, 1995).

If Isaac Newton is the Father of Modern Science, then Hermes Trismegistus may very well be considered the Father of Ancient Science, given the blitheringly vast array of insights attributed to his name.

> "As might be expected, an extraordinary number of writings were attributed to Hermes, including the "philosophical" or "theoretical" treatises that comprise the *Corpus Hermeticum* along with the Latin *Asclepius*. In addition, a vast number of "technical" hermetica - treatises and fragments on the practical aspects of astrology, alchemy, sympathetic magic, talismans, invocations, and the like, - passed under his name, including the famously enigmatic *Emerald Tablet* (or *Tabula Smaragdina*) [...] Sir Isaac Newton, for example, wrote a serious *Commentary on the Emerald Tablet*..." (Linden, 2003).

It is certain and most true that Newton was influenced by the work of Hermes Trismegistus, and it can be argued that his Hermetic studies were centered around the *Tabula Smaragdina*. Apocryphally penned by Hermes Trismegistus, a quasi-mythical and almost certainly syncretic figure of the Hellenistic period, the Emerald Tablet was reputed to hold alchemical secrets and revelatory insights. While there is no extant version of the fabled Emerald tablet, there are a number of Arabic texts from the 6th to 8th century which claim to be translations of the text (Goodrick-Clarke, 2008). Newton's translation of the work, produced around the 1680's, is reproduced below.

"Tis true without lying, certain and most true.

That which is below is like that which is above
and that which is above is like that which is below
to do the miracles of one only thing

And as all things have been and arose from one by the mediation of one:
so all things have their birth from this one thing by adaptation.

The Sun is its father,
the moon its mother,
the wind hath carried it in its belly,
the earth is its nurse.
The father of all perfection in the whole world is here.
Its force or power is entire if it be converted into earth.

Separate thou the earth from the fire,
the subtle from the gross
sweetly with great industry.
It ascends from the earth to the heaven
and again it descends to the earth
and receives the force of things superior and inferior.

By this means you shall have the glory of the whole world
and thereby all obscurity shall fly from you.

Its force is above all force,

for it vanquishes every subtle thing and penetrates every solid thing.

So was the world created.

From this are and do come admirable adaptations
where of the means is here in this.

Hence I am called Hermes Trismegist [sic],
having the three parts of the philosophy of the whole world

That which I have said of the operation of the Sun is accomplished and ended."

(Newton, n.d..)

While the whole of Newton's translation of the Emerald Tablet are included for the sake of context, this analysis is interested in only the first four lines, which are arguably the most influential in the subsequent development of and scholarship on the occult. "Tis true without lying, certain and most true", Newton translates, "That which is below is like that which is above / and that which is above is like that which is below / to do the miracles of one only thing" (Newton, n.d.). In contemporary magical practice, Newton's rendering of these Hermetic principles is effectively truncated into the conjunctive phrase 'As Above, So Below'. This maxim can also be reformulated as 'The Microcosm Reflects the Macrocosm', i.e., that the human being and the cosmos mirror each other (Hammer, 2004). The epistemological thrust of this argument is that, if one can understand the microcosm, you can understand the macrocosm, and vice versa. To use an example that may resonate with my audience, the full text of an article is always already reflected within the abstract, just as an abstract can be produced from an article. The abstract of an article is its epitome; while the abstract is not identical to the article itself, there is a correspondence between the two that allows readers to understand each with reference to either. This is highly useful for busy scholars, as intended; abstracts are designed to perform just such a function. Such correspondences are not, however, restricted to the realm of functional design; hierarchical patterns and network forms appear to recur in society and nature as well.

> "[Newton] had to know everything there is to know about the behavior of matter, from the smallest particle to the grandest star. Before 1666 he had focused on what scientists refer to as the

> *macrocosm*, or the cosmos itself. After 1666 his interests broadened to include the *microcosm*, the smallest worlds of invisible matter through which all things in nature are formed, grow, decay, and eventually return to their basic elements. By studying these worlds, Newton believed that he could discover what light truly is, how forces such as gravity and magnetism act across great distances, and how the theoretical ether of his experiments triggers changes in the bodies it inhabits" [emphasis added] (Christianson, 2005).

Was Newton's conception of the occult force that is gravity completely accurate? No. Was it useful for understanding the world in which we live? Certainly. Similarly, magical practitioners' conceptions of divine and elemental forces is unlikely to be perfectly correct. It is, however, useful insofar as it informs us how to act in regards to occult and indeterminate systems; wisely, carefully, and with the understanding that one does not completely understand how the system works. This central tenet of 'As Below, So Above' is an active concern in regards to human relations to occult systems generally, and is not restricted to mathematical or mythical abstractions. More to the point, this microcosmic/macrocosmic heuristic is active in our relations towards infrastructure, particularly the more occult forms of information infrastructure.

Magical approaches are endemic to, if not requisite for, human relations towards occult infrastructures. Once again, I do not mean to say that we think that the internet or email are magical, but rather that from the relative perspective of the user it is practical to treat them as such. The practice of magic arguably constitutes the traditional approach towards occult systems, a folk cybernetics of unrivaled pedigree. And this is a productive practice, in both science and magic, for dealing with systems that exceed my conceptual grasp. I can see the movement of the stars as being akin to the falling of an apple without any idea as to why; as long as the effects remain correspondent, it hardly matters that the causes remain occult. I can see the operation of my own internal infrastructures and my numinous relationship with the wider world as reflections of each other without ever pinning down the exact mechanisms responsible; it may only be a working theory, but it is a theory that performs *work*. Similarly, it is possible to understand one occult system (technical infrastructures) through the lens of another occult system (magical infrastructures), without necessarily attributing both to the same cause; as long as treating a system *like* magic is effective, it hardly matters whether or not it is *actually* magic.

As Aircraft Above, So Anti-Aircraft Below

The antagonistic context of World War II provides another historical example of humans reconceptualizing occult infrastructures in order to more effectively understand our relation towards such systems. I am talking about cybernetics, particularly the canonical example of the Anti-Aircraft predictor, which sought to calculate and predict the relationship between an anti-aircraft battery and the "shrouded, hidden entity whose only features were those you could see in the control of the airplane", or the enemy pilot (Najafi and Galison, 2003). This AA predictor was " designed to characterize an enemy pilot's zigzagging flight, anticipate his future position, and launch an anti-aircraft shell to down his plane" (Galison, 1994). In such a scenario, "the anti-aircraft operator was obviously in no position to talk to or even see the pilot"; while the enemy's airplane may be visible, the enemy herself is relatively occult (Galison, 1994). This was the problem facing Norbert Wiener and other collaborators on the AA predictor project: how to calculate and predict the actions of a system composed of human enemies and mechanical airplanes without a complete understanding of the internal states of either. The human pilot was particularly occult in relation to the Wiener and the AA gunners in respect to both relative invisibility due to cover and distance, but also due to the relatively indeterminable nature of human cognition; reading faces is hard, but reading minds is significantly more difficult. As such, these early cyberneticians opted to conceptualize the pilot/plane system in terms that they could both readily understand and effectively use. Wiener, writing later in his life, explains that "Since our understanding of the mechanical elements of gun pointing appeared to us to be far ahead of our psychological understanding, we chose to try to find a mechanical analogue of the gun pointer and the airplane pilot." (Wiener, 1964).

Though a pilot is not an airplane, and an AA gunner not an anti-aircraft gun, seeing each in terms of the other allowed for "...a theoretical representation in which information, statistics, and strategies are applied to moves and countermoves in a world of opposing but fundamentally *like* forces [Emphasis in Original]" in that "once you've started the analysis of the "man-machine" system in this way, the pilot and the gunner seem alike" (Galison, 1994; Najafi and Galison, 2003). This likening of forces allows for the effective interchange of man and machine, at least insofar as their relation to the human is concerned, and "The language of cybernetics provided a site where this exchange could occur" (Bowker, 1993). This cybernetic slippage between man and machine, wherein occult elements can be conceptualized and related to in terms of more visible and relatable forms, has clear resemblances to the approaches outlined by both Hermes and Newton, to say nothing of the parallels that could be drawn between the cybernetics and the surveyed students' relations

towards occult infrastructures. These are ideas with a long, if somewhat occluded, intellectual lineage. Wiener's enduring contribution to the field of informatics was that, in his efforts to render enemy pilots relatable in mechanical terms, he found that he had also effectively mechanised the human role of the AA gunner as well. I find that I relate to this insight better in the following formulation: 'As Aircraft Above, So Anti-Aircraft Below'

Problems in complex systems often have explanations or solutions that are similarly complex. Our relations towards such systems are often considerably less complex. A bus barreling towards me is not simply having a brake-related acceleration malfunction; as far as I am concerned, my relation to the bus is something along the lines of 'Oh God, it's trying to kill me!'. While it is unlikely that the bus has been programmed to flatten poor graduate students, it makes little difference to me what, or even if, the bus intended. This is as true of users of infrastructure as it is users of anti-aircraft batteries; "Imagine that the plane had a rocking motion from left to right every two seconds—whether this resulted from an instability in the plane's design, a mishandling by the operator, or a periodic gust of wind made strictly no difference" (Galison, 2003). All of these different occult causes *could* be responsible for the visible effects. While understanding each possible cause is a rather difficult undertaking, effectively *relating* to these occult systems can be done with rather less effort.

> "The semi-humorous superstition of the gremlin among the aviators was probably due, as much as anything else, to the habit of dealing with a machine with a large number of built-in feedbacks which might be interpreted as friendly or hostile. For example, the wings of an airplane are deliberately built in such a manner as to stabilize the plane, and this stabilization, which is of the nature of a feedback [...] may easily be felt as a personality to be antagonized when the plane is forced into unusual maneuvers" (Wiener,1945).

While Wiener states that feedback-induced tremors in an aircraft "may easily be felt as a personality", it could also be argued that these visible signs of occult infrastructures may be *effectively* felt as a personality. A plane may have increased lag between the controls and the flaps due to a leak in the line somewhere within the pneumatic system, but in relation to the pilot the plane can effectively be understood as having a lazy personality, just as "A skipper trying to dodge a self-guided torpedo could be excused for referring to the device, as it shouldn't be any different whether there's a little man inside the torpedo steering it or the torpedo is probing magnetic fields to determine which way to turn." (Galison, 2003). Whether

one chooses to relate to an occult system as an agential force or a mechanistic series is not related to the essential nature of an occult system, but is rather dependent on whether agents or mechanisms, metaphors or technics, provides an effective analog of your relation to said occult system. While the message may stay the same, we relate differently to different messengers; metaphorical and technical descriptions describe the same world, but differently. Choosing an appropriate messenger which allows for one to more effectively relate towards a system was a concern in cybernetics, even *avant la lettre.*

> "I first looked for a Greek word signifying 'messenger' but the only one I knew was angelos. This has in English the specific meaning 'angel', a messenger of God. The word was thus pre-empted and would not give me the right context. Then I looked for an appropriate word from the field of control. The only word I could think of was the Greek word for steersman, kybernetes." (Wiener 1956)

As cybernetics proceeded and evolved as a discipline, it showed a marked tendency towards rediscovering the effective universality in applying the heuristic Hermetic maxim of 'As Above, So Below' in the context of occult infrastructures. Once we have a properly mechanistic metaphor, Wiener suggests we can examine situations "which have been discussed in religious books and have a religious aspect, but possess a close analogy to other situations which belong to science, and in particular the new science of cybernetics…" (Wiener, 1990).For the cybernetician, humans proceed via feedback, making corrections based on that information to pursue various goals. Feedback occurs in all systems, but in an occulted system, the feedback happens too late for us to make corrections.

> "While it is always possible to ask for something other than we really want, this possibility is most serious when the process by which we are to obtain our wish is indirect, and the degree to which we have obtained our wish is not clear until the very end. Usually we realize our wishes, insofar as we do actually realize them, by a feedback process, in which we compare the degree of attainment of intermediate goals with our anticipation of them. In this process, the feedback goes through us, and we can turn back before it is too late. If the feedback is built into a machine that cannot be inspected until the final goal is attained, the possibilities for catastrophe are greatly increased. I should very much hate to ride on the first trial of an automobile regulated by photoelectric feedback devices, unless there

were somewhere a handle by which I could take over control if I found myself driving smack into a tree." (Wiener, 1990)

As Hermes and Newton before him, Wiener recognizes the difficulties inherent in forming an effective relationship with occult infrastructures. Whenever we use infrastructures that are occult in their relation to the human, there is no opportunity to amend our 'wishes' before they are carried out. Newton was in a similar position concerning gravity. He had feedback in the form of experimental results, certainly enough, but for Newton the forces of gravity were occult, "a machine that cannot be inspected" (Wiener, 1990).

In both cases, Newton and Wiener applied a form of the Hermetic maxim 'As Above, So Below', in order to form a relation towards an infrastructure that was otherwise relatively occult. Whether we understand hidden systems in terms of 'occult forces' or cybernetic metaphors is of little import. What matters in these cases is that we explain occult infrastructures in terms of systems to which we have a similar relation. For Newton, gravity worked like an occult force, and so its relation towards the human could be effectively understood in terms of other occult forces. For Wiener, enemy pilots worked like mechanisms, and so its relation towards the human could be effectively understood in terms of other mechanisms. In each case these scientists have enhanced the efficacy of their relation towards the occult by drawing on more familiar systems which share a similar relation to the human. For Newton, the Hermetic tradition dealt with issues much akin to what he was grappling with, namely how to conceptualize the workings of insensible forces. For Wiener, there were considerably more tools available for predicting the actions of mechanisms than men, so insofar as men resembled mechanisms, it is effective to treat them as such. These approaches are chosen for their efficacy, rather than accuracy; men are understood in terms of mechanisms because it is effective to do so. One could easily imagine a parallel world wherein our social tools are significantly more developed relative to our technical suites of skills. In such a world, our alternate cybernetics might consist not of understanding men in terms of mechanisms, but rather a sort of psycho-analysis of the machine, an attempt to understand where a particular bomber 'wants' to go, or what a particular system 'desires' to have.

This is both a very silly situation to be in, and the situation in which we find ourselves. Our technical capacity to understand information infrastructures is limited, both effectively and absolutely. While we have a suite of techniques and tactics for using infrastructure in a technical sense, these are of little use in helping us to understand how we relate towards infrastructural systems in a more general

sense. While a more transparent system would allow for cybernetic feedback and correction, helping users to how inputs and outputs are related, occult infrastructures provide no such service. In these cases, the relatively occult is effectively understood in terms of the relatively less occult: forces for Newton, mechanisms for Wiener, and for the students, magic.

Through recasting the infrastructural occult in terms of relatively less occult systems, familiar tools and techniques can be brought to bear, and received wisdoms effectively reapplied. For the magical practitioners, elemental and cosmic infrastructures are reconceptualized in terms relatable to the human. For the surveyed students, a similar move is performed in regards to technical information infrastructures, in that their reconceptualization of such systems as magic allows for the deployment of traditional knowledge and tools. I will further discuss the role of magic as an infrastructure for forming relations towards the relatively occult within the following discussion.

Chapter 3: Magic Data

In the section above, I examined the ways in which both Newton and Weiner utilized an analogic logic similar to that of the Hermetic precept, 'As Above, So Below'. In doing so they did not change the object of their observation, but rather altered the way in which they viewed the phenomena. Magical practitioners perform a similar move. Magic is not the art of making the impossible possible; none of my interviewees made such a claim. But magical practices are useful in expanding what is considered to be possible, and through doing so arrive at conceptions of the occult that are effective in rendering the occult relatively predictable. In this section we examine human relations to systems that are far more occult relative to the human than any technical system or informatical infrastructure, and discuss the various techniques and tactics used by magical practitioners to render such archetypically occult systems amenable to the human. These practices are simultaneously traditional and contemporary, reflecting both historical and synchronic issues endemic to human relations to the occult. As with the students and their analogical metaphors, magical practitioners employ magical practices only when it is effective to do so. In essence, both the students' relations towards the occult and those of the magical practitioners are on a continuum of human relations to the occult. Magical practitioners are a particularly perspicacious example of this generalized relation to the occult because their work foregrounds the occult,

encouraging its practitioners to enhance the predictability of their practices through careful and conscious conceptualizations.

This section examines interviews with magical practitioners of varying degrees of experience and engagement. Their experience with magical practice range from self-taught novices and aspiring initiates to leaders and luminaries of their communities. The interviewees were asked a standard series of questions about their relations towards information infrastructures, both technological and magical. This interview protocol opened by asking participants about their relation to the internet and other information technologies, such as the metaphors they used to describe the Internet, or asking what aspects of information technology they felt they had a good grasp on, conceptually speaking. The questions then shifted to discuss the participant's magical practice, and how they conceptualized their work. Most critically, these questions seek to understand how the participant's practices enhance the relative predictability of the occult systems , and how the participant has refined their practices for working with the occult over time. Of particular interest to this project are instances where participants give advice for a novice in their own tradition; hard-won knowledge of potentially disastrous pitfalls, and the consequences of abusing these systems for personal gain. Whether expert or novice, each of these interviewees has taken time to seriously consider their relationships with occult systems. If we wish to better understand how we relate to occult systems, it is a good idea to look to those already engaged in doing so.

From Malinowski to Mauss, scholars have long considered the role of magic as a technology (Malinowski, 1954; Mauss and Hubert, 1902). Both etic and emic renderings of magic and magical systems through a technological lens are present within the literature, with Stratton's work on ancient witchcraft and Greenwood's work on magical consciousness being two particularly well suited examples (Stratton, 2013 ; Greenwood, 2013). The craft of magic is a practice with a long history, and the claim that magical practices constitute a technology is not a novel one. The magical practitioners interviewed were keenly aware of both of these discourses, and made frequent mention of the historical uses of magic, often with reference to its role in understanding and relating to elemental infrastructures. Magic is not responsible for the creation of the suns, stars, and seasons, but the tactics and techniques of magic have been instructive in the practical prediction and effective uses of such cosmic systems. In general, interviewees were not only cognizant of the history of their magical tradition, but were also well aware of the role that such traditions have historically played in society.

The following excerpt comes from an interview with Kerry and Terry, university professors and researchers who value their engagement with pagan magical practice primarily for their role in constituting a just and holistic moral basis. While initially attracted to pagan practice by the allure of getting to "pull back the curtain" on reality through magic and ritual, their practice now focuses more on using magic as a way to understand and explore interconnections between broader patterns in human behavior. For Kerry and Terry, magical practice informs and inspires their professional activities as well as helping to shape their moral worldview. They are agnostic as to whether magic is 'real', but argue persuasively that it is useful regardless of its facticity. This makes them fairly critical and insightful interlocutors who possess a degree of analytic distance from which they view their magical practices, evinced by their following description of ancient magic and archeo-astronomy working as a mechanism for measuring elemental infrastructures.

> "When you think about a lot of druidic traditions, they are more about passing down craft knowledge through ritual than about the ritual effecting change of the world. You know, a lot of archeo-astronomy was not about changing the universe but understanding it. Like Stonehenge was a mechanism for measuring various aspects of the solar and lunar year" (Kerry and Terry. Interview. Conducted by Aubrey Slaughter, 11 Oct 2018)

This idea that magic, historically speaking, "was not about changing the universe but rather understanding it" is debatable; there are numerous instances on record wherein magical practitioners or observers have claimed that magical practices have created physical effects in the world. But, for the magical practitioners interviewed for this study, such extraordinary claims are suspect at best.

Alice, one of the more experienced interviewees, is both a senior software engineer for major figures in the information services sector as well as a veteran leader of her own coven. She has been featured in local publications for her ability to interweave programming and magical practice, and taking lessons from each. A dedicated supporter of information access, Alice has spent much of her professional career developing computer interfaces for the non-sighted community. She is both a magical practitioner and a scientist, without contradiction. "As a scientist", Alice explains "I don't believe that anything physically impossible ever happens. It just doesn't"(Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018) . .Fair enough; like most technological practices, magic cannot accomplish the impossible.

“But...”, our veteran interviewee continues, “...that leaves an incredible amount of room for things that we today would call magic” (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). That is to say, while magic cannot accomplish the impossible or subvert the physical laws of reality, there is still much it can accomplish within those bounds. The purpose of magic as a historical technology is not to accomplish the impossible, but rather to aid in the conceptualization, prediction, and use of elemental infrastructures. This view of historical magic as a nascent or underrecognized technological form is present in a number of the interviews, often with reference to the practical uses of tools and techniques involved.

> “There's a bunch of indigenous traditions that were built around being able to map out star patterns and solar patterns, where it's not using magic to do a thing but it's instead using systems of magical thinking to encode scientific knowledge as craft knowledge or practical knowledge, which will allow you to make decisions about when to plant and when to harvest” (Kerry and Terry. Interview. Conducted by Aubrey Slaughter, 11 Oct 2018)

Once again magic is described not as a method of action, but rather a frame of interpretation; a way of knowing, not doing. Magic cannot end the winter, but it can aid you in interpreting when winter is over. This idea of magic as a frame through which elemental infrastructures are rendered legible further supports figuring magic as a form of *techne*, a fact that was not lost on the interviewee in question. Magic does not change the world, but rather informs the manner in which we relate to the world in a way that is useful and beneficial. These relations may not be real, but to invoke the Thomas theorem, they are real in their consequences (Thomas and Thomas, 1928). Or, as the previously quoted interviewees put it, “A lot of this is a thing that we construct on top of the actual relationship to things in the world, because it makes us live together better” (Kerry and Terry. Interview. Conducted by Aubrey Slaughter, 11 Oct 2018).

That magic constitutes an interpretive framework is almost universally agreed upon by the interviewees; where such a framework derives from, on the other hand, is not. While some practitioners saw the practice of magic as predating the human, and of a divine or supernatural provenance, more than half of the practitioners interviewed averred that magical practices are a human invention. Conceptualizing of magic as an intentionally designed framework through which we relate to the world helps to put into context sentiments such as, “It isn’t that magical practitioners are better at thinking outside the box, no. We just build different

boxes. You have to have a box, but we get to *design* our box as well" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). An interpretative frame is a necessary prerequisite for interacting with or relating to a given system, but it would seem as though magic as a practice has been designed for a particular type of system. If magic is a technology, what is it a technology *for*?

Making Yourself Aware of the Pipes

For a significant portion of the interviewed magical practitioners, the occult systems at play in their practice are familiar, and transparent to use (Star and Ruhleder, 1996). As an experienced practitioner, seeing certain occult systems as infrastructural is second nature. But no one is born an adept in the use of infrastructure; recognizing and using infrastructures is a learned behavior (Star and Ruhleder, 1996). For many aspiring magic users, learning to recognize the infrastructural dynamics inherent in social or elemental systems is the first, and most difficult, step.

> "One of the things that was difficult for me at first was about love being the most powerful source of magic. Of course, it makes for a beautiful kind of story. It's a very poetic sentiment that love is the most powerful thing in the universe. So, I thought that was totally bullshit for a really long time. I was like, 'No, no, no. The most powerful thing in the world is *power*.'....But love is a very very powerful force to create meaning. When you love something, or when you love someone, when you listen to a song that's your song or our song, so to speak, it is so much more special. And magic is all about special....And so love is a sort of wellspring and an almost undying source of meaning, and in that sense, yes, perhaps love then is the greatest source of magic. Love is the most powerful magic of all because the meanings that are forged through that sort of release of oxytocin generates a very profound, almost supernatural sense of attachment in association" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018).

The quote above is sourced from an interview with Dieter, one of the more critically-minded practitioners. Deiter describes himself as a lapsed Wiccan, but still remains deeply interested in magical practice and its various uses throughout history. A consummate consumer of both occult texts and musical scores, Dieter is particularly well-versed in the intersections between magical practice and musical composition. For Dieter, magic, religion, and science all share similar aims in that

they aim to explain the larger world, and our place within it. Magic, he says, is a particularly humanistic explanatory system that centers on the anthropic in a holistic manner, with a focus on producing meaningful relations. In the above quote Dieter discusses how he relates to love, not love in an interpersonal sense, in the way that one might discuss love for a romantic partner, but love in an instrumental sense; love as a system for the production of meaning. More to the point, he discusses when love, and the socio-chemical bonds from which it is constituted, can perform an infrastructural function. Infrastructures subtend actions, and in this case one could argue that the action being performed is the production of local meaning, made possible through the larger socio-chemical technology of love. Dieter is neither purely a scientist nor purely a mage; he recognizes the biochemical basis of love as oxytocin, but never loses sight of the larger picture wherein love is a system for the production of meaning.

What is love? A complicated question, to be sure, and not one with a single answer. But, as with Newton and gravity, it is not one that we necessarily need to answer in order to make good use of either occult system. If "Gravity, therefore, is an occult quality which is not hypothetical because it can be shown that it 'does really exist'", then the same can be argued about love (Newton, 1728). So, love exists, not as disparate and isolated phenomenal instances of love, but rather as "a very very powerful force to create meaning" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018). This requires that we slightly alter our stance towards love; not to think outside the box, but to slightly widen the box in which we think. Dieter has had phenomenal experiences with love, and understands at a physical level how the affect of love is bio-chemically produced. But unfortunately, such physical and experimental insights do little to explain the way in which love is productive of meaning. In order to better understand, predict, and make effective use of love, Dieter opened himself up to the possibility that love produces the visible affects of attachment and affection through relatively occult means. Dieter has productively widened his stance on the occult, moving from a description of love in terms of undirected physical biochemistry to one that figures love as a teleological force. This widening of one's stance towards the occult is a core move in effective magical practices, particularly those oriented towards forces such as gravity or love, which, while immaterial "are real in their consequences" (Thomas and Thomas).

It can be tricky to simply adopt a more capacious stance towards the occult; being a relational concept akin to infrastructure, the occult can only be recognized as systemic if it is perceived as systemic relative to the human. Otherwise, it is simply an odd, one-off phenomena; a cryptid, not a conspiracy. But through widening our stance towards the occult, we open ourselves to the idea that these

disparate phenomena are interconnected somehow; that these occult forces are occult flows, moving through occult systems. Focusing in on just one component, such as the role of oxytocin in love's production of meaning, may very well miss the point.

> "So, one way to think about it is like this. Think about a set of garden sprinkler pipes. You have one main pipe coming in, and a lot of branches that go to different beds in your garden. The water comes in as one flow, and it goes out in a lot of different directions. Magic is kind of like understanding where the flow is in each of these different directions. And if you want to make sure that your tomato plant over here gets watered you may have to make sure that that allocation of water from your main flow goes into the bed of tomato plants. But you have to be aware that all of those plants exist. That all of those types exist. It's all part of the system. And if you focus on just one pipe you're going to miss the whole picture. You have to make yourself aware of all the pipes"(Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

If one had to define magical practice in regards to infrastructure, it would not be incorrect to describe it as the ability "to make yourself aware of all the pipes" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). In this interviewee's rather direct technological metaphor, magic is explicitly described as a way to practically understand an infrastructural system. But, of course, she is not speaking merely of irrigation pipes. There are a number of infrastructures that subtend our daily lives; some of which humans have designed, and many more which humans have adapted for use. Most human-designed infrastructures are seldom as simple as the amateur agriculturalist water network described above. That said, even the most labyrinthian technical infrastructural is simple in comparison to the twisted trajectories entailed in tracing out all possible paths between two points. Alice further explains the sorts of infrastructures that the technology of magic is useful for; namely, those of exceeding complexity.

> "But in physics, if you want to go from Point A to Point B, there's no such thing as a straight line. Well, there is such a thing as a straight line, but it's not useful to think about. When you go somewhere, you get there by going all possible paths. The pressure against you is related to how few paths you have to get there. So, if you're thinking about driving to a friend's house and you drive along and find that the route you normally take is blocked, then you'll just

> drive around some other way. How reality flows from point A to point B is by all of those possible paths. Magic is the attempt to make some paths easier, maybe let them flow downhill a little bit. Or just make the flow going towards it easier, which may mean making more paths. It may mean making one path even wider. But, magic is playing with our understanding of all those paths and how your energy is distributed among them" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

To paraphrase somewhat, there are an infinite number of ways to draw a line between point A and point B. There are, notionally speaking, an infinite number of ways to drive to your friends house. There are, notionally speaking, an infinite variety of ways in which an occult system could be connected, an infinite variety of ways in which the occult can be conceptualized. Through taking a wider stance towards the occult, you are creating another 'route' to your friend's house, an alternate but still structurally feasible path. One can imagine experiencing occultation as a sort of roadblock; while when making predictions we might prefer to closely examine the occult in a technical sense, that is often relatively impossible. Through encouraging its practitioner to be more sensitive towards the presence of systems by widening their stance on the occult, magical practices are able to offer heuristics for the exploration of otherwise intractable phenomena. This also extends the infrastructural metaphor of 'making yourself aware of the pipes', and expands the notion of infrastructure to subsume both human and elemental systems. Here the role of magic is to aid in better understanding the system, but also the role which humans play within such systems. In line with Hughes's Large Technical Systems, current technical infrastructures dwarf the human in terms of scale and complexity; they are often vast undertakings involving thousands of supporters (Hughes, 2000). But even the largest of the Large Technical Systems is but a mote on a cosmic scale. Magic might aid people in conceptualizing and predicting bewilderingly vast systems, but it is important to remember the disparity of scale at play between the anthropic and the non-anthropic. The following quote comes from an interview with Hazel, who describes herself as both an "eclectic witch" and "totally geeky". A professional in the information sector, Hazel understands magic as a sort of atrophied capability, a disused method for connecting to our broader context. She suggests that magic, like cooking, does not depend on any particular spiritual commitment, but is rather a skill to be developed. There are, of course, limits to what even the most skilled practitioner can accomplish.

> "The universe is a huge machine, you know, like a ginormous machine that over millennia has been shoved around and programmed and pushed by different forces wanting this or needing that. And when you're trying to alter reality to suit your style, you're pushing a cog in a huge machine to try to get a very small thing done" (Hazel. Interview. Conducted by Aubrey Slaughter, 27 Jan 2109).

The universe and its underlying laws are the ultimate exemplar of an infrastructure that exceeds current human capacities in terms of scale and complexity. Such systems were not designed to be hidden or complex, or in fact designed at all. While science strives to understand the fundamental laws of the universe, it cannot change them; while legal and technical systems can be redesigned with an eye towards accessibility and transparency, physics cannot. It is much easier to shift one's perspective to better see the world, than to shift the world to better see from one's perspective; 'If the mountain will not come to Muhammad, then Muhammad must go to the mountain' (Bacon, 1597). Or, in other words, magical approaches to infrastructures of non-anthropic scale recognizes the relative paucity of the human capacity for action and comprehension within the context of human/infrastructural relations. While magic can be understood as "making yourself aware of all of the pipes", it is also the recognition that there are always more 'pipes' than one is aware of; reality is a "ginormous machine". Infrastructural systems may be relatively occult to the human not through being small or hidden, as is the case for many technical infrastructures, but instead operating on non-anthropic scales of time, space, and speed. The solar, seasonal, and stellar archeo-technologies of Stonehenge and similar sites are repeatedly mentioned throughout the interviews as an example of magical practice aiding in the effective assessment and use of infrastructures of non-anthropic scale.

While the cosmos, nature, and other elemental infrastructures are all systems of exceeding scale and complexity, magical approaches are also applicable to systems which, while relatively minute in comparison to elemental infrastructures, are still ineluctably complex in relation to their human users. News media and other informatical infrastructures are imbricated in a broader social, political, and technical milieu. Such an assemblage is witheringly complex, and can be difficult to predict. As with the students surveyed in the last chapter, magical practitioners often invoked magical explanations when complex systems produced results that were otherwise relatively inexplicable.

The following excerpt is from an interview with Titus, a magical practitioner who follows a syncretic tradition based on Classical Mediterranean cultures. As a pragmatic and practical polytheist, Titus uses magic and ritual to ensure he can be heard and seen by the various figures that constitute his pantheon. As his deities are not omniscient, there is a real need to elicit their attention and speak aloud if there is any hope of being heard. Practices that change what is said, and consequently what is heard by those in power, have historically proven to be quite powerful.

> "Some things that people consider quite everyday are actually magical, such as the ways that people can manipulate information. To make people's perceptions of reality different is magic, and for the last three years we've been seeing that on the large scale of American politics. If anyone needs any convincing about the reality of magic, just watch the phenomenon of our current president" (Titus. Interview. Conducted by Aubrey Slaughter, 18 Nov 2018).

Pipes and paths, machines and media; these are all interesting metaphors through which to describe the sort of systems that magical approaches are directed towards. When the students surveyed in the previous chapter wanted to gesture towards hidden complexities, they often invoked magical explanations. When the magical practitioners interviewed in this chapter wanted to gesture towards hidden complexities, they often invoked technological explanations. Perhaps this should not be surprising. Both information technologies and magical technologies allow for access to otherwise inaccessible systems of meaning and knowledge, and both information and magical technologies have their roles to play in human/infrastructural relations. As Hazel, one of the more experienced practitioners, puts it, "My computer is just another tool. It's another tool used besides my consecrated salt, my herbs, a crystal or whatever else I have in my bag of tricks" (Hazel. Interview. Conducted by Aubrey Slaughter, 27 Jan 2109). But, if magic is a tool, what is it a tool *for*? Hazel further expands upon how she conceptualizes the practice of magic, and its role in relating to infrastructural systems.

> "What we call magic is something like an atrophied capability that we've always had, but which we haven't used as much since the Industrial Revolution. We're just beginning to develop it again, like a muscle that we haven't used in a long time because other things have taken its place. You could call it intuition, or a sixth or seventh sense. I prefer to think of it as a way of relating to the collective consciousness. And I think human beings, ever since they became Homo Habilis and realized that they could manipulate a useful tool,

> have used that. We've always tried to alter our reality at whatever level it's on" [Emphasis Added] (Hazel. Interview. Conducted by Aubrey Slaughter, 27 Jan 2109).

In this depiction of magic, it is described as a sort of sensory locus used to tap into a communal network; an immanent tool for connecting to the occult. And, in a very real sense, this is true; the practice of magic entails widening your stance towards the occult, and opening up a space where systems can be posited to account for otherwise indeterminate phenomena. The presence of a collective consciousness *could* account for some of the odder sociological phenomena in the world today, but even if such a network does not exist, it still provides more predictive power than no model at all. But does this formulation of magic as a tool for widening our stance towards the occult with an eye towards enhancing the predictability of the occult relative to the human make for a good definition of magic in a general sense?

Defining magic can be difficult. Dieter, one of the more critically minded practitioners, had this to say. "The definition of magic is so slippery and so unagreed upon...there are all of these definitions, but none of them are quite accurate" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018). This is as true in the social sciences as it is in the occult arts; magic has variously been characterized as a perverted science, an inverted religion, and, for a decent period, a practical response to stress (Hanegraaff, 1999). The computer sciences are not without their own definitions of magic, either. Ever a pragmatic field, one glossary of early hacker culture helpfully defines magic as "As yet unexplained, or too complicated to explain" (www.catb.org., n.d.). But asking *what* is magic may be the wrong question entirely. In line with Bowker and Star's formulation of infrastructure, the proper question to ask may be *when* is magic (Star and Bowker, 2006). That is to say, if magic is a relational concept, what is the relationship in question?

> "In the past, I've had undeniable experiences with the divine that removed any doubts that I had. But now, it's just sort of like I don't understand what is required of me to have a relationship. And you know, it is something that's so beyond my understanding, or even my capacity for understanding. This is the problem; how do you get through to it? How do you get the most out of your relationship, and how are you worthy, and what can you do to be worthy to the point where they want to communicate with you?" (Dani. Interview. Conducted by Aubrey Slaughter, 18 Oct 2018).

The above excerpt comes from an interview with Dani, who is relatively new to magical practice in comparison to some of the more experienced interviewees. Dani works in an industry that uses, but is not centered around, computers and other information architecture. She is comfortable with technology, but not a specialist in the field. She interweaves magic and technology in pragmatic ways, such as keeping her magical texts on Google Drive. Her magical practice is primarily theurgic, i.e. made possible through petitioning and propitiating the appropriate deities. She is interested in having a closer relation to these deities, and uses her magic to better understand both their needs and her own worthiness.

Once again, we see that widening one's stance towards the occult can provide a way to orient action in relation to the occult. In this discussion of her theurgic magical practice, Dani lays out what she sees as the most difficult aspect of magical practice; building a relationship with an entity or system that operates on a scale that exceeds the anthropic capacities of comprehension. Her magical practice centers around acting in a manner that would allow her to have a relation with her relatively ineffable divine patron. In other words, Dani's magical practice is concerned with the difficulties in understanding how she relates to a highly complex, relatively occult, and seemingly agential system. This is a theme that is echoed and re-echoed throughout the interview responses. Whether the system in question is a deity, an aetherial network, or a collective consciousness, magical practices can be used to conceptualize one's relation to such systems. But first, our stance towards the occult must be widened to allow for space for such conceptualization. To revisit the example of archeo-astronomy, though magic does not work to move the Sun, it can act as a useful framing device for predicting the relationship between us and the Sun; but only if we consider such a relation to be possible. Similarly, magical practices help place the human within networks of knowledge and meaning, particularly those possessed of complexity and lacking in transparency. The role of the human and such systems can be relatively limited; Alice, one of the more experienced witches, had this to say about her place within such networks. "When it comes to magic, I'm not the source. I'm just a gateway. Not a source point, and not an end point. I don't collect it. I don't generate it. I make it flow" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

Defining what magic is in a general sense would be a tricky exercise, and it is fortunate that this analysis does not require that we do so. We are much more interested in the contexts in which magical relations arise. If

magic, like infrastructure, is a relational concept, then in order to understand *when* magic is, it is necessary to examine what sort of relations entail magical practices. Or, as Alice puts it, "The greatest secrets are out there; anybody can figure them out, they're just sitting there. But, if you come up to them in just the right way, and open your eyes in just the right way, then they click better and you understand them better" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). I argue that magical relations and their associated practices emerge when humans attempt to understand how they relate to complex and hidden systems. Are they, like Dani, a supplicant struggling to understand what is required of them to earn access? Or are they more akin to Alice, and figure their role as more of an infrastructural throughpoint for a vast network? Perhaps they see themselves as more like Hazel, and believe that "Anybody can do magic. It's like anybody can cook. It doesn't matter what your religious practice is, or what your belief system is. Anybody can open a cookbook and get a recipe and follow the recipe" (Hazel. Interview. Conducted by Aubrey Slaughter, 27 Jan 2109). In each of these instances, the first step towards effectively predicting the effects of the occult through magical practice is to widen your stance towards the occult, and open oneself to the alternate paths and possible systems that might populate the blank space of the black boxes.

As Above, So Below: Analogizing the Occult

While widening your stance towards the occult does allow for the positing of explanatory structures, an openness towards alternative explanations is no good without available alternative explanations. This section examines the sort of structures that magical users elect to fill the spaces of their widened stance towards the occult, and listens closely to the reasons behind each selection. As with Newton's relation to gravity or Weiner's predictions of pilots, these conceptions of the occult are used because they are effective in orienting the human in their relations towards the occult. In other words, they are used because they do some sort of work. But why these particular conceptions of the occult, and not some other? As there are as many possible ways to perceive the occult as there are ways for two points to be connected, the question of how any particular conception of the occult is selected is pertinent. While a precise psychological or neurological understanding of this choice is beyond the purview of this project, I would argue that the magical practitioners deploy an analogical heuristic much akin to those used by the students in their depictions of technical infrastructure, or Newton and Weiner's formulations of their

respective occult systems. If the first step in magic is widening your stance towards the occult, then the second step pertains to figuring out how to most effectively fill out the space you've opened up. Drawing upon our own experiences, we ask ourselves, 'What relates to us, in the way that we relate to the occult?'. What microcosm could reflect the macrocosm?

Being able to predict a system is a prerequisite for rational action in relation to said system. This remains the case even when one's understanding of said relations is incomplete, misinformed, or otherwise inaccurate. While I argue that magical relations play an important role in conceptualizing the role of the human in relation to infrastructural systems of exceeding complexity and diminished transparency, I do not argue that they do so perfectly. It is difficult to conceptualize how one relates to the cosmos, but then again, it is also difficult to know exactly how one relates to a given information infrastructure.

The following excerpt comes from an interview with Mark, a magical practitioner and academic who is a well-respected researcher in his field, as well as occupying a role of some importance within his magical community. Mark has spent the bulk of his professional career deeply engaged in examining fairly complex systems, both in magical and scholarly contexts, and could be comfortably referred to as a 'high priest' in either setting. He has deep networks in both academic and magical circles, and was invaluable in the recruitment of other interviewees. Being well-versed in both information infrastructures and magical practice, Mark was quick to point out the degree of unknowability and uncertainty inherent to human/infrastructural relations.

> "I think there's also something interesting about the obscuring of the materiality of the Internet and the almost unknowability about the geographic location of information. We know there are big data trunks. We know that there are huge data centers, and we know there are big server farms. And yet if I were to at any minute ask, 'Where in the world does the hard drive reside that contains my Facebook profile or my google search history', that is not an answerable question" (Mark. Interview. Conducted by Aubrey Slaughter, 20 Jan 2018).

Answers to unknowable questions are often inaccurate. That does not, however, mean that they are uninformative. While ascertaining the precise nature of our relations with large occluded infrastructural systems is a relative impossibility, an imprecise answer outlines trajectories for investigation, and informs our comprehension of such systems even as it inflects our actions in relation to them. This section examines a few of the ways in which magical practice assists the human in relating towards large and complex infrastructural arrangements.

As previously stated, many of the magical practitioners interviewed in this project possess some degree of technical proficiency. The depth of their familiarity with technology and technological systems varies; while some of the practitioners interviewed are professional programmers or internet mentors, others interviewees may have a personal website or participate in on-line communities. All of the magical practitioners interviewed have had experiences with the technical, and were more than proficient enough in their skills to navigate the highly technical infrastructures endemic to contemporary American society. Discussions centered around the intersection of technical and magical practice were not an uncommon feature during interviews. But even in cases of the technological occult, it is necessary to first widen your stance towards the occult. In order to determine which microcosm best reflects the occult macrocosm, one first has to be aware of the macrocosmic occult.

> "My first experience with email was during my first year of college, which would have been the fall of '94. At that point the only thing I really did with it is we would all go to the computer lab at school, because pretty much everyone in my immediate group of friends, because we didn't have computers ourselves. And we would email each other across the room while we were there and that was pretty much initially all I did with it. And I kind of thought to myself, 'Well this is kind of neat, but why don't I just go across the room and talk to this person?' Yeah. I didn't, you know, I didn't initially realize that you could email somebody somewhere else. I don't know why there was that kind of gulf in my knowledge" (Titus. Interview. Conducted by Aubrey Slaughter, 18 Nov 2018).

In this excerpt from my interview with Titus, an experienced magical practitioner, he describes his first time using email. For Titus at that time, email was exclusively a local phenomena, bounded by the confines of the college computer lab. While there was a recognition that messages could be sent between computers through some sort of local infrastructure, there was no similar conception of a

global email infrastructure, or indeed the knowledge that such a global infrastructure exists. In order to form a relation towards infrastructure it is necessary to have some sort of conception of infrastructure, but first one must be conscious of its existence *as* infrastructure; an unknown function serves no function. This does not necessarily mean that one must perceive or accurately understand the infrastructural system in question; as we have discussed above, it is not uncommon for infrastructures to be occult in relation to the human. But, once we are conscious that our own local infrastructure is but a small offshoot of a global infrastructure, how do we understand our relation to this broader infrastructural system?

Let us briefly imagine ourselves in a situation similar to the one that Titus found himself in. Perhaps we can take on the role of one of his compatriots at the computer lab, who is likewise having their first brush with email. Like Titus, we understand that email can send messages inside the computer lab, and we are just about to make the conceptual leap that email can be used to send messages outside the computer lab as well. It is likely that we have some conception as to how email works within the confines of the computer lab. Perhaps we think that the letters are broken down into coded blips and shot down the wire like a telegraph, or perhaps we imagine there is some sort of 'mailman' program delivering piecemeal packages. Whether we imagine email as a bit-based bucket-chain or a post-human post-man is not the issue; the point is that we have arrived at some conception of how the system works. This conception of infrastructure need not be accurate in any structural sense; they are reflective of our relation to infrastructure, and not the physical infrastructure itself.

So, we have an understanding of our relation to the local email infrastructure, but what happens when we find out that our local infrastructure is but one node in an inhumanly vast network of hidden interconnected systems? How do we move from understanding the affordances of local infrastructural provision to understanding our relationship to international infrastructural assemblages, particularly when such assemblages challenge conception and defy aspection? This is a vital point; while understanding how one relates to local implementations of infrastructure allows one to use infrastructure, learning how to predict the dimensions of one's relation to infrastructure in a global sense can meaningfully inflect how we interact with the world in general.

Local relations to infrastructure are often fairly visible and straightforward. At the most basic level water comes into my home through a tap, and, once I am done with it, leaves through a drain. I can observe and understand these processes fairly easily. But, I am required to imaginatively conceive of what occurs on the

other side of the tap and drain, and also how water might travel through my body on its trip from tap to drain. Neither of these processes are readily visible without the help of experts; both interior and exterior infrastructures are often occult in their relation to the human. This presents somewhat of a difficulty for those interested in predicting or understanding how they relate towards infrastructure. Magic offers a way to explore these systems, extrapolating off of patterns we recognize to reconceptualize the occult as knowable.

> "There are many ways in which magical thinking is adaptive in being able to recognize causal connections between things even when those causal connections might be very very loose. This is really important for recognizing things like the consequences of your actions socially. Or if one thing happened here, and so this thing is happening over here now because of the chain of events that we're putting into motion. Magical thinking just extends that drawing of connections beyond that which we can necessarily see. And so there are certain aspects you get from magical systems of thinking. A spirituality that I think can be really valuable in terms of recognizing the ways in which we are connected to the earth, recognizing the ways in which our behavior is part of a broader pattern of human behavior, and that we as a person is just sort of one variant of this thing that is humanity. And that's powerful and that's good stuff to think about because that leads you to recognize the interrelationship of things in the world. And a lot of that is invisible." (Kerry and Terry. Interview. Conducted by Aubrey Slaughter, 11 Oct 2018)

Let us briefly review what this quote from Kerry and Terry has to say about the "adaptive" qualities of a magical approach towards the systems that subtend our lives. It is useful for "drawing of connections beyond that which we can necessarily see", which allows for "recognizing...the consequences of your actions socially...the ways in which we are connected to the earth...the ways in which our behavior is part of a broader pattern of humanity, and...the interrelationship of things in the world" (Kerry and Terry. Interview. Conducted by Aubrey Slaughter, 11 Oct 2018). This is a rather comprehensive list, and touches on many less-than-visible infrastructural systems; sociological, ecological, and ethical systems are often relatively occult from an anthropic perspective. Magic does not tell you specifically that if you pull String A, it will move String B. It does not offer perspective on an occult infrastructure that renders the infrastructure transparent, which would be needed for such specificity. What magic does tell you is that if you pull on String A, other strings will be moved,

and perhaps in a manner that you did not anticipate. Similar arguments can be made in reference to technical infrastructures. But whether material or not, these infrastructural systems are occult in their relation to the anthropic, and some sort of conception of infrastructure is prerequisite to forming a human/infrastructural relationship. How, then, does the macrocosmic logic of 'As Above, So Below' aid in the conceptualization and eventual utilization of occult infrastructures?

> "I see myself as a network that goes underneath the surface of that which again has that exact same structure. We see that the structure of a neural network in the human brain is similar to the network of the entire cosmos, which is similar to the networks that mycelium set up, which is similar to the network of the Internet. These are all just the same thing. It's just different whether it's organic or cosmic or mechanical or whatever. I mean, in what realm does the network of the Internet even exist? I think it is physical; we can diagram it and we can make pictures, but you can't ever put our hands on it" (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017)

Oberon Zell-Ravenheart is a highly experienced magical practitioner and the founder of The Grey School of Wizardry, which is noted for its use of the on-line platform Second Life as a virtual campus. A noted Neopagan writer known primarily for his writing on Gaea, he is also the co-founder of The Church of All Worlds. In his role as headmaster of The Grey School of Wizardry, he has become highly adept at teaching and practicing magic within in a virtual context, while still retaining a focus on nature. An extremely dynamic and insightful character, Oberon occupies a rather unique role as perhaps the most prominent public magical figure in America today.

In the quote above Oberon describes what the phrase 'As Above, So Below' means for him in regards to both his magical practice, and his life in general. In his conception of infrastructure, infrastructures may exist on different levels and consist of different materials; "organic or cosmic or mechanical or whatever" (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017). But, regardless of the size or stuff of the system at stake, there are certain forms that recur, instances of patternicity that point towards an overarching correspondence. Oberon sees these networks in the world, certainly, but perhaps more importantly he also sees himself "as a network that goes underneath the surface of that which again has that exact same structure" (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017). Or to paraphrase, As Within, So Without. But of what use are such insights? Does this help Oberon to understand the

various technical elements that, taken as an assemblage, constitute the infrastructure known as the internet? Not particularly; this is a highly virtualized version of the internet which "we can diagram it and we can make pictures, but you can't ever put our hands on it" (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017). The infrastructure of the internet is arguably physical, but hardly visible, at least from an anthropic perspective. The same can also be said of the "neural network of the human brain...the network of the cosmos…[and] the networks mycelium set up"; arguably physical, but not terribly easy to see. But, it isn't necessary to see a system to conceive of its form; one can hypothesize a system's effects (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017).

> "So, when you've got an organism the size of a planet, you inevitably will have the emergence of a sentience that is equivalent to that. And it may be no more comprehensible to us than our sense of self is comprehensible to the cells running around inside our little body, here in their own little corner. You know, if your cells could imagine that there was this greater consciousness going on thinking out there, they would probably find that really preposterous. I believe we're in that same sort of the situation" (Zell-Ravenheart, Oberon. Interview. Conducted by Aubrey Slaughter, 15 Dec, 2017)

If we can understand our cells as microcosms of our selves, and our selves as microcosms of Gaia, then our relations to the occult systems both far above and far below our phenomenological plane of experience can be understood in terms of microcosmic/macrocosmic correspondence. That is to say, if all levels of structure from the infrastructure to the superstructure have the same essential form, then it is not necessary for these structures to be made amenable to anthropic aspection; one simply analyzes what is visible, and from there extrapolates into the infrastructural unknown. This magical approach towards infrastructure certainly aids magical practitioners in understanding how they relate to cosmic, divine, and elemental infrastructures; while perhaps lacking in absolute accuracy, this extrapolated conception of a fractally cellular world is an efficient and useful heuristic for understanding and relating to a system that is, relatively speaking, ineffable.

Is Oberon a technician or magician? Was Newton a scientist or an occultist? Do we differentiate between designed and elemental infrastructures, or face that *We Have Never Been Modern* (Latour and Porter, 1993)? Magic is not science; I do not seek to make that claim. I do contend that magic is *useful* to science, and that the logic of the occult has historically accompanied and informed scientific work. Magic

is often presented as a thing of antiquity, a quaint tradition supplanted and obviated through the rise of science and empirical reasoning. I would argue that this is a less than accurate depiction of the relationship between the two; in fact, science and philosophy has always dealt with the occult as a source of inspiration and as a means of understanding. In the example of Newton, the Hermetic tenet of 'As Above, So Below' was arguably influential in his work on gravity. The same occult force that works on apples also pulls on planets, and though we may not know why this is the case, that does not make it any less true. More importantly, it is not necessary for me to personally understand the laws of gravitation in order to understand that they work. I'm sure that one of my colleagues could attempt to explain gravitation to me, but I can still make good use of gravity without knowing much beyond 'it pulls things to things'. The same could also be said of Newton, who made substantial use of gravity despite the relative paucity of his knowledge in comparison to modern theories on relativistic or quantum gravity. In terms of science as a whole, we find a similar situation in regards to gravity as Newton. At time of writing there is a good scholarly consensus about gravity's *effects*, but considerably more contention as to gravity's *cause*; gravity remains occult. While we may not be able to pin down exactly how gravity works, we work off of the assumption that it works the same *there* as it does *here*, across continuums of scale. Or, to perform an infrastructural inversion on the hermetic maxim, 'As Below, So Above'. How things work *here* is not just the same as how they work over *there*, but is rather universal; how things work *here* is how they work *everywhere*. It is this sort of magical thinking, a heuristic approach towards occult systems, that allows us to make *use* of systems of which we cannot make *sense*.

Casting Circle or Weaving Webs: Interpolating Structure in Magical Practice

Magic, as a traditional practice, has a number of traditions. One tradition shared by a number of magical practitioners is the drawing of a circle to delineate a space for magical work (Hume, 1998). This is particularly prevalent among practitioners of Wicca, and was mentioned as an integral aspect of Wiccan magical practice by several interviewees. The casting of a circle is not an absolute requirement. Inscribing a circle was described as being good for magical focus and protection while working; a 'best practices' approach in-line with a safe working environment, but not a necessity. Even among the handful of practitioners interviewed, individual methods of casting circles varied from person to person, like an accent or a signature. Still, whether they are bound by chalk, salt, or more esoteric means, circles remain a popular component of Wiccan craft. I would also argue that the casting of a circle is a practice intended to enhance the predictability

of connecting to a broader infrastrastructure. How, or if, one chooses to cast a circle can reveal a good deal as to how they conceive of their relation to the larger systems at play. Differences in practice appear to result from the interpolation of structures derived from the practitioners' chosen analogical heuristic; i.e. the microcosm that they felt most effectively reflected their occult macrocosm. Differences in ritual practice, such as in the drawing of circles in the Wiccan tradition, are indicative of alternative conceptions of the occult. Alice, one of the more experienced interviewees, was kind enough to instruct me as to the reasons behind her own use of circles in magical practice.

> "In my own personal magic practice, I don't cast circles anymore. A circle is a barrier. Instead, I use a spider web and I pin it to the corners of my working space, to solid places in my magical universe, and use that as a stabilizer rather than separating myself out. I live out in the woods. I'm sitting here in my dining room and I look around and I can't see a house or a road. So I don't have to worry about urban noise or the psychic noise of people that a circle is really good about cutting out and shielding. I don't have to do that. I want my magic to reach out as far as it possibly can and affect everything. And you can't affect everything being in a little silo.You gotta reach out, but also it's a very big, very chaotic universe out there, and you do need some structure. So the vision is of hooking yourself in; it's like if you were on a trapeze, you'd have to have the safety line. So instead of casting a circle, I pin my web as a kind of a safety harness that I can launch myself from (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

What do webs do? They connect, bridging a gap between two points, but they also restrain, keeping one close. Alice wanted her magic to reflect the spiderweb; for her arachnid microcosm to reflect her occult macrocosm. Through the conceptual use of the spiderweb, she has interpolated a web-like structure onto her rendering of the occult. Now, her relation to the occult is more predictable, in that she knows that she can expect greater connectivity, but at the cost of safety, of "cutting out and shielding". This is what I would consider to be the third step in magic: interpolation. Once one has identified a suitably effective and analogous microcosm, the next step is to put it into practice; ritual practice.

In this rendering, rituals are an aspect of magical practice, but are by no means the only aspect of magical practice. Magical practice entails acting in a manner that assumes actions are subtended by magical infrastructures. These

actions may not be ritualistic, in that they are not formalized actions meant to inflect infrastructural relations or propitiate infrastructural agents and phenomenal actors, but are rather actions that are informed by the understanding that such an infrastructure exists. Rituals, in my rendering, are actions directed towards infrastructures, maintenance care and repair, whereas magical practices may make use of magical infrastructures, but are not directed at magical infrastructures.

Rituals are directed at the care, repair, and maintenance of an infrastructural connection. Magical practices, on the other hand, are the use of magical infrastructures to perform tasks that have aims outside of the immediate human/infrastructural connection. Ritual has an important place within magical practice, but not all magical practices necessary include ritual.

More importantly, my interlocutors did not make a distinction between magical practice and rituals, and would use each term in place of the other. This makes any distinction I choose to draw one of etic convenience, and not necessarily reflective of emic categorizations of these terms.

Alice conceives of her relationship to the larger magical infrastructure as not only relational, but also as contextual. There might well be cause for casting a protective and focusing circle when in a dense urban environment teeming with people, but the isolation of the woods calls for a more projective yet grounded approach. Alice's choice of using pinned spiderwebs rather than the traditional chalked circle is a way of rendering predictable these systems of meaning and power. If "I want my magic to reach out as far as it possibly can and affect everything", it might be necessary to think outside the circle, so to speak, and to approach things differently (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). What happens when such a connection is made can have good or bad consequences, but some sort of connection is necessary for any work to be done. In Alice's magical practice we can see the recognition that, depending on one's micro/macrocosmic conception of a given infrastructure, one's practices may have to shift. Though her own personal practice no longer involves the casting of circles, she is aware that other practitioners might reasonably do so. The idea that one's relation towards a given infrastructure might differ from that of another individual is a useful concept within Alice's rendering of her magical practice, and indeed beyond. I argue that these conceptions of human/infrastructural relations established through magical approaches towards infrastructure meaningfully inflect how we interact with infrastructural systems in a more general sense. Take, for example, the following excerpt from a discussion of Alice's professional career.

> "I'm not really good at user interfaces, but at least I know it. Most of the user interfaces these days are designed by men in their 20s, able of hand and eye and ear. Most of the time I spent working with [COMPANY] was spent on creating ways of reading books and maps for the blind. Our CEO would sometimes walk in to a presentation when people were trying to say 'Well, our stuff is accessible to the blind!', and he would walk up to their computer and take off the mouse and turn off the monitor and say 'OK, now show me your software'. You know, no offense to young men, but computer design as a field is mostly young men, and they haven't yet realized that there's a whole world out there"(Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

In this snippet, Alice shows why interpolation is essential for rendering the occult more predictable relative to the human. Here, the programmers failed to 'see' their products as if they were blind; to see their products as the users see them. In other words, they failed to interpolate their microcosm of the phenomenal experience of blindness onto their system, which meant that they were poorly oriented when their system became occult relative to them. The blind use computers as they do other things; without recourse to pointing, or receiving visual feedback based upon where they point. As with computers, so without computers; as above, so below. While the programmers undoubtedly understood that their users were blind, and interacted with the world in the way that the blind do, they failed to interpolate that into their products.

What is the practical application of magic, in regards to infrastructural systems? Perhaps it is the art of seeing the system more abstractly, so that one can see their own place in said system more clearly. Take a map, for instance. A map is little more than an abstracted shift in perspective, and can be quite handy. The map may not be the territory, no, but it can certainly be useful in orienting oneself to the territory. Or rather, it is useful in deciding that you are oriented, and proceeding from there. Magicians are prodigious mapmakers; occult authors often make ready use of the abstractions required to outline the unrepresentable territories they detail in their texts. Which map one chooses to orient oneself by, and what abstractions one uses to do so, are unique to each practitioner. There are relational and contextual aspects to consider in decisions of how and if a magical practitioner chooses to cast a circle, or indeed perform any ritual act. For example, please take a look at Titus's criteria for connection; his process for connection is radically different from Alice's, but is still highly reflective of his contextual relation towards the infrastructural unknown.

> "There is a theological idea that we have in polytheism that our deities are not necessarily omniscient. Operationally, what that means is that you need to let them know who's praying, because they don't automatically know. And the way that you do that is you write your name down, or you say it, and then you pray. This is obvious when you look at ancient cultures. When somebody builds a temple and they put their name on it, it isn't because they want everyone to know that they made this temple, it's because they want the gods to know. But then the other thing is that if the deities are not omniscient, then they don't know what you're thinking. And so your intention is not as important as the actions and the words that go with it. So this whole thing of praying in silence and stuff like that, it's no good if your deity is not omniscient. Yeah, no use whatsoever. So say it, and when you actually do say things out loud they become more powerful. You know, I mean they don't necessarily last very long but in that moment, my experience has been that it seems more powerful and the results have been better" (Titus. Interview. Conducted by Aubrey Slaughter, 18 Nov 2018).

Titus , the practitioner interviewed above, has a particularly wide stance towards the occult. For Titus, the occult is too complex to be understood as a teleological system or a mechanistic agent. Rather, his occult system is figured as a phenomenal locus of experience, a god who hears and sees what can be seen and heard. For Titus, the occult is a person, and sees and hears like people do. As people see and hear below, so too do the gods see and hear above. So speak up! Pray loudly, and don't forget to sign your prayers. I would like you to note that Titus has a very clear and definite idea of how to best render his relation to the occult more predictable; his actions in relation to the occult are precisely and effectively oriented. This is due, I argue, to the degree with which he has successfully interpolated his chosen analogical heuristic; through interpolating the occult as a person, he can confidently and effectively predict the occult's effects.

For Titus, silent prayer is about as effective at achieving an infrastructural connection as a visual interface would be for the blind; that is to say, not at all effective. In Alice's case, a circle did not provide the effect that she desired, and so she took a different approach. One can see a similar theme in Alice's discussion of her professional work designing software for the blind. She admonishes the young men "able of hand and eye and ear" who cannot conceive of interfacing with infrastructure differently; who cannot think outside the circle. Alice's and Titus's

relation towards magical infrastructures is both relational and contextual, with a practice that shifts according to the demands of situation and circumstance. This conception of infrastructure is useful for magical practice, surely, but these conceptions inform our relations and inflect our actions in regards to infrastructural systems in a more general sense. If we understand that we relate to infrastructures differently, it is easier to recognize how others might do the same.

In Alice's magical practice, the techniques and technologies used in achieving infrastructural access highlight the subjective and situated contextuality endemic to human/infrastructural relations. At times our relations to infrastructure need to be protected; at others, projected. But, before either of those are possible, these relations must be conceived of, either as something to be protected or projected. Alice's choice of pinning webs rather than casting circles in her magical practice is interesting, but it is Alice's conception of magic, wherein such a choice is both possible and meaningful, that is truly fascinating. If, as I argue, magical approaches towards infrastructure aid infrastructural users in understanding how they relate to large, complex, and hidden systems through the interpolation of analogous microcosms, then the choice of pinning a web versus casting a circle is not simply a matter of peculiarities in practice. Rather, it is reflective of an understanding of infrastructural systems, magical or otherwise, built upon a lifetime of professional experience and contemplative interaction.

The Sorcerer's Apprentice: Prediction, Failure, and the Perils of Hyperfunction

While we did not explicitly discuss power dynamics between lay and expert users, there are certain elements of these relations discussed during the interviews that allow for a general sense of how expert practitioners of magic view inexperienced or lay practitioners.

The greatest issue for practitioners of magic in relation to lay users is the subject of naivete, the idea that spells or practices do just what they say on the tin, with nothing in the way of externalities. Lay users may have a relation to infrastructures, but expert users have a relation to the complexities of infrastructure, the tacit knowledges and unspoken interconnections that allow for expert practice. Naive users assume that the map is the territory, or at the very least depicts the territory accurately. Expert users, having practice navigating the territory of infrastructure, are well aware of the disconnect between map and territory. The main difference between experts and lay users appears to be a respect for the inherent complexity of the system, and the idea that while there are

solutions, there are no clean and simple answers to any question put to an infrastructure.

The power dynamic between expert and lay users is strained, because expert users do not trust lay users to test their received wisdom. The fear is that if they teach tricks to the lay users, the lay users will not understand or respect the complexity that belies the trick, simple as it may seem. So, they encourage you to engage in complexity, and also to find your own ways through the thicket. Expert practitioners respect those who have made their own way down their own path, or respect the work that has gone into the pathmaking done by others. An expert's tricks and tips give knowledge, but it is a knowledge that lacks a basis upon which future knowledges can be formed. It does you no good to overlay a superficial infrastructure over an occult infrastructure, if you want to really understand how you are related to the system.

Experts suggest stepping away from a neutral, tool-use depiction of magic and realize that each system which we choose to cathect ourselves into is a conscious choice. One should be aware of the sort of systems in which you are immersing yourself, and how they affect the world around you, without the prerequisite of cracking the system open to prove how it is doing these things. The difference between lay users and experts is that lay users have a tool-use view of magic, and of technology, whereas expert users understand that there are always externalities, complications, convolutions, and that nothing is ever as straightforward as it seems, especially if it seems straightforward. There is a lot of work that goes on to make things appear seamless, both in magic and in technology. The experts are aware of this work; the lay users are only aware of seamlessness, and then only barely.

The purpose of magic, in my formulation, is to make the occult more predictable relative to the human. In other words, magic allows us to make predictions about what the occult will do, based on how we believe the occult to function. But, just as with answers to unknowable questions, predictions based on speculative models are often inaccurate. That said, when one is aware that their model of the occult is incomplete, one can be prepared for the presence of the unaccountable.

Alice had stated previously that magic could be described as the art of "making yourself aware of all of the pipes", but her strategies for managing her infrastructural relations suggest a slight extension of this metaphor (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). While "You gotta reach

out...it's a very big, very chaotic universe out there, and you do need some structure" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). In other words, achieving an infrastructural relation does not end when the connection is established; some "cutting out and shielding" may be required (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). The interpolation of more visible microcosms on the then occult macrocosm makes the occult more predictable relative to the human, but only insofar as the chosen microcosm provides an effective analogical frame. A prediction of the occult based upon a more visible microcosm can be wildly, even dangerously inaccurate. This can be as true in technical infrastructures as it is in magical systems, as Alice's following discussion on the difficulties of technical development illustrates.

> "I think the problem has to do with boundaries. See, normally when you're building and creating something, you're not thinking about limiting it. And a lot of trouble we get into it has to do with not respecting where the boundaries are for privacy, or for security. You know, when someone's sitting there by themselves banging on a machine, you aren't thinking about there being millions of people doing the same thing at the same time. Right. And that's a common glitch, throughout. The question is, what can you touch safely without making a mess of things? […] And that's just not something you think about when you're building a big beautiful castle with windows and doors in it. Sometimes you forget that doors and windows need locks too" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).

A prediction of the actions of a million people online based upon the internet activity of a single person is unlikely to be accurate. While predicting the occult, when possible, is always a good idea, being cautious in relation to the occult is never a bad idea. Magic allows one to make predictions in relation to the occult, certainly, but it does not promise that those predictions are perfectly accurate. The occult, after all, remains occult; while we may have a conception as to how the occult functions, we are unlikely to be perfectly correct in a technical sense. To quote Alice " The question is, what can you touch safely without making a mess of things?" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). Magic allows for the making of predictions in relation to the occult, yes, but it's practitioners are still responsible for unintended consequences. More specifically, they are responsible for being aware that there are always consequences for their actions, intended or otherwise.

> "Technology and science tries to narrow in and focus, but often loses sight of side effects and connectedness. The explosion of the Internet is all about connectedness.This beautiful bounty of information we have, it is all because of connections. But, we forget that when you pull on string A, then strings B, D, D, E, F, and all the way to ZZZ are all going to be raveling. Everything we do has effects, and that implies responsibility. We are responsible for everything we do, and you can't separate yourself from the consequences of your acts. That's kind of a magical ethics statement. But I think we need better ethics, absolutely" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018)

While we cannot always predict exactly what will happen, we can predict that something unanticipated will happen. We can confirm, in other words, that our model of the occult is incomplete. Despite our best efforts, there are always consequences that we may not have intended, connections that we had not mapped out, and elements of infrastructure that remain relatively occult. But, simply because these conceptions of the occult are imperfect, and the predictions it allows are less than perfectly accurate, does not mean that they are any less effective in orienting human action in relation to the occult.

In the previous section, Alice discusses connecting to infrastructures, magical or otherwise. While "It's very hard, in today's world, to get a good balance between being the magical witch and being an in-the-world techie", Alice's years of professional experience in both magical and technical contexts have allowed her to more effectively conceptualize her relation to functional, fantastical, and fantastically functional infrastructures (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). Understanding what is required in order to connect to a given infrastructure is prerequisite to an infrastructure's use, but prior to that the infrastructure must be recognized *as* infrastructure. Systems are always potentially infrastructural, becoming infrastructure in relation to the human only when said system is recognized as a method for resolving tensions between the local and the global (Star and Ruhleder, 1996). Potential infrastructures abound. It is not a question of what systems are infrastructural; all systems, notional or otherwise, have some facility to undergird human activities. Rather, it is a question of *when* a given system is viewed as having the potential to perform an infrastructural function, of *when* vast powers can be bent to my arts. Or, to quote Star and Ruhleder, "That is, an infrastructure occurs when local practices are afforded by a larger-scale technology, which can then be used in a natural, ready-to-hand fashion" (Star and Ruhleder, 1996). While Star and Ruhleder were discussing large-scale technologies,

the systems enjoined in magical practice are also large-scale, and arguably technological. Magic, as a tool for conceptualizing how one relates to infrastructure, does not call infrastructural systems into being. Rather, the use of magic in this context lies in recognizing *when* a system may serve an infrastructural function. *When* is infrastructure is often a matter of perspective; magic simply offers a different perspective. If magical approaches towards infrastructure can be understood as a way of conceptualizing human/infrastructural relations, then one of the primary uses of magic is in recognizing when systems can serve an infrastructural function.

The predictive power that magical approaches towards the occult affords its practitioners is not without limit. But this is, to conflate contexts, a feature and not a bug. An understanding that one does not know everything in relation to the occult is the foundation for an effective relation to the occult; even if you open your eyes as wide as you can, you still won't see everything. To think otherwise, and assume one's predictions of the occult are perfectly accurate, is rather presumptive. But such presumptions are made every day; we assume that things work in the manner that we think they do until presented with evidence to the contrary. In such cases, we come face to face with the consequences of our predictive failure. If we are fortunate, we may even pass down our experiences in the form of a cautionary tale.

Cautionary Tales

> "There are a number of cautionary tales in magic. Of course there's the Faustian bargain which is so popular, or the inept conjurer of The Sorcerer's Apprentice. I think that's kind of the classic example. I think it's a very useful story. It's a cautionary tale, obviously, that power and knowledge must be tempered wisdom" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018)

Cautionary tales proved to be a popular subject in the interviews. Each practitioner interviewed gave at least a brief word of warning, and many interviewees took pains to describe instances of magic gone awry. This section examines three cautionary tales, two exemplary and one archetypical, and asks what these experiences might reveal about their teller's relations towards infrastructure. I have chosen cautionary tales in magical practice as a subject of analysis because such instances reveal a breakdown in magical infrastructure, and it can be argued that infrastructures become visible upon breakdown; "The normally invisible

quality of working infrastructure becomes visible when it breaks; the server is down, the bridge washes out, there is a power blackout. Even when there are back-up mechanisms or procedures, their existence further highlights the now-visible infrastructure" (Star and Ruhleder, 1996). No one thinks about the air conditioning until it cuts out on a hot day, and even the presence of fans won't make you forget that the AC is broken. This is a tried-and-tested approach, examinations of infrastructural breakdown have been used in analysis of disaster response, (Boin and McConnell, 2007) symbolic frameworks ('t Hart 1993), and rice farming (Morita, 2016), just to name a few pertinent cases .

But failure is not the only way that infrastructural systems can break down; "Moments of material or infrastructural rupture do not have to simply be restricted to those times when infrastructures fail, but might equally be a response to when they succeed particularly well" (Knox, 2017). Take one's tap in your home for example, a classic and ready-to-hand case. When you turn on the tap, you receive water from the spigot; not too much, but not too little either. In a hypofunctioning water infrastructure you may only be able to get a few drops a second out of the spout; certainly not enough for a household. This is a breakdown in infrastructure; your tap and its associated water infrastructure no longer subtend your daily activities. Of course, the same would also be true in a hyperfunctioning water infrastructure; imagine using the output of a fire hose or an industrial water-jet cutter to wash your dishes. You would likely wind up rather wet and not a little injured, which is hardly an ideal outcome. While you may certainly be receiving water by the bucketful, the infrastructure is once again not subtending your daily dish washing.

Examples of infrastructural hypofunction, or failure, are rare in magic. That is not to say that it is impossible to fail when using a magical approach towards occult systems, but rather that such failures are subtle, and difficult to recognize. For a rough analogy, imagine making a shipping mistake when ordering a book from Amazon. There is no immediate indication that you have sent your newly purchased tome to Aberdeen rather than your own home, and the only way you are likely to notice your error is when, after several weeks, your book fails to arrive. While in this example the fault is yours, a million things could have gone awry in the shipping process; a missed connection, a mislabeled parcel, or a sleepy packer are all potential culprits. In a material infrastructure, such failures of hypofunction serve an illustrative purpose in that they help to foreground the materiality of infrastructure, calling attention to normally less-than-visible systems. In infrastructures that are perspectivally hidden or exceedingly complex, however, the cause of infrastructural hypofunction can be difficult to pin down; "The shift de-

emphasizes things or people as simply causal factors in the development of such systems; rather, changes in infrastructural relations become central" (Star and Ruhleder, 1999). But cautionary tales of magic shared by the interviewees are not stories about hypofunction; these are warnings about hyperfunctional infrastructures, and they enjoin you to be careful what you wish for.

In the opening quote of this section, Dieter mentions two archetypical cautionary tales that are particularly pertinent to magical practice. The first example, Goethe's *Faust*, wherein the eponymous Faust trades his soul to the devil for the love of knowledge and pleasure, is indeed a popular trope. Faustian bargains abound in depictions of magic in popular culture, but throughout my interviews I was hard-pressed to find any practices that were reminiscent of deals, devilish or otherwise. That said, the second example, that of *The Sorcerer's Apprentice*, proved to be extremely resonant with a number of interviewees. *The Sorcerer's Apprentice* is an old tale, with the most ancient extant version being sourced from Lucian's *Philopseudes* (Lover of lies), penned around 150 A.D. While it trades a sorcerer for an Egyptian, and an eavesdropper for an apprentice, it is still the classical tale of the Sorcerer's Apprentice; both Goethe's *Der Zauberlehrling* (1797) and Disney's *Fantasia* (1940) draw from the same well.

> "Whenever we came to an inn, [the Egyptian] used to take up the bar of the door, or a broom, or perhaps a pestle, dress it up in clothes, and utter a certain incantation; whereupon the thing would begin to walk about, so that every one took it for a man. It would go off and draw water, buy and cook provisions, and make itself generally useful. When we had no further occasion for its services, there was another incantation, after which the broom was a broom once more, or the pestle a pestle. I could never get him to teach me this incantation, though it was not for want of trying; open as he was about everything else, he guarded this one secret jealously. At last one day I hid in a dark corner, and overheard the magic syllables; they were three in number. The Egyptian gave the pestle its instructions, and then went off to the market. Well, next day he was again busy in the market: so I took the pestle, dressed it, pronounced the three syllables exactly as he had done, and ordered it to become a water-carrier. It brought me the pitcher full; and then I said: *Stop: be water-carrier no longer, but pestle as heretofore.* But the thing would take no notice of me: it went on drawing water the whole time, until at last the house was full of it. This was still going on, when [the Egyptian] appeared. He saw how things stood, and turned the water-carriers

> back into wood; and then he withdrew himself from me, and went away, whither I knew not.'" (Trans. Fowler and Fowler, 1905).

A classical example, that clearly illustrates the dangers poorly predicting and therefore inarticulately using an occult system. The narrator's conception of the occult made him competent enough to forge an infrastructural connection to the occult, but failed to predict how such a connection could be controlled. That is, at least, until an expert steps in to take control, a common feature across iterations of this tale. Stories of infrastructural hyperfunction due to predictive failure of occult relations such as these are an excellent way to examine what happens to our conception of the occult proves insufficient. The next two vignettes come from two different interviewees with a similar problem; a spell they have worked, has worked too well.

> "As an example, I have a friend of mine who called me in a panic because she had cursed herself, and she didn't know how to get out of it. What she had done was that she had realized that she had done a very intense spell, because she had a crush on this guy. All she really wanted him to do to pay attention to her. When she had worked the spell she found that, wherever she would go, [her crush] would be there. And so she'd go 'Wow this is really cool!' But then she noticed that [her crush] became more and more terrified of her, because whenever she would go he would be there. And she realized that he would see her as a stalker" (Hazel. Interview. Conducted by Aubrey Slaughter, 27 Jan 2109).

Who has been cursed here? The interviewee's friend. Who has done the cursing here? Once again, the interviewee's friend, albeit unintentionally. How has she been cursed? Through the agential but inexpert use of an occult system. What form does this curse take? It takes the form of infrastructural hyperfunction, an overzealous undergirding, a profusion of provision. Too much of a good thing, in other words. We see the same theme repeated in another cautionary tale, told on a separate occasion by a different interviewee.

> "I had a problem, almost a year ago, where I needed to ask a friend to help because I had opened some Shadow Magic. There was something I was working through, and I wanted to bring it out so I could move past it. But when I brought it out I forgot to put it back. I forgot to send it away. And so I actually started seeing things in the

> corner of my eye, and I was having these horrible nightmares to the point where I was getting really scared. In magic, if you bring something out you have to release it, or else it hangs around. It might be that it wants to stay, or that it just can't go away. Especially if you're doing something like Shadow Magic, it is attached to you. What was 'haunting' me, and I say that haunting in 'quotes', it was *me*, so it couldn't go away until I released it. But it's things like that, without proper knowledge or proper preparation, that you can get yourself in trouble with psychological and psychic issues" (Dani. Interview. Conducted by Aubrey Slaughter, 18 Oct 2018).

Once again, we have an instance wherein someone curses themselves a bit on accident. One could consider this the magical equivalent of forgetting to turn off the stove; you need fire to do certain types of work, certainly, but it isn't something you want freely moving around your home. The themes at play in each vignette are somewhat similar; an agential human attempts to use a complex and shadowy infrastructure, and through their own actions suffers infrastructural hyperfunction.

Magical practitioners are not the only ones who find the tale of *The Sorcerer's Apprentice* to be resonant to their field of interest. The themes of complex interplays between the seen and the unseen has a currency beyond its coinage, as we have seen in the works of both Newton and Weiner. A particular perspicacious example of this can be seen in Norbert Wiener's own interpretation of this now-familiar tale of infrastructural hyperfunction.

> "In Goethe's poem, The Sorcerer's Apprentice, the young factotum who cleans the master's magic garments, sweeps his floors, and fetches his water is left alone by the sorcerer, with the command to fill his water butt. Having a full portion of that laziness which is the true mother of invention—it led the boy who tended Newcomen's engine to fasten the valve string which he was to pull to the crosshead, and so led to the idea of the automatic valve gear— the lad remembers some fragments of an incantation which he has heard from his master and puts the broom to work fetching water. This task the broom carries out with promptness and efficiency. When the water begins to overflow the top of the water butt, the boy finds that he does not remember the incantation that the magician has used to stop the broom. The boy is well on the way to be drowned when the magician comes back, recites the words of power, and gives the

> apprentice a good wholesome scolding. Even here the final catastrophe is averted through a deus ex machina." (Wiener, 1990)

Here Wiener reframes the maxim of 'Be careful what you wish for' into a more technical form in which one should not be leery of wishing, but rather should be leery of using systems which "cannot be inspected until the final goal is attained"; in other words, occult infrastructures (Wiener, God and Golem, Inc.).

Four cautionary tales of magical mishaps; four cautionary tales of infrastructural hyperfunction. While one story is ancient and the others of contemporary coinage, there is a clear common theme running through each.

> "The thing with science and magic is that they're deeply imbricated. They're very humanistic because of the fact that they're human-oriented. As systems one of the things that they both have in common, really intimately, is the idea that humanity is empowered with a certain degree of agency in a way" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018)

From the cautionary tales told above, this would appear to be true; magical approaches allow the anthropic to conceptualize assuming an agential stance within an infrastructural context. Whether for good or ill, magical approaches towards infrastructure and the infrastructural unknown give its practitioners predictive power. Power, yes, but not necessarily control. The same could also be said of technical infrastructures, as the following quote from Dieter seems to suggest.

> "I'm afraid to use the command prompt function in Windows because I'm like 'Oh man I'm not getting into it so much so that I could fuck things up'. And I understand, I'm very much aware of the fact that the operating system exists almost as a safety net for me because I don't have the technical knowledge to fix things at that level. And so the operating system is like 'Hey, no, we got this for you. We're trying to save you from yourself, OK?'" (Dieter. Interview. Conducted by Aubrey Slaughter, 2 Sep 2018)

What does a magical approach towards the infrastructural unknown entail, and how is this related to Alice's insistence on the need for ethics in magic? In each of the stories above, the sorcerer's apprentice is empowered to act through magical means, but is not *necessarily* empowered to control or curtail their actions. This is an important lesson, and a central facet of what it means to use a magical approach

towards infrastructure. Both elemental and technical systems are vast and complex, occult infrastructures in their relation to the human. When we conceive of infrastructure and our relations to it, we also conceive of ways to act through it; we imagine ways in which an infrastructure could be put to use. These imagined uses are often predictive, and anticipate a functional rather than hyperfunctional infrastructure. While users of infrastructure imagine what a given system *should* do, and how it *should* work, may radically differ from how an infrastructural system actually functions.

None of the practitioners discussed above meant to curse themselves. While each used magic to pursue their own goals, none of them intended to make their own life less pleasant. Yet in each case the interviewee describes a definite failure, a hyperfunctional back-firing brought about by their own designs. It is unlikely that they would have pursued such a course if they knew what would happen, so it is fairly safe to assume that they did not know that things could go awry in such a fashion. But given the complex and hidden nature of the infrastructures at play, how could they have known? In the beginning of this chapter, magic was described as the ability "To make yourself aware of all of the pipes" (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). An excellent aim, certainly, but a practical impossibility when one considers the scale of the 'pipes' in play. While ethically speaking "We are responsible for everything we do, and you can't separate yourself from the consequences of your acts", such consequences are often difficult to predict, or indeed even conceptualize (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). These systems are vast and complex, and understanding how different parts of an infrastructure connect is very difficult.

We need to be aware that our actions in regards to infrastructure have consequences, but in a relatively complex and hidden infrastructure, we cannot know what those consequences may be. Some of these consequences may be delayed or distant, while others are quick and close, but none can be assumed with surety. In the cases discussed above, the consequences descended upon the practitioners themselves. Seen in this light, the Wiccan rede "Do what you will, so long as it harms none" is less an ethical stance against causing harm to others, and more a cautionary warning about the potential for harming oneself (Harrow, 1985). Be careful not to burn yourself when playing with fire, the interviewees appear to suggest. But what does this magical approach towards occulted systems reveal about the dynamics between humans and their infrastructure? Primarily, that these infrastructures are indeterminate in their relation to the human, and should be understood as such by their users. Or rather, infrastructures are indeterminate from

the user's particular and relationally contextual perspective; there is always a friend, an expert, or an Egyptian who understands matters more completely.

Thus far a magical approach towards infrastructure emerges as a relationship with the following dimensions. First, that recognition of and connection to infrastructural systems is a highly contextual and situated affair; magical approaches aid users in these acts of infrastructural recognition and connection through allowing them to conceptualize their relation to said systems. Second, that infrastructures are powerful and relatively indeterminate in their relation to the human; while we may imagine how our infrastructural interactions will play out, the hidden complexities endemic to infrastructures ensure that we are never sure. Each of these dimensions addresses how the use of magical approaches towards infrastructure helps humans to conceptualize how they relate to infrastructural systems, and examines how activity is informed and inflected by these conceptions of infrastructure. But magic as a technology for conceptualizing how one relates to infrastructure is not limited to informing users what is required to achieve an infrastructural connection, or warning about the indeterminate power of such systems. Rather, the magical approach towards the occult tells us to make predictions, and to act on the predictions that we make, but to be ready to reassess should our predictions fail.

As Above...

So far we have discussed how magic works as a technology for relating to infrastructures that are, by dint of scale, complexity, or invisibility, relatively occult in relation to the human. Magic aids it's practitioners by providing a framework through which through which infrastructural connections and their uses can be conceptualized. In this manner, a cautious, contextual, and perspectivally situated relationship to an otherwise occult infrastructure becomes possible. I argue that magic is a technology for relating to occult systems, and that it does so by encouraging magical practitioners to eschew examining hidden materiality in order to focus on heuristic relationality. What an infrastructure is composed of is important, to the composers of infrastructure; it is less of a concern for users of infrastructure, who are more interested in what the infrastructure is to them, than they are in the infrastructure *qua* infrastructure. The same can be said of many technologies; whether one relates to cars as a vehicle or as a hazard says much more about their relation to cars than any fine-grained empirical analysis of the car in question ever could. Much as how infrastructural inversion highlights the materiality of infrastructure by foregrounding the role of relationality and perspective, the magical approach towards infrastructure offers an inversion of its

own. What dimensions of infrastructure emerge when we do not simply focus on relationality over materiality, but instead remove materiality from the equation altogether? Simply put, what is magical practice in relation to infrastructural practice?

Magical practice is the art of rendering occult infrastructures relatable to the human, for the purposes of managing the infrastructure in relation to the human, and managing the human in relation to the infrastructure. Magic is an attempt to create an interface for occult infrastructures; a notional and creative imaginative interface that is nevertheless the best option available when dealing with infrastructural systems, or phenomena that exhibit infrastructural systematicity in relation to the human. This, arguably speaking, has been an aim of magical practice since antiquity. What are these systems to us, and, perhaps more importantly, what are we to these systems? These are important questions when dealing with technical infrastructures such as email and the internet, but they are altogether more pressing when the answers are germane to questions of life, death, and beyond. There are a number of different practices within the diversity of magical traditions aimed at understanding the role of humans in divine, cosmic, or elemental systems. Even among the rather limited set of magical practitioners interviewed for this project, heterodoxy appears to be the norm; practitioners nominally working within the same tradition may have very different views on how these systems work. But, while their final conceptions of these systems may differ, the process through which these conceptions are formed appears to be similar.

The magical approach towards the occult appears to consist of successive iterations of the following five steps. First, one must widen their stance towards the occult, and allow for space for the positing of alternate systems to explain perceived connections between otherwise disparate phenomena. Second, deploy the Hermetic logic of 'As Above, So Below' to find a microcosm that analogously reflects one's relation to the occult. Third, interpolate this microcosm onto the occult as a heuristic for orienting action in relation to the occult. Fourth, make predictions based upon this interpolated heuristic conception of the occult. In the last step, one's predictions either succeed to an effective degree, or they fail to do so.

If your predictions prove effective, then nothing else need be done; you have achieved an effective relation to the occult system, and may proceed with whatever actions the system subtends. If, on the other hand, your predictions fail to prove effective, this is no cause for despair. In the following discussion I theorize as to how this cycle can be understood as part of a progressive and cost-effective approach towards occult systems in a general sense.

Chapter 4: Automated Quantitative Data

Overview

The previous chapters argue that magic can be an effective method for relating towards the infrastructurally occult in a technical context. This chapter is intended to demonstrate that discussions of magic occur within the student data relatively more often than in the control corpora, and to examine any connections or covariance between the use of terms within the testing corpora. The analysis in this chapter examines and compares three relevant corpora using EmPath, a deep-learning skip-gram network, which "learns associations between words and their context, providing a model of connotation" (Fast et al, 2016). Using EmPath, words are caught in a neural embedding in order to learn association between the words and the contexts in which they are used. Once a corpus has been processed through EmPath, the analyzed text is broken down into two hundred categories, ranging from achievement to zest. Each of these categories is scored; a high score indicates that this category is more present within the corpus relative to the total text of the corpus.

The goals for this chapter are modest. Little of this analysis is statistically significant, but much of it substantially suggestive. The purpose is to illustrate how these corpora overlap, while investigating my hypothesis that discussion of and issues with occultation occur within both the student and magical literatures more than they do in general English-language texts. With that in mind, I make three claims in regards to this data. At the most basic level, I show that the three corpora being analyzed are related to each other. I demonstrate that discussions of magic and other related phenomena occur more in two of these corpora under analysis than they do in a general control corpora. I close this chapter by discussing interesting connections between corpora, with particular attention paid to the role of secrets, order, and magic within informatical and magical literatures.

Data and Model

The data used in this analysis consists of three textual corpora, collected and constructed for the purposes of this project, as well as a fourth control corpus, sourced to act as a general baseline against which the other corpora may be measured. Through the use of EmPath, these corpora are rendered into 200 scored categories and made amenable to comparative analysis. Each of the three experimental corpora relative rates of use of

each category are then compared, and instances where the corpora categories covary at more than one standard deviation from the mean are examined.

Corpuses and Analysis

This project makes use of five corpora, four experimental and constructed for the purposes of this project, and one sourced from the digital humanities to serve as a control, or baseline for comparison. The corpus I selected as a control is the Open American National Corpus, or OANC. This large, contemporary, and richly annotated corpora represents a wide range of genres, from transcripts of switchboard operator conversations and 911 reports to biomedical journal articles and governmental web standards. It is an eclectic but suitably broad collection that runs some 15 million words, and after proper normalization of the data provides a perfectly reasonable approximation of contemporary parlance. Though OANC is not as capacious as its predecessor, the British National Corpus, the OANC is more suited for comparisons to texts in American English. The Corpus of Contemporary American English was also considered as a possible control corpus, but the OANC's logistical and financial accessibility proved it to be a superior corpus for the purposes of this project.

The first experimental corpus consists of student responses to prompts in an Informatics course I taught in Spring Quarter, 2019. I will refer to this corpus as ICS3 for the rest of this document. The ICS3 corpus consists of approximately 100,000 words, with around 100 students writing roughly 100 word assignments, ten times over the quarter. These 100,000 words were written in response to prompts, given by me as a part of the course, and as such are necessarily biased towards the topics I prompted and the concepts discussed in the course. This is neither unfortunate, nor unexpected; the content of their responses is due in large part to the context in which they were formed, for which I was responsible. That said, this automated qualitative approach does not engage in the content of the student responses, per se. Rather, we are interested in the manner in which the content was discussed, the terms being used, and the sentiments expressed.

The second experimental corpus, which I refer to as INFORM, is a large set of texts that is intended to represent a legacy of questions about the workings of hardware and software, from the heady days of BBS's to more contemporary questions about word processors. More specifically, this corpus is comprised of the following elements: a collection of texts from BBS's on running a BBS, a collection of texts from BBS's on computing in general, a collection of texts from BBS's on programming in general, the entirety of the Microsoft Word help forum (2005-2018), and all written text within the StackExchange forums (2016-2019). I intend to use the INFORM corpus as a sort of

bellwether for discourse about computational systems in both the near past and the contemporary. That is to say, I intend to use the INFORM corpus to reflect professional and amateur attitudes in relation to technical systems. As with the ICS3 and OANC corpora the INFORM corpus is also an English language corpus. While more specific in scope than the OANC corpus and more general than the ICS3 corpus, the INFORM corpus is intended to reflect mainstream approaches towards technology and the various issues to which they give rise.

The third experimental corpus in use is the Occult corpus, designated OCC, and contains a veritable cavalcade of grimoires, spell books, arcane treatises, and other occult texts. More specifically, it contains the samples from the following magical traditions: alchemical texts, grimoires, general esoterica, kabbalah, mystic texts, Ordis Templi Orientis philosophy, pagan and neo-pagan writings, and theosophy.

To compare all copora, I created three textual datasets divided proportionally between texts from the informatical corpus, texts from the occult corpus, and the entirety of the student survey responses. Taken together these corpora contain more than 100 million words in total across roughly fifteen thousand documents.

Next I selected a control corpus of English language text, the OANC, to act as a baseline against which the other corpora can be compared. I then ran the EmPath tool over the documents in both the test corpora and the control corpus, recorded their category word counts, then used these counts to compute Pearson correlations between all shared categories, as well as aggregate overall correlations. Pearson's r measures the linear correlation between two variables, and returns a value between (-1,1), where 1 is a total positive correlation, 0 is no correlation, and 1 is total negative correlation. In this analysis, these correlations speak to how well the OANC is suited to act as a control or baseline for the comparison of the test corpora.

As a control corpora, the OANC shares Pearson correlations with the testing corpora ranging from a moderate positive correlation in the cases of the INFORM and ICS corpora (at correlations of 0.67 and 0.55, respectively) to a weak positive correlation with the OCC corpus (at a correlation of 0.49). These scores indicate that the control and testing corpuses are positively correlated, making the OANC a suitable control for the corpora being tested. In all three of these cases the p-value for each pair was less than .00001. This indicates that the null hypothesis, that these corpora have no relation, can be safely rejected.

Once the positive correlation between the control corpora of the OANC and the testing corpora was found, I began analysis of the results of running the EmPath tool over

each respective corpus. EmPath produces outputs in a decimal form, representing the proportion of times a particular category of terms was used over the entire text. For example, if there was one instance in a text that contained a term related to the EmPath category of 'joy', and the entire text consisted of 100 words, then the EmPath tool would produce an output of 'joy: 0.01'. This is the proportion of the text that contained terms related to the EmPath category of 'joy'.

The outputs from running EmPath on the testing corpora were then transformed into percentages of the output of running EmPath on the control corpora. For an example, if the testing corpora returned a result for the category of 'joy' of 0.01, indicating that one out of a hundred terms fit within the category of 'joy', and the control corpora returned a result of 0.02 for the same category, then the testing corpora features terms that fit within the category of joy half as often as the control corpora, or 0.5. This process was carried out for each testing category, rendering the results of the EmPath tool into a database of the use of each EmPath category in the testing corpora, proportionally relative to the use of the same category of terms within the control corpora. This reduces the impact that the relatively dissimilar quantities of text in each corpora has upon the ensuing analysis by ensuring that each measure is made proportional to the same control corpora. Though the ensuing dataset is non-normal in its distribution, the use of a power transformation with a Box-Cox parameter of -0.04 allows for normalization of the data within a maximum correlation to a normal curve of 0.998; i.e. normal enough to proceed with analysis.

I have opted to analyze the ensuing data in terms of standard deviations from the mean in order to understand how each testing corpus proportionally covaries from the control corpora in their use of terms ascribed to categories through EmPath. This serves two main purposes. First, it serves to normalize the difference in quantity of text between the testing corpora, and between the testing corpora and the control corpus. Second, examining standard deviation from the mean in terms of a proportion of the control ensures that the relationality of the corpora remains central to this analysis. Or, in other words, doing so allows me to see not only whether the testing corpora discusses a particular topic more or less than the control, but also to assess whether or not they discuss the topic more or less than the control as a proportion of their total text.

Results

The results of this analysis are not conclusive, nor were they hypothesized to be so. The purpose of this analysis is not to claim that there is a statistically significant connection between the proportional rate that each corpora utilizes a particular category of terms, but rather to indicate that similar discourses exist within each corpus, and do so at rates that are suggestive, but not demonstrative, of an orientation towards the occult.

For the first pass at the results we will focus on EmPath categories wherein the testing corpora used said category at proportions that were greater than two standard deviations from the mean. As you can see in Appendix D., much of these results are just as one would expect. The students in a computer course discuss computers and social networking more often than the sources in the control corpus, and the occult authors discuss subjects that fit within the categories of magic and the divine more often. By and large, these results are neither novel nor interesting, but there are a few elements which call for further attention.

In the case of the student responses, most of the categories are directly related to their course work. The categories of 'programming' and 'technology', 'tools' and 'work' all make sense within the context. There is, however, one category which stands out as different from the rest: the category of 'deception'. Students used terms associated with EmPath's category of 'deception' more than one and a half times more than sources in the control corpus. This is both interesting and suggestive; why would students discussing their relations towards infrastructure and its adjacent technologies do so in terms of deceit and trickery?

Unfortunately, the results for the categories of 'secret' and 'order', detailed in Appendix D., are the only results for which I have strong evidence to back up interpretations. The results detailed there are only those categories for which the testing corporara scored at proportional rates that were two standard deviations above the mean, or a five percent margin of error. The results discussed in the following paragraphs contain both significantly higher margins of error, but even without a guarantee of accuracy they may still help us to better understand the phenomena in question.

The results of the testing corpora of ICS3, INFORM, and OCC, did not converge in the proportional use of any particular category in a statistically significant manner. This is unsurprising; while the corpora may be related, they are rather dissimilar. A topic that occult authors may be very interested in may not even be a subject for discussion in the other corpora, and vice versa. That said, while there are no categories of terms which all three testing corpora use at a similar rate relative to the control corpus, there are two categories for which there is a degree of convergence: the categories of 'secret' and 'order'.

This is, once again, not a statistically significant result. While the occult corpus did discuss secrets at a statistically significant proportional rate, roughly 160% more often than in the control corpus, the students only discussed secrets 30% more often, and the informatical corpus around 50% more than the control. The results for the EmPath category of 'order' were slightly closer, with both the student corpus and the occult corpus

using those terms 35% more often than in the control, with the informatical corpus using 'order' related terms 15% more often than in the control. Though in neither case can we claim that this is evidence of a statistically significant relation between the three corpora, these are the only EmPath categories for which the proportional rates of use between the testing corpora positively co-vary. That is to say, these are the only two topics which all three testing corpora talk about more than we would expect, in comparison to the control corpora.

In order to unpack these results, we must first unpack the categories from which they sprung. A complete list of every EmPath training set can be found in Appendix C. Through examining the terms that constitute these categories we can ascertain that, for instance, the category of 'order' relates to ordered commands, and not food orders. A similar examination of the category of 'secret' reveals that these are not just any secrets, but dark secrets; or rather, both 'dark_secret' and 'dark_secrets'.

While 'order' and 'secret' are the only two EmPath categories where all three testing corpora positively covary in their proportional use of the category's terms, there are a plethora of instances wherein the two of the three testing corpora positively co-vary in their proportional use of categorized terms. In Appendix D. you can see the instances wherein the ICS3, OCCULT, and INFORM corpora positively co-vary in their proportional use of EmPath-categorized terms, along with the proportional rates of use for each term within the all three testing corpora.

Comparing the proportional rates of use of each EmPath category's terms within the ICS3 and INFORM corpus, in Appendix D., does not provide particularly surprising results. As it turns out, the student discussions of technology and discussions of technology in a more general sense have a common factor; namely, technology. Both the ICS3 and INFORM corpora discuss social networking and messaging at similar rates, and covary reasonably closely in regards to topics such as phones, computers, and the internet. The comparison between the INFORM and OCC corpora is slightly more interesting, but scarcely more informative. Other than the two categories where all three testing corpora positively co-vary, 'order' and 'secret', there are no other instances wherein the occult corpus and the informatical corpus positively covary in their use of terms categorized by EmPath. There are numerous instances wherein the occult and informatical corpora negatively covary, or talk less about a certain topic than one might predict from looking at the control: the categories of 'sports' and 'banking' are particularly strong examples of two subjects not often discussed by either techies or magicians. But a shared antipathy towards football and stock brokers is hardly evidence of a conclusive relation.

While the results of the analysis thus confirms much of what one might expect, given the corpora in question, the comparison of the proportional rate of use of categorized terms within the ICS3 and OCC corpora is rather more illuminating. The ICS3 and OCC corpora positively co-vary in their proportional use of categorized terms across a broad range of categories, roughly a third of all of the categories that EmPath is designed to test for, and can be seen below in Appendix D. The covaraiance of proportional use between the emotional categories of 'hate' and 'love' are present, if not particularly pronounced, at roughly 35% and 70%, respectively. These strong emotions are more strongly related in their respective rates of use than less intense affects such as 'joy' or 'shame', which show a comparatively slight degree of covariance of use.

Of particular interest to this project is the covariance of the proportional rates of use of three EmPath categories: 'divine', 'magic', and 'legend'. Each of these categories are pre-built into EmPath, created through deep-learning skip-gram network and validated through human crowd-sourcing, and were in no way modified for the purposes of this project. A full listing of each category's seed terms can be found in Appendix C. The INFORM corpus had very low proportional rates for each of these categories, scoring -1.29 on 'divine', -0.72 on 'magic', and -1.17 on 'legend'. Each of these rates are quite low, with some proportionally lower than results from the control corpus. In the OCC corpus we find the situation reversed, much as one might expect, with scores of 1.85 on 'divine', 1.52 on 'magic', and 1.05 on 'legend'. It would be sensible to assume that the student corpus would receive scores for each category somewhere in between the results for the other two testing corpora, and that assumption is correct. It is interesting to note, however, that the scores for the student corpus are much closer to the scores of the occult corpus than those of the informatical corpus, with 1.06 on 'divine', 1.14 on 'magic', and 0.76 on 'legend'. The comparison can be seen below in Appendix D.

Once again, I do not claim that this positive covariance in the proportional use of terms related to magic is conclusive evidence. As these results all fall roughly one standard deviation from the mean, there is roughly a 34% chance that any one of these three results across three corpora could be due to chance. A 34% probability of any one of these results being erroneous is too much of a chance to take, certainly. These results are not conclusive of a definitive relation between the students and the occult authors in regards to their use of magical terms, and nor were they intended to be. What these results do indicate, however, is that discussions using these terms appear in both corpora, and do so at rates at rates higher than in a similar proportion of text in the control corpus.

Conclusion

The use of EmPath as an analytic tool has allowed for a broad-spectrum analysis of the testing corpora with an eye towards how their proportional use of categorized terms covaries in relation to a control corpus. Doing so has allowed us to confidently make the following, fairly modest, claims. First, that these corpora are similar enough for meaningful comparisons to be drawn between them. Second, that the students use terms related to the EmPath category of 'deception' far more often than the control corpus, roughly 160% proportionally speaking.

While I have strong evidence that the student-produced corpus used terms related to the EmPath category of 'deception' significantly more than the control corpus, there are also other results, less well supported, but still worth investigating. Of particular interest to this project are the two EmPath categories on which all three testing corpora positively covary, 'order' and 'secret', as well as elevated proportional use of terms related to the categories 'magic', 'legend', and 'divine' in the student data. Neither the model nor method chosen for this examination is designed for the sort of fine-grained analysis required to verifiably prove either of these more speculative results. Though they may not be accurate, they are certainly suggestive, and such qualitative suggestions are useful in our theoretical investigation of human relations towards the infrastructural occult.

Chapter 5: Discussion

It appears as though computer experts, informatics students, and magical practitioners are all invested in the secret order of things. Though the distant reading approach does not profess to prove any well-defined causational link between the corpora examined, my analysis illustrates the possibility of a shared interest in similar issues relating to human/infrastructural relations. Given the interviews and other data discussed above, this shared interest is fascinating but unsurprising; after all, what is an occult system but a secret order, an obscured arrangement? Both magic and science can be understood as quests for the secret order of things, disparate in their approaches but sympathetic in their aims. Both disciplines strive to make the occult appear more predictable relative to the human, but using different approaches; "Technology and science tries to narrow in and focus, but often loses sight of side effects and connectedness." (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018).I argue that magical practices enhance the predictability of the occult relative to the human not through the scientific practices of narrowing in and focusing on materiality, but rather by spiraling out and emphasizing relationality. I theorize that our relation towards occult systems can be understood not as a cycle, but rather an ever-widening gyre that, through successive moves and stages, allows us to conceptualize the occult in an effectively predictable manner.

Before we reach our destination, however, it might be instructive to remember how we got here in the first place. I began this project by examining the ways in which college informatics students describe and characterize the various information and technical infrastructures that subtend our everyday. I found that, in relation to the students, many of these infrastructures are understood to be occult. A thing, system, or entity can be understood as being occult relative to the human when said thing appears to produce visible or otherwise sensible effects through invisible or otherwise insensible means. Wi-Fi or the deep web are examples of technical systems that the students considered to be relatively occult, being as they produce sensible effects through insensible methods.

We interact differently with occult systems than we do non-occult systems. As the operations of the occult cannot be effectively examined, we must posit conceptions of the occult in order to give it the appearance of predictability. In my examination of the student data, I noticed that the more occult a given system was relative to the human, the more likely that the students were to conceive of the technical occult as an agential force or intentional entity; "I find myself more likely to talk to my computer and phone than the television or my rice cooker" (Research Data. *Week Nine Writing Assignment*. 30 Nov 2018). Students were unwilling to ascribe agency to brute tools such as a hammer, but were considerably more open to the possibility that more complex and occult technical forms might act in an agential manner.

Students had a number of strategies for dealing with the occult, and rendering it more predictable relative to the human. The primary tactic used to make the occult more relatable was to conceive of the occult using an analogical framework as a heuristic for exploring the intricacies of human/infrastructural relations. For the students, this often took the form of natural, architectural, and anthropic metaphors for the occult systems in question. Other scholars have deployed such an analogical frame, interpolating the form of more well-known microcosms onto the blank spaces of the macrocosmic occult. I have identified the work of the apocryphal Hermes Trismegestius and his formulation of the Hermetic maxim 'As Above, So Below' as a concise and effective encapsulation of this move, and argue that a similar logic can be seen at play in the works of Newton and Weiner, as well as our academic contemporaries. Such analogic conceptions of the occult allow for orientation of action in relation to the occult, but do not do so perfectly; these practices are cost-effective ways to use occult systems, not flawlessly accurate depictions of the occult.

If we want to know about human relations to fish, we talk to people for whom fish are a focus of their practice. Fisherfolk, marine biologists, and aquarium owners likely have a greater understanding of the relationship between humans and fish, and have more techniques and tactics for making that relationship predictable than their less ichthyology-

inclined counterparts. If we are interested in understanding our relationship to fish, we talk to people who have a relationship to fish. If we are interested in understanding our relation to the occult, however, we need to ensure that we talk to people for whom the occult is the focus of their practice. The magical practitioners interviewed in this project work with the occult, and by examining how they render the occult effectively predictable relative to the human in their magical practice, we can come to a better understanding of how humans relate to the occult in a general sense.

In my examination of the magical practitioners' interviews, I found that the interviewees tended to perform many of the same moves in their efforts to formulate a conception of the occult. First, they widen their stance towards the occult. If a phenomena cannot be rendered predictable through simple examination, then the possibility that these seemingly disparate phenomena are occultly connected must be considered. Second, a suitably analogical microcosm of the occult must be selected. I argue that this move can be best understood with reference to the Hermetic maxim 'As Above, So Below' wherein the macrocosm is understood as a reflection of the microcosm. Third, this microcosmic form, and its relations to the human, are interpolated onto the otherwise blank box of the occult, giving it a notional structural framework through which the occult can be effectively conceptualized. Fourth, practitioners make predictions of the occult based on these conceptions, and orient action in relation to the occult based upon these predictions. If the analogical conception of the occult system in question provides the practitioner with predictions that are accurate and effective enough for the current purpose, then this process comes to a halt. Once again, it is unlikely that their conception of the occult at this juncture is perfectly accurate, so their predictions based on these conceptions will also be imperfectly accurate. But if these predictions are good enough for their purposes, then the conception of the occult is also good enough, for its purposes in enhancing predictability. It is, however, often the case that the predictions produced by these conceptions of the occult are *not* good enough, and fail to effectively predict the appearance of phenomena. This is failure, the last step before we widen our stance to the occult, and begin the cycle again.

People have different stances towards the occult depending on how hidden or complex the occult is relative to their perspective, as well as their own personal need to predict the occult. As we saw in the student data, these stances may figure the occult as some variation on non-anthropic forces, hidden systems, or intentional agents. Several of the magical practitioners went one step further, and approached the occult as though it were its own phenomenal locus of experience, endowed with moral weight. I argue that the approaches towards the occult seen in the examined data can be understood in terms of what philosopher Daniel Dennett would refer to as stances towards entities. Dennet's stances can be understood as progressive levels of abstraction through which we can attempt to understand or predict the actions of a given entity. There are three levels of

abstraction, three stances aimed towards understanding and predicting otherwise occult entities that Dennet describes in his original formulation (Dennet, 1971).

The first of these stances, the physical stance, is simply our prediction of what an entity will do based upon physics, and the physical makeup of the thing in question. When I predict that rain will make me wet, or "When I predict that a stone released from my hand will fall to the ground, I am using the physical stance" (Dennett, 1971). This can be very useful when predicting fairly simple phenomena; just like a stone, a computer will also fall to the ground when dropped. But, simply knowing that computers are made out of metal and plastic does not allow me to predict what a computer can do. In regards to occult systems, which resist this sort of physical aspection, such a physical stance is tricky to maintain; when one's call 'drops', it does not fall to the ground in the same manner as a stone. Physical stances towards the occult are often accurate in their predictions, but such predictions are often of very limited use.

When the physical stance fails to provide predictive purchase, we can add another layer of abstraction and enter into what Dennet refers to as the design, or teleological, stance. In this stance, the physical rendering of a computer as an assemblage of plastic and metal no longer holds. Rather, the computer is what it does; namely, compute. That which is designed to act as a computer, is a computer. This teleological stance towards the occult is perhaps best exemplified by students who had a tool-use view of information technologies; i.e. "Wi-Fi is the tool that allows people to access the internet. The internet is the tool that allows people to access websites" (Research Data. *Week Three Writing Assignment.* 19 Oct 2018). Things are what they are designed to be, and their actions can be predicted based on what we surmise about the teleological end for which they are designed. This is, of course, only effective in relation to the occult insofar as we can determine the purpose for which the occult was designed. In instances where the purpose of the occult is obscured or lacks a relatively sensible design, such a teleological stance may prove ineffective.

Dennett's third stance adds another layer of abstraction in what is referred to as the intentional stance, wherein the "thing is treated as an agent of sorts, with beliefs and desires and enough rationality to do what it ought to do given those beliefs and desires" (Dennett, 2014). Dennet uses the example of a chess-playing computer program when describing the predictive utility of the intentional stance in relation to entities. One could, with enough time and effort, predict the next move of a chess-playing program by laboriously poring over each positive and negative charge within the circuit board of the computer, and through doing so eventually and exhaustively extrapolate out to predict what move the computer will make next. This would be taking a physical stance towards the chess-playing program, and while it would be highly accurate, it is hardly a cost-

effective or reasonable way in which to predict the next move of the chess-playing program. Dennett suggests that it is much more effective to "...just think of them as rational agents who want to win, and who know the rules and principles of chess and the positions of the pieces on the board" (Dennett, 1998). In other words, the entity is thought of as having certain desires and beliefs, and rationally acts to fulfill these desires based on their beliefs. This approach is applicable to a broad range of entities, but only insofar as it provides useful predictions; "Anything that is usefully and voluminously predictable from the intentional stance is, by definition, an intentional system" (Dennett, 2014). When things act agentially, relative to the human, it is effective to relate to them as agents, particularly for the purposes of prediction.

Dennett's original formulation of the physical, teleological, and intentional stance has been adopted and expanded upon by a number of scholars, including Czachesz's 2007 study of Christian canon and Auge's 2013 work on apotropaia. Two of these scholars in particular, Philip Robbins and Anthony I. Jack, have argued for the inclusion of what they refer to as the phenomenal stance (Robbins and Jack, 2006) . The phenomenal stance goes beyond the intentional stance, treating the entity in question not as a rational automata, but rather as "...a locus of experience…" which entails "...a kind of emotional sensitivity..." and "...involves regarding it as a potential target of moral concern" (Robbins and Jack, 2006). These are things which feel, in other words, and we ought to feel bad if we hurt their feelings; " if a being has phenomenal experience of any sort (i.e. if there is something that it is like to be that being), we are morally obliged to take that experience into consideration" (Robbins and Jack, 2006). Such a stance can be seen in technical cases such as "...there's this feeling that if I give it encouragement, perhaps it will not crash on me…" or magical in cases; "...what can you do to be worthy to the point where they want to communicate with you?"(Research Data). In each of these cases, the intention is to render the occult more predictable based not upon what an agent would rationally do given a certain set of beliefs and goals, but rather what a phenomenal locus of experience might feel about the situation, given our own experiences with and as a phenomenal locus of experience ourselves.

Our relations towards the occult can be understood in terms of Dennett's expanded typology of stances towards entities. When predictions based upon the physical stance fail, we widen our stance towards the occult, approaching it through successive stances until we arrive at a stance that provides us with a way to render the occult effectively predictable. We do not start off by viewing the occult as a phenomenal locus of experience, but, given a system of exceeding occultation and complexity, that is often where we end up. But, while it appears that we do proceed through Dennett's successive stances in our efforts to render the occult more predictable, Dennett speaks very little as to the process through which we leave the proceeding stance and arrive at a successive one.

I argue that we can understand the transformative moves required to transition between Dennett's stances towards entities with reference to the processes used by magical practitioners in formulating their conceptions of the occult. If, for example, our teleological stance towards the occult is failing to provide effectively accurate predictions, I would first need to widen my stance towards the occult, and consider the possibility that the occult may act more like an intentional agent than a mechanistic system. Then, I would need to ask myself, if this occult entity were an intentional agent, what sort of an agent would it be? The answers to this question generally follow the analogic form of 'As Above, So Below', and return results that speak to the relationality rather than the materiality of the occult, offering up microcosms through which occult macrocosms can be understood. Then, this microcosm is interpolated onto the macrocosmic occult, giving the practitioner a framework from which to make predictions. These predictions then either succeed, in which case all is copacetic, or they fail, requiring that the process begin again. But, since this process requires a widening of our stance to the occult at each successive iteration, it is not quite a cycle. While we may perform similar moves in each iteration, we do so from successively more abstract perspectives on the occult. Rather than a cycle, the journey of this process can be understood as a bounding path, spiraling out to encompass ever more of the occult.

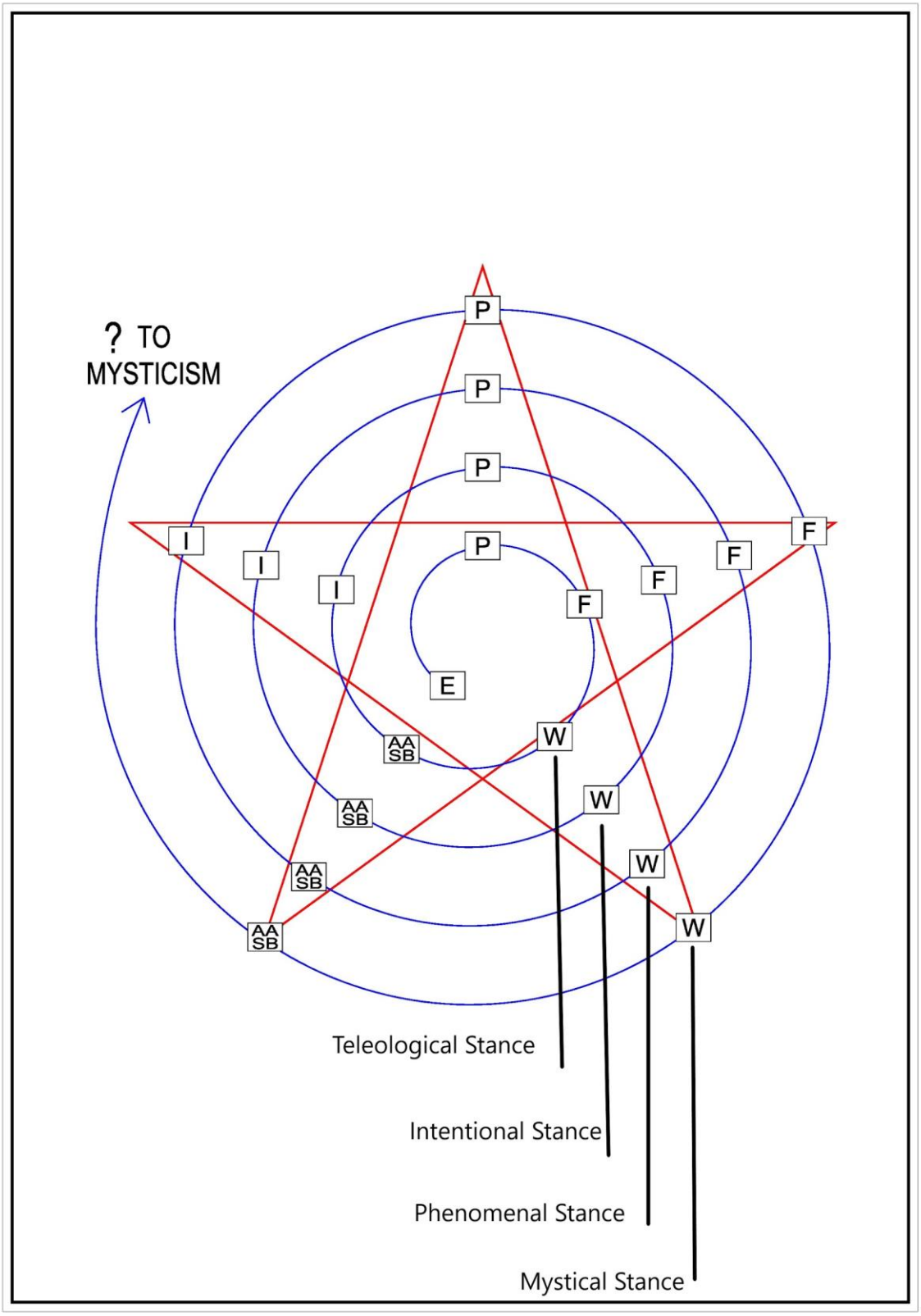
The process can be visualized as follows. You begin with an initial experience with a phenomena (E). Using the physical stance, you make your prediction as to how this phenomena could be replicated (P). If you are predicting that, say, ice will melt on a hot day, this would be an effective and accurate prediction from the physical stance. Attempting to predict more complicated and interesting behaviors using the physical stance often lead to failure (F). In the wake of this predictive failure predicated on the physical stance, we widen our stance on the occult (W), opening ourselves to the possibility that the initial experience was the result of an occult system, and not simply an inherent property of the experienced phenomena. As we cast around for alternate explanations, we ask ourselves 'What has the same relation to me, as I do to the occult?'; i.e. what is a microcosm I know of which reflects my current role in this occult macrocosm?

As we do so, something interesting occurs. Up until this point, we had been dealing strictly with what is perspectivally visible or sensible of the occult and its material components. There is, of course, much more to the occult than what one can see. But, in our deployment of 'As Above, So Below', we are bringing something into our conception of the occult from elsewhere, outside of the occult itself. We do so in order to come to better understand and conceive of the occult, yes, but upon interpolating the selected microcosm we have produced an admixture, consisting partially of what we know of the occult phenomena, and partially of how we believe said phenomena is produced. As we proceed down this path towards the higher levels of abstraction, our conception of the occult has

less to do with the occult itself, and more to do with the tools and techniques through which we form these conceptions. As we proceed through the stances, from the physical to the teleological to the intentional to the phenomenal, we are able to make progressively more expansive predictions with diminishing demands for data. In other words, taking progressively more abstract stances towards the occult allows one to do more, predictively speaking, with less, empirically speaking. In the phenomenal stance, for instance, you do not need to know whether or not the internal hardware of your computer would survive a nasty tumble onto the concrete. You simply know that you would not like a nasty tumble onto the concrete yourself, and so are able to effectively predict that your laptop would not 'like' it either.

The teleological, intentional, and phenomenal stances are agnostic as to the physical, technical, or structural makeup of the occult; these stances are not concerned with what the occult is, but rather what the occult is in relation to the human. By putting questions of materiality on the side, they are able to foreground relationality, ensuring an effective if not entirely accurate conception of the occult. The physical stance, for example, is very accurate in the predictions that it can make, but the predictions that it can make are not often useful or otherwise effective. As we proceed along, performing the moves that take us through progressively more abstract depictions of the occult, we are able to make more and more expansive and effective predictions of the occult, using less and less accurate depictions of the occult. In other words, we understand how we relate to the occult through conscious and practical misunderstandings of the occult's structure.

The following diagram (Fig. 1) visualizes the process of a cycle of moves that lead us to successively more abstract stances on the occult. In this diagram, the spiraling path represents our attempts to effectively predict the occult, represented by the star. Beginning with our initial experience with phenomena at (E), we make predictions (P), which fail to be effective (F), causing us to widen our stance towards the occult (W), find a microcosmic/macrocosmic analog (AASB), and interpolate the microcosm onto the occult macrocosm (I). We then form new predictions based on this framework, and the process begins again. But, as we widen our stance towards the occult each time, this is not a cycle, but rather a spiral; we may make the same moves, but in different and successive stances. As our stance widens and our path spirals out, our conception of the occult encompasses ever more of the occult, but intersects the occult ever more tangentially; note how in the diagram how the last pass of the spiral is only barely brushing the tips of the occult. This is meant to represent the decrease in accuracy of conceptions of the occult even as our conceptions of the occult become increasingly effective; an increase in effective relationality over accurate materiality.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AA
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Teleological Stance
Intentional Stance
Phenomenal Stance
Mystical Stance

Fig.1

But such a state cannot be maintained indefinitely. Let us assume that you have progressed along this spiral path, and have arrived at taking a phenomenal stance towards the occult. You find, to your dismay, that treating the occult as though it were a phenomenal locus of experience does not allow you to effectively predict the appearance of occult phenomena. So, you widen your stance towards the occult one final time, opening yourself up once again to the idea that things are a bit more complicated than they seem. When you then attempt to find an appropriate microcosm to interpolate onto the occult macrocosm, you run into a bit of an issue. So far, all of our predictions have failed. We know that treating the occult as a deterministic system, an intentional agent, or a phenomenal locus of experience is not an effective way in which to predict the appearance of occult phenomena. We can now assert that our relation to the occult is unlike our relation to other entities, and we are able to assert that a relation exists, but we are unable to effectively conceive of, describe, or predict the occult based on this information. We only know that, in relation to us, the occult is like nothing else we know of.

I would like to further extend Dennett's typology of predictive stances towards entities by arguing that this relation towards the occult constitutes a fifth stance, beyond the phenomenal stance. I refer to this approach towards the occult as the mystical stance. This stance is derived from three bases. First, that there is some relation to the occult, and that we are aware that there is a relation. Remember, as with infrastructure, the occult is a relational concept and only present where it is perceived as such. Second, that we know that we do not know how we are related to the occult; we are unable to make effective predictions as to the appearance of occult phenomena. And third, we hold that making the occult more predictable relative to the human is important to us. If these three things hold true, then we have entered into a mystical stance on the occult.

Though the mystical stance is not an effective means through which to render the occult more predictable relative to the human, it is nevertheless oriented towards that goal. If we know that we do not know, so to speak, we can predict that our predictions will be worthless. While in the mystical stance we may not know what the effects of our actions will be in relation to the occult, we are aware of that fact, and may take it into account. This, I would argue, is precisely what the students are doing when they invoke the term 'magic' in their descriptions of occult technical infrastructures. The only relation that they find analogous to their relations to the infrastructural occult is another system to which their relations are occult; namely, the mechanisms of magic. Saying something 'works like magic' is an admission that it works, yes, but that it works in a way that is as relatively explicable and predictable as magic. This does not mean that the technical occult *is* magic, but simply that the technical occult is as understandable in relation to me as magic is; the saying 'It's all Greek to me' does not state that a text is written in Greek, but rather that in relation to me, it may as well be.

The students invoke the term 'magic' to indicate when they have adopted the mystical stance towards the occult. Curiously enough, the magical practitioners interviewed did not make use of the mystical stance; all of their depictions of the occult operated off of an analogic framework that oriented their relations to the occult. I can offer two possible explanations for this finding. First, that the magical practitioners are practiced in their craft of relating to the occult. As relations to the occult are the focus of the interviewee's practices, they have put considerable time and thought as to how their conceptions of the occult can be most effectively constructed. These practitioners have also made use of technologies and techniques oriented towards enhancing the predictability of the occult in relation to the human. As such, they have considerably more material to draw from in their constructions of the occult, as well as guidelines for doing so effectively. In other words, magical practitioners were less likely to enter into the mystical stance because they are more likely to have crafted a conception of the occult that provides effective predictions in one of the proceeding stances. This leads me to my second point as to the efficacy of magical practice in relation to the occult. As the magical practitioners were involved in researching, considering, and testing their conceptions of the occult, they were aware that these conceptions are constructed, rather than discovered. Our relations to the occult are both contextual and perspectival, and may be different for different people in different settings. The magical practitioners interviewed appeared to be well aware that, as their relations to the occult are always already constructed, they could always have been constructed differently.

This project began with two research questions. First, I asked what these students mean when they invoke the term 'magic' in relation to occult systems. I argue that the use of the term 'magic' in this context indicates that the students have adopted a mystical stance towards the occult. Second, I asked how magical practices in relation to the occult are used in creating effectively predictable conceptions of the occult. In doing so, I found that magical practitioners are able to avoid adopting the predictively ineffective mystical stance through the construction of effective if inaccurate depictions of the occult. Through actively and consciously constructing their conceptions of the occult with an eye towards rendering it amenable to prediction, they have managed to successfully form workable infrastructural connections to systems that are arguably more occult than any technical infrastructure yet designed.

These findings suggest that the mystical stance is an ineffective stance to take in relation to the occult, as it offers little in the way of predictive power. They also suggest that, by being more creative and intentional in our construction of the occult, we can maintain a more effective stance in relation to the occult. While none of these stances are likely to give us a good understanding as to how the occult works in a technical sense,

through interpolating the appropriate analogic heuristic onto the occult we can construct a framework with which to predict and meaningfully orient action in relation to the occult. In being conscious of the act of constructing the occult, we are necessarily aware of the fact that our conception of the occult is constructed, and could always have been constructed differently. Understanding that our conception of the occult is constructed, and understanding how to construct such conceptions to provide effective predictions, is what the practice of magic has to teach us about our own relations to the occult, technical or otherwise.

Information infrastructures and other occult systems are not phenomenally approachable on an anthropic scale. The role of magic and magical practice in relation to information infrastructures is to allow us to more effectively form predictions about systems that resist aspection. Magic and magical practice can instruct users of infrastructure how to effectively if irrationally relate to information infrastructures for which they would otherwise lack both an agential role and an interface. Magical practice in relation to information infrastructures empowers the anthropic in relation to the occult, hypothesizing possible connections and assaying possible agents. In short, magical practice in relation to information infrastructures allows for its users to explore their relation to occult systems and agents by expanding the explicable; it allows them to explain more, because they have more to explain with. If a magical practitioner is able to effectively manage and render predictable an informatical infrastructure through approaching the system as a phenomenal entity, then that is an effective infrastructural relation.

Chapter 6: Conclusions

It is easy to misunderstand how systems work, particularly when they work regardless of your lack of understanding. I can use a system without knowing how it functions, as long as I know what to do in relation to said system. Though the infrastructure in question may be hidden by design, rendered transparent in use, or simply of non-anthropic scale and intensity, my relation to the infrastructural occult is phenomenal, and as such always already appears to the anthropic. That is to say, while my depiction of occult infrastructures are notional, creative constructions that are only tangential to reality, its basis is derived from experiential, flesh-and-blood interactions with the inflecting forces of the occult.

I examined and analyzed the responses that the students wrote to their assigned prompts, which were crafted to elicit descriptions of their relationships towards information infrastructures and their adjacent technologies. In doing so, I noticed an

interesting correlation between depictions of information infrastructures and technologies as occult, relative to the students, and depictions of said technologies as seemingly agential. The more occult a technical system was, relative to the student, the more agential said system appeared to act. This impacts the student relations towards these occulted technical systems; for example students were much more likely to talk to their cars, phones, or computers than they were to talk to hammers, rice cookers, or other similarly sensible mechanisms. These stories of infrastructural agency are not whimsical abrogations of rationality, but rather effective narrative frameworks which are oriented towards rendering these occult systems more anthropically approachable, relatable, and predictable.

Many of the students drew upon analogical depictions of magic in their attempts to relate to occult infrastructures. This is likely due in some part to my use of Clark's Third Law, that "Any sufficiently advanced technology is indistinguishable from magic", as a part of one of the prompts to which the students were required to respond. It could certainly be argued that the students would not have mentioned magic in their responses quite as often had I not chosen to make the intersection between magic and technology a required area of investigation. But this single mention of magic occurred in week five, midway through the course, and so is unlikely to be a determining factor in the fantastical depictions of infrastructure described by the students in weeks one through four. Furthermore, the students in question are not majoring in creative writing or anthropology, but rather computer science and informatics; two subjects which generally do not include courses on witchcraft and ritual. Though a description of the internet as 'working like magic' may be meant flippantly, I take such jokes very seriously; such forms of humorous dismissal are often a mask for very real anxieties related to the issue.

Though I am very serious about magical depictions of the infrastructural occult, the students are less than absolutist in their use of their depictions. Students recognize that technical information infrastructures and their adjacent technologies are not *really* magic; there are no fairies in the modem, no httpixies. Students recognize that technologies do not work *by* magic in an absolute technical sense, but they also recognize that some technologies work *like* magic, in a relative and phenomenal sense. In other words, they recognize that some technical systems are occult, and have identified magic as a legacy of tools, techniques, and tactics that has historically been used in fostering an effective relation to the occult. Technical information infrastructures are not magic, but they are occult, and the occult is what the practice of magic has specialized in for millennia. Students chanted invocations at Alexa, made propitiations to their laptops, and gave thanks and praise to The Cloud, through which all are saved. These instances cannot be chalked up to youthful ebullience, or dismissed as a contemporary staging of a Melanesian cargo cult, but

should instead be understood as a semi-serious attempt to fit these systems within an narrative framework oriented towards safe and effective use of the infrastructural occult.

My analysis of the student data situates occultation as a fundamental dimension to human/infrastructural relations, and magical practices as a method of managing the risk of indeterminacy in dealing with the occult. An effective infrastructure is necessarily occult to its users to some degree; otherwise it would not be a site of work, and not infrastructure. This occultation relative to the human also renders the infrastructure indeterminate relative to the human; the more occult a system is, the more indeterminate it becomes. That which is indeterminate is not amenable to prediction, and in order for infrastructures to be used effectively, it must be amenable to prediction. The students' use of magic was oriented towards a heuristic determination of the occult; if thinking of the technical occult through a magical frame allows the students to view the occult as more determinate in its inflecting influences upon the anthropic, then such a frame is useful for orienting action, *even if* it does so inaccurately. The students know that information infrastructures are not *really* magic, and that their infrastructural fantasies are not *really* true. But, if rendering the infrastructural occult through a magical frame is effective *in* reality, it hardly matters whether it is reflective *of* reality. Magic is not that which works without explanation; magic is that which allows us to work, without explanation.

Of the tools, techniques, and tactics that magical practice affords in relation to the occult, the concept of microcosmic/macrocosmic concordance, as put forth in the Hermetic axiom 'As Above, So Below', is perhaps the most influential. Alchemy, physics, and cybernetics have all made use of a similar analogic logic in their relation to their respective occults, whether these be the "occult forces" of gravitation, the "shrouded, hidden entity" of cybernetics, or the cosmic correspondences by which "all obscurity shall fly from you" (Newton, 1728; Najafi and Galison, 2003; Newton, n.d.). These three areas of inquiry have made good use of notional constructions of otherwise occult systems in order to render these systems more approachable and predictable. As with the students' fantastical renderings of information technologies, the trio of Hermes, Weiner, and Newton crafted notional systems that were analogous to the occult not in content or structure, but rather analogous in their relation to the anthropic; it is the relation to the occult that is analogous, and not the occult itself. Gravity is not an "occult force", though it does act like one in relation to the human, in the same sense that a man is not a mechanism, but can be rendered predictable via analogy to a homeostatic mechanism. Weiner is not claiming that men are machines, that 'Above *is* Below', but rather that men can be, to us, as machines are, to us; 'As (we understand our relation to the) Above, So (we can frame our relation to that) Below'.

These renderings of the occult are never perfectly accurate; any analogy is necessarily incomplete. This is neither unprecedented nor unanticipated. Speaking generally, this is not a matter for concern; we are always already performing analogical moves using correspondences that we know to be incomplete, but which are effective enough for our purposes. We are all inflected by the force of gravity prior to being informed as to the theory of gravitation; a child knows *that* things fall down long before they are taught *why* things fall down. Similarly, we learn to use infrastructure long before we learn to critically interrogate and investigate such systems. The process of learning how to use infrastructure is an exploratory one, heuristically oriented towards the recognition of patterns, concordances, and analogies that could be used to render the occult more determinate and predictable relative to the human.

Hermes, Newton, and Weiner all grappled with the occult in their respective bodies of work, and seized upon analogical reasoning as a way to render the occult effectively predictable relative to the human. Though these are perspicacious examples of relations towards the occult in their respective fields of inquiry, they are by no means the only such cases. It could be argued that both science and magic are, at their core, analogous in their approach towards the occult. Though one seeks to understand the occult in a relational and phenomenal sense, and the other in an objective and empirical sense, both magical practices and scientific practices are oriented towards rendering the otherwise anthropically occult amenable to human determination, or at least human understanding. Both modes of inquiry share a similar aim; it is any wonder that they also share similar tools, techniques, and tactics?

In my examination of magical practitioners and their associated practices, I focused on unpacking how magical practitioners conceptualize occult systems, and analyzed how these conceptualizations enabled them to more effectively predict, use, and live within environments subtended by occult infrastructures. Prerequisite to this process is an awareness of the occult, or a willingness to accept that an occult system may be responsible for our phenomenal experiences of inflecting and being inflected by occult forces. We must be, in other words, "aware of the pipes" and open to the prospect of a systematized occult (Alice. Interview. Conducted by Aubrey Slaughter, 27 Sep 2018). Once we establish that there may be an infra-structure, a structure below structure, it is possible to find analogies between our relation to the infrastructure in question and other structural forms that share a similar relational form in regards to the anthropic. These analogic forms are then interpolated into magical practice, informing and inflecting human relations to the infrastructural occult through heuristically orienting ourselves to the occult such that it appears more determinate relative to the human. How we envision the occult necessarily impacts how we relate to and make use of occult infrastructures, technical or otherwise. Based upon this analogical rendering of the occult, predictions can be made as to how,

when, and why we inflect and are inflected by such systems. Though these predictions are flawed, based as they are on necessarily incomplete analogies to otherwise occult infrastructures, they may still satisfice, and provide predictions of the occult that are effective for their purposes. If this is the case, then the magical practitioner in question has succeeded in forging an effective relationship with an occult infrastructure, and may now use said connection to the occult *as* infrastructure, rather than as a site of work. Such is the case for a number of the more experienced magical practitioners, who viewed a number of highly esoteric and complex practices as nigh-commonsensical and quotidian; infrastructural transparency at its most sublime. But not all predictions are prophecy; not all relations are effective. It is of course entirely possible that a prediction made in the magical mode lacks efficacy, and fails to provide predictive purchase. In such an instance, I have argued that magical practitioners once again widen their stance towards the occult, opening up to the possibility of intentional or even phenomenal agents, and begin the process anew.

This argument as to the role of magical practice in relation to the occult categorizes magic as a particular subset of a more general category of relations to the occult. This formulation of magic situates its practices as neither a nascent science nor as an over-active awareness, but rather claims that magical practices constitute one of a multitude of approaches towards the occult. In this sense, occultation as a dimension of human/infrastructural relations is prior not only to the exploratory practices of magic, science, and religion, but also prior to our conception of infrastructure. The occult is antecedent to the infrastructural; the first infrastructures, primal and cosmic systems of non-anthropic scale, were discovered and adapted to, not designed or built. Before fire subtended the act of cooking, it was wildfire; voracious, dangerous, and not amenable to careful examination by our primitive forebearers. First it was occult; only later infrastructural. Similarly, the intricate gravitational interplay between the stars, seasons, and the sun are not readily apparent, but have instead been uncovered a little at a time, piece by piece, over millennia. These are systems which, like gravity "really do exist", and do so regardless of whether or not we are aware of them (Newton, 1728). It is only through a process similar to the one outlined above, a series of magical moves oriented towards enhancing predictable patterns, that the occult is 'uncovered' as the infrastructure it has been all along. This otherwise occult infrastructure then becomes transparent in use, retaining an infrastructural dimension in relation to the human, while at the same time remantling itself as once again occult, in relation to the human. That which was occult becomes infrastructural, but that which is infrastructural becomes occult; As Above, So Below.

As a matter of practical concern, it is important to understand magical relations to the occult because they appear to inform our relations to the occult in a more general

sense. Magic is a ready resource for depictions of the occult, as magical practice centers around furnishing such depictions. A system which is said to operate 'like magic' tells us something of our interlocutor's relation to said system, but a system which is said to operate 'like a theurgic divination ritual' tells us considerably more. If the terminology and techniques of magical practice prove to be an effective way to concisely relate the character of human/infrastructural relations, then it is incumbent upon us to make productive use of this rich and storied legacy of inquiry and critical thought that is magical practice.

In the discussion, I theorized as to the process whereby magical practitioners come to an accord with the occult, and make the occult appear more predictable relative to the anthropic. I propose that we can understand our attempts to relate to the occult as a path along an ever widening gyre that, through repeated iterations of a series of magical moves, gradually shifts our stance towards the occult, in pursuit of greater predictive power in relation to the occult. This process takes us through Dennet's three stances towards entities (the physical, teleological, intentional stances), towards the phenomenal stance proposed by Robbins and Jack (2006). As we progress through these stances towards the occult entity of infrastructure, we increase our predictive power in relation to the occult, but diminish in our capacity to accurately reconstruct the structural form of the occult. For example, thinking of an infrastructural system as a person with needs and desires may very well provide you with an efficient and cost-effective way in which to predict the infrastructural inflections of the occult, but such a narrative is unlikely to be an effective form of orientation in the case that the infrastructure undergoes rupture, and requires repair. Instances of repair require a retrenchment to the physical stance, but repair is not enough for sustainable human/infrastructural; care is also required (Jackson, 2014). Repair is a physical act, best conducted from the physical stance, but care is not corollary to repair. Rather, care is prior to repair; we repair that which we care about. If we feel pathos for a broken device, or feel as though it 'wants' to be fixed, then we are taking a phenomenal stance towards the infrastructural occult. The care and the repair of infrastructure both require different stances towards infrastructure, and encourage the sort of semi-serious tacking back and forth between magical and technical frameworks that the students deployed with such casual proficiency.

I theorize that our movements between stances in the magical mode of infrastructural inquiry can be sorted out into steps through which a notional structure of the occult human/infrastructural relation is formed, shaped, and put to the test. Through the interpolation of a less-occult system which shares an analogical concordance with the occult, magical practitioners are able to orient action and make relatively effective predictions in relation to the occult infrastructures that subtend their practices. As our stance towards the occult widens to accommodate intentional and phenomenal agents, it encapsulates ever more of our relation to the occult, while at the same time being informed

by the structure of the occult ever more tangentially. This is, generally speaking, not an issue, unless taking a phenomenal stance fails to provide predictive purchase. In such a case, I theorize as to the addition of a fifth stance towards occult entities; the mystical stance. Whereas in the intentional and phenomenal stance, in which a practitioner proceeds towards prediction through interpolation of analogous relational forms, in the mystical stance no such analogous relational form can be found. That is to say there is something, some system or entity that is occulted relative to the human, but which inflects our actions in a manner that is unlike anything else we have ever known. The mystical stance occurs when the Hermetic maxim 'As Above, So Below' breaks down and suffers rupture. This does provide a form of negative knowledge, in the sense that it informs practitioners that they are out of their depth; while the mystical stance does not enhance understanding of the occult, it does allow practitioners to know there are unknowns.

The mystical stance is not an effective way to orient action in relation to the occult. The magical practitioners interviewed were able to avoid assuming the mystical stance towards the occult in part due to the vast treasury of occult relations that makes up much of magical literature, the polyglottal renderings of the occult that constitute the core of magical practice. To put it simply, magical users are less likely to experience the occult as experientially novel and un-amenable to analogy because their respective magical traditions are rife with ready-to-hand relational analogies to the occult; the more relations you consider to be possible, the more likely one of those relations will prove effectively analogous for predictive purposes. In this sense, the core facility of magical practice entails this widening of interpretive scope, and a reassessment of what constitutes a relation between occult infrastructures and their humans. Relations, being a relational concept, are located where they are recognized, and magical practices are superlative tools for recognizing relations. As such, magical practice can be seen as a project antithetical to mysticism, and an attempt to avoid abrogation or rationality in the face of the otherwise insensible.

Above, I argue that we ought to incorporate magical terminology into technical parlance when it is effective to do so. Below, I argue that we always already do so, in our relation to the occult. But here, *in medias res*, I argue that, while the words may differ, both technical and magical literatures grapple with the occult.Through the use of neural-net processing and distant reading methods I examined the relative proportional rates of use of terms between the student data, an occult corpus, and an informatics corpus, using the Open American National Corpus as a baseline for comparison. In doing so, I demonstrate that discourses on the occult are more present within both technical and magical literatures than in the control corpus. Aside from this correlation, two other points of data are pertinent to this discussion. First, that the students discussed terms related to 'deception' at rates that were disproportionally high. Second, that the occult corpus and the

students corpus positively covary in their proportional use of terms related to 'order' and 'secret', and in no other category.

As stated prior, these results are intended to be illustrative and exploratory, not definitive and explanatory. They are, in other words, incomplete, and serve only as an exploratory heuristic for those seeking to uncover hidden correspondences. But, as I have argued above, that does not render these assays of literary infrastructure invalid, but merely imperfectly accurate. They serve as orienting elements, opening up lines of future research into, for example, the phenomenal affect of being deceived and delighted by emergent infrastructural inflections, or comparative studies of systemic secrets. They serve as indicators of immanence, computationally refactored from lived experience. They serve, primarily, as a reminder of the compossibility of the occult, and its compatibility in conjunction with both the technical and the magical. In doing so, the data derived from this distant read of these corpora invites you to make a magical move of your own, and open oneself up to the possibility of that there is an hidden systematicity in our relations to the occult, visible only through a computational phenomenology alien from our own. In this way, as well as others to be discussed below, neural networks and their adjacent technologies can be thought of as the cybernetic inheritors of magical tradition.

Mysterious VAEs[5]

Neural networks are computer systems modeled on the function of neurons in the brain. Where, historically, we have used metaphors of the most advanced technologies to describe the brain—hydraulic systems, chemical soups, circuits—we have now reached a point of Ouroboric feedback: the technologically deciphered brain becomes, itself, the foundation for novel technologies. These novel technologies create separate and separable distortions of the human world of perception.

Broadly, a neural pathway that gets used more gets stronger, whereas one that does not get much use becomes weaker. If, for example, you lived in a world that was exclusively different shades of blue, your neural pathways for detecting, differentiating, and discerning between different types of blue would be enhanced, whereas your ability to tell puce from mauve would be diminished. Neural networks work in a similar way: they 'learn' to detect patterns in data and, having done so, get better at detecting the patterns that they 'know.'

This sort of pattern detection is useful when you want to store a lot of data in a very small space, such as in image compression. Sending or storing large image files is costly, so these files are often compressed for transmission and storage. Many forms of image compression are lossy, in that they lose some nuance of the image in the compression

[5] This section of the dissertation is based in part on a forthcoming article co-authored by John Seberger and Aubrey Slaughter (Seberger and Slaughter, 2020).

process. One can think of a monochrome copy of a full-color image as a particularly lossy form of image compression; though color has been sacrificed, the monochrome image now takes up less than a third of the space than the full-spectrum original.

Of course, this kind of lossiness is a high price to pay for a little extra storage space. Most image compression tools use algorithmic processes to ensure that compression is as lossless as possible—that the human eye won't detect loss. Although continuous pigments are rendered a discontinuous pixel through this process, these image compression algorithms are designed so as to render the difference between the two nearly imperceptible, already flirting with the interstices of the seen and unseen.

Imagine I have handed you a picture of a human face. Asked, 'What's in the image?' you are likely to say, 'a face.' You are less likely to tell me that the picture consists of, say, 1024 pixels and subsequently list the hex color codes of each one. Humans and computers communicate what is seen differently. ('A face' is more human-readable than a description of a thousand or so pixels.) Like forests and trees, what is communicated signifies what is seen and unseen.

In this example, the list of each and every pixel's hex color code represents the (computer-oriented) lossless compression of the image. On the other hand, the (human-oriented) 'face' description is, to a computer, highly lossy. If you tell me that the picture is of a face, I and my computer are unlikely to perfectly reproduce the picture. But, because I have seen faces before, I know something of how they are structured—eyes, ears, nose, chin, cheeks, jaw, forehead—and can draw upon what I know of their structure when I imagine the image you describe. While I am unlikely to perfectly reproduce the face in the image you are looking at, I will be able to quickly and effectively approximate it.

This is roughly how autoencoding neural networks function—what is 'known' (e.g., the color blue, the structure of faces) informs the output. First, the autoencoder reads a set of images. Then, it attempts to find patterns in the images, regularized co-occurrences of structure in the data. These patterns are referred to as *latent structures*. (You can think of latent structures as rules or heuristics that the neural network has learned in the process of encoding the data. For illustration, the grammatical axiom "I before E, except after C" is an example of the latent structure of the English language. Like many of the rules of spelling, this structure is not to be found in the data itself, but is rather latent, and produced in the process of learning to 'encode' thoughts into English.)

As the autoencoder reads images, it learns to recognize the latent structures. The more latent structures it can recognize, the more rules that it has for understanding how images are structured, the more accurately the autoencoding neural network can 'draw' the image. But, just as with humans, neural networks do not have an infinite capacity for storing rules. You can perfectly describe a data set of n size using n rules, but this offers nothing in terms of compression; the set of rules could be larger than the data itself, and

you would be better off memorizing images pixel by pixel.[6] So, autoencoders need to use as few rules as possible to effectively compress an image, but need as many rules as possible in order to effectively decompress the image again. These rules, or latent structures, are representations of the data stored in what is referred to as *latent space*. The bigger the latent space is, dimensionally speaking, the more representations of the latent structure of the data we can store, and the more accurately we can decompress, decode, or 'draw' the initial data.

Each of these latent structures describes a dimension in which it is structurally possible for an image to emerge. Through a recombination of latent structures, the original image can be effectively decoded from its encoded representations, and 'redrawn.' As the rules about the data take up less space than the data itself, we are also able to store the data in a more compressed form, without excess loss.

These sorts of autoencoding neural networks are designed for image compression, and are excellent at effectively encoding an image, storing its latent structure, and then decoding these structures back into an image. What they cannot do, however, is generate new images based upon these latent structures, other configurations of lines and color that are not in the original image, but are structurally possible given what the system has learned of the latent structure. For that, a slight variation on the autoencoder principle is required.

Known as a variational autoencoders (VAEs), these neural networks work in a similar manner to autoencoding neural networks, in that they both decompose and encode input data into a set of lower-dimensional rules than it then uses to decode output data. The twist is that variational autoencoders do not encode data as latent *structures*, but rather as latent *variables*; clouds of probability rather than points of precision. While the latent spaces of autoencoders are striated and discontinuous, the latent spaces of variational autoencoders are smooth and continuous; the spaces between points of structuration are filled with potentially actualizable, structurally possible alternates which *could* have been encoded using the same rules as before.

If given a series of digits of ten handwritten digits from zero to nine, an autoencoding neural network will return a series of ten handwritten digits, from zero to nine. A variational autoencoding neural network, on the other hand, will generate every structurally possible variation of these ten handwritten digits, including digit-like glyphs that were not included in the original data. (See Figure 2.)

The unseen emerges from the seen. Variational autoencoding neural networks use the latent structures within images, in order to produce images that are latent within these structures—possible but not perceptible. In other words, variational autoencoders

[6] This is related to Ashby's Law of Requisite Variety. In order for a neural net to be perfectly accurate, the number of states it is capable of encoding in its latent space must be greater than or equal to the number of states being encoded. But neural nets offer real advantages for endeavors that do not require perfect accuracy.

generate the otherwise unseen, with reference to the otherwise unstructured; they regularize and structure, rendering visible the seeable unseen and normalizing the otherwise discontinuous. As computers come to see the world on behalf of their users, the world of the seen merges with the world of the unseen: the overlapping umwelts of the computer and the human—one prosthetic and the other organic—merge.

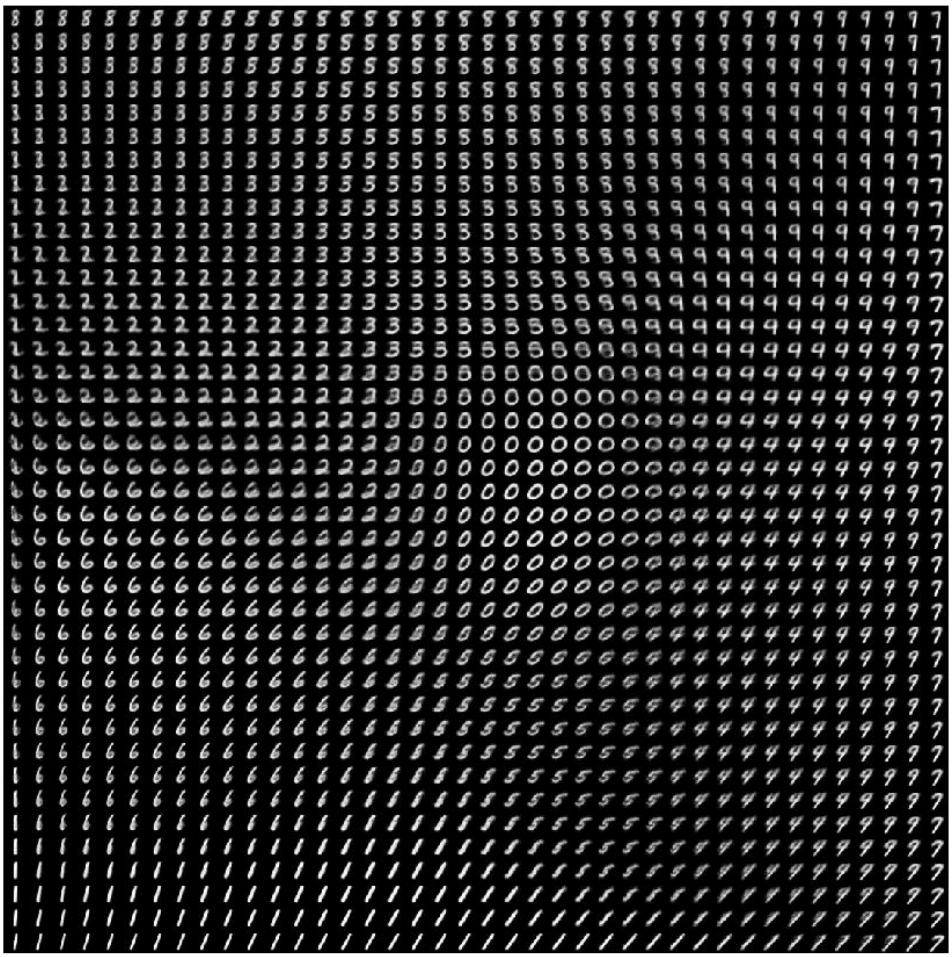

Fig 2. (Doersch, 2016)

In the case of VAEs, the computer constructs a visual world based on the inputs it receives. The overt construction of this world appears at the point of output—that which is seeable to the human eye—but it is not a construction solely intended for computational use: computer outputs become human inputs when the computer is placed in relation to a user. There is magic in the transformation from computer-output to human-input: in the form of synthetic images, predicated as they are on phenomenologically alien and inaccessible modes of prosthetic vision, we encounter the unseen: a world beyond the reach of human sensation and perception, but which is ultimately fed through the process of computational output into the human umwelt. The visual realm of the human umwelt becomes somewhat more magical through the seeing of the unseen (particularly if the seer does not understand how the seen is produced).

Magic can be understood as the art of occult aspection, a series of tools and techniques for discovering hidden interconnections, structures latent to the otherwise imperceptible. Though it could be argued that many of the more esoteric latent structures posited in magical traditions do not actually exist, this is less of a problem than it initially appears; "In general, we don't need to worry about ensuring that the latent structure exists. If such latent structure helps the model ...then the network will learn that structure at some layer" (Doersch, 2016). That is to say, it does not matter whether or not the latent structures that one has learned to recognize actually exist; what matters is whether or not learning these latent structures enables you to accurately and effectively 'encode' or understand the original data. Though these latent structures only exist insofar as they are useful, they are real in the sense that they inform and inflect our relations to the otherwise insensible. This is as true for people as is it for neural networks; to offer a computational twist on the Thomas theorem, 'If […computers…] define situations as real, they are real in their consequences' (Thomas & Thomas 1938, as cited in Hildebrandt, 2011).

As a practice of seeing the unseen, magic is predicated on hidden connections, occulted patterns, latent structures; seeing the unseen requires an unseen. In regards to neural networks, we have two forms of the unseen at play: first, in the otherwise unseen of the latent structure; second, the otherwise unseeable variants of said latent structures. The same might also be said of magic: that magical practices are oriented towards learning the latent structure of the otherwise occult in order to make effective use of said structures. Understanding how magic does what it does is no prerequisite in either case; "Comparisons between machine learning and magic are common even amongst experts and practitioners [….]. They work, but it is difficult to explain why or how" (Browne & Swift, 2018). In this sense, the latest advances in cognitive computation are a move inexorably towards a shamanism of the machine, a magical phenomenology based on fanciful but effective latent structures that we lack either the capacity or the sensorium to interrogate.

This project was completed during the COVID-19 pandemic, and the future trajectories of this research reflect that fact. The varied responses to the virus and its social effects has made it rather clear that one's relation to occulted systems of threat, such as disease, is as much political as it is personal. Understanding how people conceptualize the occult infrastructures of epidemiological spread is necessary for education purposes, yes, but it is equally important to investigate the intricate web of conspiratorial thought that postulated the pandemic as some sort of elaborate hoax. Pronoia and paranoia are not too terribly far apart; both agree on the concept of an outside agency, but disagree as to what that agent intends. In this project we have seen how many of the heuristics used by magical practitioners and neural networks can be considered adaptive, in that they improve our capacity to conceptualize the occult. But, as it is always possible to get lost when taking a shortcut, it is always possible that following a given heuristic may lead to maladaptive behaviors that foreshorten our capacity to conceptualize the occult. This, I would argue, leaves practitioners of maladaptive heuristics in a mystical stance towards the occult, a state which is rather vulnerable to authoritative appeals that offer a way out of the mystical muddle. It is simply easier to be told how to feel about your relation to the occult, than to attempt to unpack these relations yourself. This makes sense; if you have no tools with

which to orient yourself, being told which direction to go can be quite useful. But, with the proper set of tools with which one can effectively conceptualize the occult, self-orientation in relation to occult infrastructures becomes more feasible.

With this context in mind, the future trajectories for this research include examining the anthropic use of heuristics in infrastructural settings, demonstrating the capacity for magical practice in technical relations, and investigating the psycho-social informatics of occulted systems of threat. Human use of heuristics in their relations to infrastructure are effective because infrastructures are the instantiation of standards; a heuristic that is effective on this irruption of infrastructure will be effective on that infrastructural irruption as well. Neural nets use heuristics in a similar fashion, assuming that this data can be treated the same as that data. Further research into the role of heuristics in both minds and machines may allow for effective heuristics to not only emerge to interface occulted systems, but rather be designed to do so. A set of general rules for safely interfacing with occult infrastructures would go a long way towards tilting the balance of power towards the anthropic, and would likely be a useful demonstration as to the capacity for magical practice to aid in technical pursuits. Similarly, such an endeavor would be useful in unpacking how people relate to less sanguine occult systems, such as those of disease, disinformation, and state violence. If we can understand how people conceptualize of these adversarial infrastructural systems, we can better understand the heuristic shortcuts that are applied in context, as well as those reapplied across contexts. Unpacking anthropic relations to adversarial infrastructures, or infrastructures that subtend unwanted actions, may prove to be of more immediate relevance.

When we, as users, interact with this unseen realm, we become less residents of the seeable world than residents of the unseen. We abandon, however reluctantly or unknowingly, the world of the physical subject—the world of direct human experience, wherein 'that which appears' appears because it does so to us. In such abandonment, we become objectified subjects: subjects living in a world known through the lens of the computational object. This is a black magic, indeed….or, perhaps, it is simply magic, reflected in the black mirror of the phenomenologically occult.

Magical practice is useful in relation to infrastructural practice because it widens our latent space for the occult, and gives us more ways to conceive of the interconnections and agents that make up infrastructural systems. In relation to certain occult systems, such as elemental and cosmic infrastructures, this serves to enhance the predictability of such systems relative to the anthropic, and make them appear more determinate to humans. While magical practice may not directly enhance the predictability of technical informatical infrastructures, it does enhance our capacity to creatively construct models of the occult, technical or otherwise. This, I argue, is an invaluable contribution, especially given the proliferation of occult infrastructures in the contemporary, and our ongoing struggles to conceptualize this ever-widening web of relations

Can machines make magic? If they seek to form relations to the occult, then perhaps they must. As with humans, neural networks attempt to model the occult, creating notional

structures and heuristic rules in their search for patterns in the noise, latent structures yet unfigured and unseen. These rules, these latent structures, form the basis for the neural network's understanding of the data in question; the rules used to encode the data are the same as the rules used in the subsequent decoding. Though the processes are fundamentally different, the neural net's relation to the data remains constant: As Encoded Above, So Decoded Below. This set of rules, this knowledge of latent structures can then be applied to different contexts, allowing for one set of data to be encoded and decoded as if it were another, disparate dataset. This is, arguably speaking, reminiscent of the analogical interpolation at play within magical practice, in that it is primarily productive of an alternative interpretation of the computationally occult. In instances of decoding failure, the latent space of the neural net can be expanded to account for more extensive latent structures, and its stance 'widened' to accommodate more capacious and intricate models of the occult. After all, what is an intentional and phenomenal stance towards an entity if not an expansion of our latent space for the occult? In this way, it is possible to understand the 'magic' of neural networks, magical practice, and magical renditions of information infrastructures as being singularly similar methods for enhancing the efficacy of occult relations.

We have already taught neural networks magic tricks, legerdemain and slight-of-hand (Zaghi-Lara, R., et al., 2019.), but perhaps they always already have a magic of their own. If we understand magic as a relational and subjective attempt to formulate an effective relation to an otherwise occult infrastructures, then both humans and their neural net models are prodigious magicians. If we wish to understand how humans model relations to occult infrastructures, we could do worse than examining the models we have built of ourselves. Regardless whether you are man or machine, meat or metal, above or below, we all appear to plumb the unknown using ingenious devices of our own design in our attempts to model our infra-milieu.

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Appendices

Appendix A:

Informatics 3: Internet, Technology, and Society

Date: September 28 to December 7, 2018

Time: Monday, Wednesday, and Friday, 9:00 to 9:50 A.M.

Place: Information and Computer Science Building (ICS 174)

Course Website: https://canvas.eee.uci.edu/courses/12095

Instructor: Aubrey Slaughter Email: slaughtr@uci.edu Office Hours: TBD and by appointment Room: 2100 Calit2 Building (EVOKE Lab)	Teaching Assistant: Jina Hong (jinah4@uci.edu) Reader: Qingyang Li (qingyl6@uci.edu)

Course Description and Objectives

From the Department of Informatics website:

> "Examines current Internet technologies and social implications at the individual, group, and societal level. Blogs, wikis, sharing of video, photos, and music, e-commerce, social networking, gaming, and virtual environments. Issues include privacy, trust, identity, reputation, governance, copyright, and malicious behavior."

Upon satisfactory completion of this course, students should be able to:

- Identify critical information technologies and infrastructures in order evaluate current uses and extrapolate upon future uses;

- Describe contemporary social issues associated with information technology, including privacy and surveillance, politics and publics, and work and labor;

- Write critically about issues relating to personal technology use.

At the end of the quarter, you will have an opportunity to evaluate the course and indicate whether or not you think we have accomplished these goals. It would be particularly helpful to the instructor if you referenced specific in-class activities, readings, and assignments in your evaluation.

Assignments and Grading

My goal is to reward you for everything you do by including some credit toward your final grade for each part of the class you complete. That said, I encourage you to explore and read on your own when you find something that interests you, whether or not I've found a way to grade you for it.

An overview of the first three papers will be available during Week 2 on our course website.

Each of these papers will ask you to critically address an aspect of your own relationship to technology. Each are worth 10% of your final grade.

Every week of the course will have an associated response prompt. Students are expected to write a one hundred word minimum response to this prompt, which is due on midnight of that Friday.

We will review the final project in Week 5.

Grade Breakdown

Paper 1	10
Paper 2	10

Paper 3	10
Paper 4	10
Final Paper	20
Midterm Exam	15
Weekly Writing Response	15
Participation and Attendance	10

Resources and Materials

The website and other class materials are password-protected and intended for the exclusive use of students participating in ICS 3. Students may not forward or circulate any course materials outside of class without the instructor's express permission.

Disabilities

In accordance with campus-wide policies, students with documented permanent or temporary disabilities who require individual academic accommodations must contact the Disability Services Center (http://www.dsc.uci.edu) at 949-824-7494. Students should notify DSC at the start of the quarter so that appropriate accommodations can be arranged and coordinated with the instructor well in advance of course assignments and due dates. Please follow UC Irvine's procedures in this area to make sure you get the accommodations you need.

Compliance with UCI Code

This course, including its website and discussion sections, is for any interested eligible student who has met the prerequisites and is a community member in good standing at UC Irvine. Every kind of student is welcome in this class and can do well. Every student has a right to a productive learning environment — again, in person or online, in our weekly lectures, anywhere on campus or at any sanctioned school event. This

implies a corresponding responsibility that we all protect and maintain this space as one that promotes a specific function: learning about informatics. This class welcomes students of any gender identity, any sexual orientation, any national origin, any disability status, any political persuasion, any major, any fandom, any marital status, any military/veteran status, any documentation status, any class, caste, or clade. It should go without saying that as a university classroom we respect intellectual disagreements and diversity in our community, but sister campuses of the University of California have recently been sites of distracting, unhelpful, and sometimes violent conflict related to issues of campus climate. We cannot guarantee everyone's chance to learn without mutual respect. As a community, let's agree to hold ourselves to the highest standards of intellectual rigor and respectful comportment.

This class is covered by all official notices from UCI's Academic Senate Policy on Academic Integrity. Students are subject to all policies with regard to academic integrity whether or not these rules are reviewed in class or individually. Of particular note, the section on "Students' Responsibilities" states,

> All students are expected to complete a course in compliance with the Instructor's standards. No student shall engage in any activity involving any Academic Integrity Policy Violations. No student shall engage in any activity that involves attempting to receive a grade by means other than honest effort, and shall not aid another student who is attempting to do so. All students are encouraged to notify instructors, but may also notify the AIAO, about observed incidents of Academic Integrity Policy Violations. Instructors should take reasonable steps to preserve the confidentiality of students making such reports.

Instructors have responsibilities too. These include reviewing class policies and grading expectations in writing. I am also required to report all suspected incidences of academic dishonesty to the appropriate school authorities.

Please consult the official statement at
https://aisc.uci.edu/policies/academic-integrity/AcademicIntegrityPolicyApproved-04.23.15.pdf

Additional Class Policies

(1) This course focuses on analysis: this is a *read-think-write* class.

(2) With respect to personal conduct during class, each member of the class is expected to use his or her own judgment to determine how best to create, maintain, and preserve a respectful, studious, rigorous class environment conducive to this task. There are a lot of bodies in this room: please keep sounds, sights, and smells that will distract others out of the lecture hall. I despise rudeness in any form.

(3) Keep what happens in class private and special. Don't record anyone or take pictures without asking first.

(4) Bring questions about the readings to every class meeting. I will try to find ways to reward students who come up with good questions and comments.

(5) Please be courteous: silence your phone, come on time, and stay the whole class. Limit your trips out of the room during lecture, and don't distract other people with any non-academic doings.

(6) Please think carefully about your use of electronic devices. We will develop an Electronic Focus Policy on the first day of class via a caucus activity.

(7) We're going to communicate face-to-face, via email, and through the course site. This can get confusing very quickly. Please check your email at least once before each class for announcements.

(8) All written work for this course, unless otherwise specified, should be prepared as a .doc or .docx document and use a standard citation format (Chicago is preferred). Number pages and make sure your name appears prominently in a reasonable place. Always use course readings and peer-reviewed sources from your own independent research to support your analysis in papers. Don't guess how to format a citation correctly: look it up (https://owl.english.purdue.edu/owl/).

(9) You can read Wikipedia all you want and refer to quality sources you find there, but don't cite it unless you have a very good reason for doing so. Actually, just don't cite it at all.

(10) Backup all your work in case of technical difficulties. Disk errors, hungry dogs, and computer meltdowns threaten us every single day: that's just the world in which we live.

(11) You must complete all reading assignments. Every week, we will read and discuss several works of varying length. Keep up on your reading and written responses if you plan to pass this course.

Late Work

Late work will be accepted at the instructor's sole discretion. Late work will be graded down as appropriate. Assignments that are considerably late may not be accepted at all.

Readings

In order to cover the topic in the short time we have together, you will need to do quite a bit of reading, roughly 30 – 50 pages per week. Coming to class without having read the required text for the day drags down the discussion and makes the whole class boring. Take your time reading and rereading; consider the time you spend thinking about an idea time spent studying. I prefer strongly that you bring printed copies of the material so that we can closely read it and refer to specific sections of text.

Students are expected to review all assigned materials (listed below and on the course website) before class, and be prepared to summarize or comment on the assigned materials in class if called upon. All course materials are available via the course website.

I'm open to revising the quantity and quality of readings based on persuasive student input.

Course Calendar and Major Due Dates

Week	Date	Day	Topic	Activity	Assignment
1	Sept. 28	F	Introduction, Syllabus, Canvas	No reading	
2	Oct. 1	M	Course Overview	Carr, N. "Is Google making us stupid? What the internet is doing to our brains. The Atlantic." (2008).	
	Oct 3	W	Early History of the internet	Bush, Vannevar. "As we may think." *The atlantic monthly*176.1 (1945): 101-108.	
	Oct. 5	F	Retrospective, present day, looking forwards	Introna, L. D. (2006). Maintaining the reversibility of foldings: Making the ethics (politics) of information technology visible. Ethics and Information Technology, 9(1), 11–25.	

3	Oct. 8	M	What is infrastructure	Star, Susan Leigh. "The ethnography of infrastructure." American behavioral scientist 43.3 (1999): 377-391	
	Oct. 10	W	How are information infras built?	Snopes	
	Oct 12	F	Why are infras important?	Collier, S.J., Miss, C.M., von Schnitzler, A. (2016, July) Public Infrastructures / Infrastructural Publics. Limn 7. Retrieved from http://limn.it/preface-public-infrastructures-infrastructural-publics/ .	
4	Oct 15	M	What is privacy	Nissenbaum, Helen. "Privacy as contextual integrity." *Wash. L. Rev.* 79 (2004): 119.	
	Oct 17	W	Intro to surveillance	Solove, Daniel J. "I've got nothing to hide and other misunderstandings of privacy." *San Diego L. Rev.* 44 (2007): 745.	
	Oct 19	F	Sousveillance	First 4 pages of Marwick, Alice E., and Danah Boyd. "Understanding Privacy at the Margins." *International Journal of Communication* 12 (2018): 1157-1165.	Self Monitoring Assignment
5	Oct 22	M	Hacking: Hacktivism	Coleman, Gabriella. "Hackers [draft][# digitalkeywords]." *Culture Digitally* 6 (2014).	

	Oct 24	W	Hacking: Cyberwar	Langner, Ralph. "Stuxnet: Dissecting a cyberwarfare weapon." *IEEE Security & Privacy* 9.3 (2011): 49-51.	
	Oct 26	F	Hacking: Cybercrime	Mansfield-Devine, Steve. "The Ashley Madison affair." *Network Security* 2015.9 (2015): 8-16.	News Assignment
6	Oct 29	M	Social Media Overview	No reading	
	Oct 31	W	Memes and Virality	https://www.smithsonianmag.com/arts-culture/what-defines-a-meme-1904778/	
	Nov 2	F	Gaming and the Internet	Trammell, Aaron, and Aram Sinnreich. "Visualizing game studies: Materiality and sociality from chessboard to circuit board." (2013).	
7	Nov 5	M	Copyright	No Reading	
	Nov 7	W	Copyleft	Young, In Jeffrey, and Tim McCormick. "Digital history: A guide to gathering, preserving, and presenting the past on the web." (2006). Read "Owning the Past?"	
	Nov 9	F	User-Generated Content	Söderberg, J. (2002). Copyleft vs. Copyright: A Marxist Critique. First Monday, 7(3). doi:https://doi.org/10.5210/fm.v7i3.938	
8	Nov 12 NO CLASS	M	NO CLASS	No Reading	

	Nov 14	W	Political Economy Week: Digital Divide	Pew Pew	
	Nov 16	F	Politics of Search	Introna, Lucas D., and Helen Nissenbaum. "Shaping the Web: Why the politics of search engines matters." *The information society* 16.3 (2000): 169-185.	**Search Engine Assignment**
9	Nov 19	M	Actual Economy Week Overview	Read pages 2-6 Curran, James, Natalie Fenton, and Des Freedman. *Misunderstanding the internet*. Routledge, 2016. 4	
	Nov 21	**W**	Blockchain technology	Underwood, Sarah. "Blockchain beyond bitcoin." *Communications of the ACM* 59.11 (2016): 15-17.	
	Nov 23 NO CLASS	**F**	**NO CLASS**	**No Readings**	
10	Nov 26	**M**	**Speculative Futures: Dystopias**	**No Readings**	
	Nov 28	**W**	**Utopias**	Smallwood, Christine. "What Does the Internet Look Like?." *The Baffler* 2.1 [18 (2010): 8-12.	
	Nov 30	**F**	**Critical Analysis**	Pew	**Speculative Futures Assignment**
11	Dec 3	**M**	**Class Choice**	**TBD**	

	Dec 5	**W**	**TBD**	**TBD**	
	Dec 7	**F**	**TBD**	**TBD**	

Appendix B:

Programmatic Occult Interview Protocol Draft

Professional Questions

1. What is your profession?
2. What attracted you to your profession?
3. How would you describe your role within your profession?
4. What systems do you most commonly interact with in your profession?
5. What systems do you most meaningfully interact with in your profession?
6. In your profession, do you know anyone you consider to be more knowledgeable than yourself? If so, who are they, and what leads you to believe they are more knowledgeable? If not, how this impact your professional relationships?
7. Of the systems that you work with professionally, which do you believe are the easiest for a layperson to understand? Which systems would be most difficult to explain to a layperson? What makes each easy or difficult to understand?
8. Is there any aspect of your profession, such as the workings of a system or the relationship between systems, that you find impossible to fully understand? Or, to put it another way, what aspect of your profession still doesn't make sense to you? What works but shouldn't, or should work but doesn't, and is difficult to explain in either case?

9. Are there aspects of your profession that you feel compelled to hide from clients or end users? They say that "A little knowledge can be a dangerous thing." What is the smallest, most dangerous knowledge an end user could possess in your profession?

10. Do you do programming in your profession? If so, could you describe for me in your own words what programming is? Where does programming happen? What happens when a program is run?

11. Is there a particular culture surrounding your profession, or any relevant stereotypes related to your profession? If so, what are they, and how do they impact your professional work?

12. Does your profession have 'black boxes', i.e. systems or tools which you cannot see how they work, but which nevertheless produce useful results?

Practitioner Questions

1. What is your (occult) practice?

2. What attracted you to your practice?

3. How would you describe your role within your practice?

4. What systems do you most commonly interact with in your practice?

5. What systems do you most meaningfully interact with in your practice?

6. In your practice, do you know anyone you consider to be more knowledgeable than yourself? If so, who are they, and what leads you to believe they are more knowledgeable? If not, how this impact your relationships within the community of practice?

7. Of the systems that you work with in your practice, which do you believe are the easiest for a layperson to understand? Which systems would be most difficult to explain to a layperson? What makes each easy or difficult to understand?

8. Is there any aspect of your practice, such as the workings of a system or the relationship between systems, that you find impossible to fully understand? Or, to put it another way, what aspect of your practice still doesn't make sense to you? What works but shouldn't, or should work but doesn't, and is difficult to explain in either case?

9. Are there aspects of your practice that you feel compelled to hide from the non-initiated or neophytes? They say that "A little knowledge can be a dangerous thing." What is the smallest, most dangerous knowledge an neophyte could possess in your practice?

10. Do you do cast spells or ritual work in your practice? If so, could you describe for me in your own words what a spell or a ritual is? Where do spells and rituals happen? What is occurring when a spell or ritual is being performed?

11. Is there a particular culture surrounding your practice, or any relevant stereotypes related to your practice? If so, what are they, and how do they impact your personal practice?

12. Does your practice have 'black boxes', i.e. systems or tools which you cannot see how they work, but which nevertheless produce useful results?

Professional/Practitioner Questions

1. What overlap, if any, do you see between your profession and your practice? What are the parallels? What are the key differences? What, if anything, is notable or unexpected?

2. What links, if any, do you see between the arts of programming and spell or ritual work?

3. What skills would you look for in a programmer hoping to become a practitioner? What skills would you look for in a practitioner hoping to learn programming?

4. How would you describe programming to a practitioner? How would you describe your practice to a fellow programmer?

5. Do you believe that your professional knowledge aids in your practice? Do you believe that knowledge derived from your practice aids in your profession?

6. How do your professional social circles and your magical social circles interact?

7. Are there more programmers among practitioners, or more practitioners among programmers, than you might otherwise expect? If so, why? If not, why do you think this is the case?

8. In both your practice and your profession, is there anything which you simply have to accept as an article of faith?

9. How does your practice inform your understanding of the world? How does your profession inform the understanding of your world? How do your practice and profession inform each other?

10. Can you describe your practice in terms of infrastructure, i.e. interrelated systems connected through some sort of flow? Can you describe your professional activities in similar terms?

Appendix C:

EmPath Categories

Achievement

milestone scoreboard competitive renown surpass scoring winner winning score bravery pride achieve ranking exceptional unbeatable conquer ambition celebrate strive earn prize success excellence nominate outdo honored competition valiant proclaim congratulate ultimately accomplish competitor medal won epic victory deserving honor succeed worthy approval celebration trophy great talent cheering accomplished brag triumph defeat promotion honor gloat win conquest contender playoffchamp touchdown raise leading outstanding victorious greatness excellent champion successful proudly honorary award domination determination pageant challenge accomplishment triumphant determined praise promising acclaim congratulation nominee honorable tournament supremacy attain lifetime invincibility goal contest performance championship perseverance applaud coveted nomination celebratory achievement applause proud academic cheer compete ultimate reward opportunity scholarship

Affection

heartfelt fond closeness yearn openly infatuation grateful courtship
happiness devoted gentleness attraction sweet amorous
compassion indulge touching dearly kindness sentimental
camaraderie desirable tenderness delightful passionate friendliness
unrequited compassionate commitment yearning crave allure
expressive unconditional sentiment fascinated attracted
wholeheartedly passion fondly doting caring intimate adoration
innocence lovingly fondness empathy adored affection
cherish sweetness love flirtation delighted smitten
openness familial empathetic companionship reciprocate
cherished wonderful sincere loving affectionate fascination
appreciation admiration admire adore unconditionally feeling
devotion brotherly trusting exuberant mutual genuine
infatuated adoring elation amicable amiable sympathize
reverence meaningful intimacy endearing longing kinship

Aggression

cockiness infuriate violent kill lethal aggressive overconfident aggression
provocation spite territorial betray outrage masculinity murderous
hostility agitated intimidation livid snarl fearsome belittle
resentment feral brutality confront fearful predatory force
aggressor unfazed malice retaliation intensity demeaning
confrontational fear savage infuriated ruthless defend barbaric
volatile intimidated dominate outburst ferocious assertive
threatened endanger bravado defiance menacing strong
undermine hostile violence brutal audacity threat sadistic
hatred unrelenting belligerent insult ruthlessness angry intimidating
threatening brute fight overpower attack quash threaten ferocity
suppress cruelty warn maim hateful harshness rage intimidate
dangerous irate brazen temper vengeful aggressiveness anger
provoke contempt offend harsh authoritative meanness malicious
harass defiant angered brash bloodthirsty vicious furious
domineering resentful intent ruthlessly fierce animosity destructive
wildness seething deadly menace incite

Air_travel

taxi terminal board boarding crash tourist intercom flew turbulence
ticket passport security soar runway takeoff transport

southwest tarmac international booking arrival transportation
cockpit aircraft cab attendant luggage carrier aboard
journey destination depart touring flied disembark sightseeing
airfield jet conveyor altitude flying vacation checkpoint
overhead helicopter spaceship flight hotel landing landed pilot
fly itinerary suitcase arrive passenger departure stewardess
airplane hangar baggage travel airport trip shuttle gate
airline plane land overseas charter

Alcohol

drunken shot tequila ale booze cup gulp bourbon tonic fridge
drinking bar cooler cider addicted partying liquor potent sober
drunkenness alcohol keg champagne rum slur pub cork
stupor nightclub intoxicated drunk liqueur drinker patron
consumption binge underage heady beer drank gin jug intoxication
whisky bartender chardonnay tavern malt pour whiskey
poisoning fruity vodka thirsty alcoholic taste lightweight sobriety
concoction hangover clubbing bottled pint cellar cocktail
drink brandy addict slurred addiction beverage bottle
saloon scotch martini wine

Ancient

oriental lineage historic disrepair ceremonial antique old
generation portly elderly rusty graying medieval dilapidated
civilization ancestry excavate bronze etching weathered tomb
origin primitive antiquity construct western ancient
mythological historian heritage artifact regal decrepit
outdated prehistoric ancestral dusty historical carved pantheon
aged depict ancestor eccentric symbol statue tradition age
archaic

Anger

unbridled infuriate disinterest underlying contorted fear
exasperation aggression envy spite stubbornness disgust outrage
indignation indignant murderous hostility condemnation
suffering revulsion ruthlessness mistrust indescribable aggravation
overwhelm malice yearning intensity displeasure irritation
loathing irritability distaste disbelief infuriated distrust
scorn turmoil pained sneer impatience disdain enmity

disappointment hatred emotion madness defiance resentment
sneering cynicism unhappiness annoyance wrath jealousy
outright frustration ferocity dismay uncontrollable
suppress twinge cruelty hateful harshness rage bitterness
sadness spat unfairness unrelenting agitation fury flaring
shame aggressiveness anger anguish contempt loathe agony
meanness defiant angered pain mockery betrayal
frustrate seriousness unspeakable palpable animosity seething
scowl furious menace

Animal

antelope livestock camel fox rodent crocodile human pheasant
chicken snout giant crab furry cub slaughter ferret vulture
bear giraffe llama kitten feathered bat parrot grizzly hunt bunny
dinosaur bison mosquito breeder mammal grouse habitat
crow hare lion cattle flock savage snail pesky pet guinea feline
pigeon rattlesnake rhino toad baboon bird trout hairy kangaroo
herd chick goldfish pup wildlife tortoise cow ostrich wolf
ox raccoon octopus feed owl reptile chimp shark elk duck
boar ape sheep horse monkey alligator breed poodle frog prey
panda fish mutate squirrel bulldog hind chimpanzee tiger
wildcat rabbit bull coyote turtle pig bug penguin hoard fur
worm pellet lizard donkey dolphin deer rooster ant rat
quail beaver hound mouse lamb paw zoo rhinoceros animal elephant
goat moose rabies nest vicious beast rabid whale hawk terrier
snarling chasing dog gorilla mammoth skunk buffalo

Anonymity

anonymously discreet anonymous unseen disclose nameless elude
hotline anonymity unknown mysterious incriminate divulge
profile identity

Anticipation

unsettle feverishly yearn quake impending anticipation tantalizingly
nervous eager enthusiasm awareness nervousness anticipated
tantalizing unconsciously intensify relish thrill anxiously
anxious perspiration arouse aroused giddy alertness joy
pumping tremor throbbing restlessness uncertainty surge

steadily foreboding apprehensive visibly adrenalin impatience
agitation contentment wildly longing quickening excite
overwhelming yearning apprehension anticipate excitement
exhilaration prospect eagerness fevered quivering lust
suspense tremble eagerly elation quicken intensifies
flutter delight trepidation curiosity fervent readiness trembling
adrenaline dread jittery frenzy urgency

Appearance

cute taller athletic slimming flattering curly fancier attractive
pretty complexion scrawny wearing woman glamorous wavy
styled height impressive flashy stylish bulky brunette scruffy hair
elegant supermodel chubby trendy pale haircut petite
stunning attire boyish revealing voluptuous nerdy dashing outfit
shaggy flawless length figure striking refined decent spiky
stylishly quirky blonde tallest naturally hairdo gorgeous
sophisticated tan handsome plain appearance appealing dirty
stature similar hairstyle intimidating slim gothic dyed blond chic
edgy dress built fashionable bleached physique strikingly buff
skinned lanky description overweight stocky unattractive stunningly
short tanned average preppy curvy classy tall skinny fitted

Art

dance artwork contemporary ornate intricate creative enthusiast
coloring macabre refurbish exhibition song photography
watercolor historic styled shading decorating sculptor artist
architecture sketch art artistically collage creation discover
mural design portrait canvas designing learn illustration masterpiece
blending talent exhibit chalk singing create creativity paint
music woodwork painted poster gothic musician craft artsy
hobby painter decoration photograph admire decorate
monument sculpture decorative classic graffiti remodel tapestry
depict handmade textile animation picture draw literature
theatre decor collection soundtrack statue gallery mosaic pottery
color dancing musical artistic painting drawing
amazed

Attractive

alluring cute attractively athletic desirable breathtaking perfect
swoon sexiest sassy attractive masculine pleasing captivating
fantastic dreamy charmingly glamorous seductive
mesmerizing inviting hunk popular fascinating flatter supermodel
fabulous irresistible enticing appealing dimpled looking
attracted adore appeal adorable compliment revealing dashing
fantasize stylish sexy flawless tempting envious angelic
lovable marvelous hotter blonde charismatic classically hunky
dazzling gorgeous lovely chiseled pretty impress charming
feminine handsome toned photogenic admire stunning
charmer coolest beautiful provocative beautifully attract
dazzle breathtakingly physique strikingly hot luscious buff
beauty attractiveness fashionable enchanting curvy built tanned

Banking

money dollar financially rich treasury finance investor bank
resource heist banking employee financial funding profit
payday 300000 payroll monetary lucrative debt
industry millionaire banker expense allowance credit
saving revenue loan bankruptcy wealth accountant checkbook
worker fund wage paying account currency cash
compensation rent merchant tax debit accounting bankrupt
corporation agency investment afford earnings income pension
broker economy paid visa cheque payment euro salary
paycheck transaction rupee client deposit pay businessman

Beach

deck hurricane fishing cruise gulf lake resort swim lifeguard boating
tourist sunny ship coast dock seawater upstream pier sandy
harbor scenic seaside bay fisherman villa inland sea oceanic
sun sand paradise tanning shoreline lapping dune
surfer water coastline lifeboat island coral scuba horizon
swimming harbor seashore coastal landscape balmy lighthouse
tropical lakeside splash grotto shipwreck relaxing western
reef sailing ferry waterway shark wharf dolphin tide boardwalk
saltwater cavern tranquil floating sailboat ashore beach surf
dive waterfront pool surfing yacht ocean shore

Beauty

alluring captivating lavish bright perfect quaint rose sparkling
pleasing wondrous spectacular richness glamorous unique
mesmerizing starry radiant timeless view lilac breathtaking
magnificent luminous crown delightful pristine stunningly
nature breathtakingly glorious exotic angelic striking
marvelous ethereal majestic awe tropical amazingly
dazzling wonderful gorgeous lovely hue vibrant landscaping
photogenic admire stunning allure adore decorate elegantly
adorn beautiful lush enchanted beautifully magnificently astonishing
shimmering elegance amazing luscious behold beauty astounding
dazzle luxurious panoramic enchanting splendid painting

Blue_collar_job

serving maid employer employee salesperson payday pizzeria
clerk supermarket job attendant restaurant waiter waitress
worker bartender hostess receptionist cashier paycheck
barista

Body

thigh shivering skin thumb feel touch breast foot muscle shoulder
bony stiff clothed ankle crotch frame collarbone tighten palm
arm knees lean midsection finger scalp kneel body leg embrace
elbow hers backside stand mouth hunch manhood eye stretch
waistline head stomach muscled butt upright neck
stiffen toned legs torso groin hip forearm chin pelvis limb
forehead chest lip frail kneecap abdomen hand wrist knee
lap waist cheek face

Breaking

splitting pane affect brittle crashing tore shattered destroyed
earthquake crack hurting worse smash crushed break smashed
fall reconstruct apart beating organ obliterate accidentally
explode bone crushing inflict hammer wrecked cut crush
barrier bash broken splintered fractured smashing
bloody spinal punching injure fight injury collapse shattering
broke tearing irreversible demolish skull irreparable damaging
rupture devastating rip crumble crash scar sever weaken

damaged bruising breaking damage fragment busted split
fracture faulty kneecap shatter collide cracking shatters
hurt wreck metal bruised breaker

Business

office trade manager planning portfolio developer profitable
producer investor freelance fund employer production
employee colleague advertising retail income wealthy
executive businesswoman clientele banking consultant
economy financial deal intern lawyer employment employ
workaholic funding entertainment profit administrative
payday dealership shipment supplier business internship
marketing clerk payroll broker boss advisor modeling
manufacturing unfinished service policy oversee industry
local promotion expense organize supply profession
entrepreneur businessman owner conference pharmaceutical workplace
working locally accountant consultation store manufacture tycoon
paperwork afford company worker paycheck catering
boardroom export bookstore promote analyst customer
commerce hire presentation work budget project banker
invest trading supervisor partnership publicist need scheduling
accounting seminar sell productive pay administration
spreadsheet insurance department establishment development
designer director cater payment salary transaction consumer
sale client corporation organization overseas corporate secretary

Car

taxi convoy cruiser pothole radio airbag windshield speed rover
asphalt tire interstate mph traffic intersection rental refuel zoom
garage wrecked trailer accelerator seat street driveway beetle
license driving diesel pickup dealership highway ignition
transportation license trunk convertible veer jeep ramp parked
bumper hearse road key civic caravan limo motor drove
parking automobile buckle destination tow coupe vehicle
expressway limousine lorry paved engine turbo gear buggy junkyard
horn passenger honking minibus car ride dashboard
mechanic accelerate overpass sunroof brake curb backseat
chauffeur speeding wheel cabbie cab petrol minivan driver

motorway tailgate sedan lane drive freeway truck ambulance

Celebration

summer themed dance wedding kickoff planning committee
present holiday excited blowout masquerade propose
commemorate year- party confetti banquet celebrate gift
marry feast yearly victory partying concert ballroom
fabulous reunion event special graduating ecstatic anniversary
prom surprise champagne festive fun host merry eventful
celebration joyous invited annual graduation nightclub spending
dinner birthday invitation honor homecoming partied family
honeymoon valentine fundraiser rave guest festival engagement
tradition gig extravagant bash happy hangout invite club
excite award brunch karaoke decoration join preparation cake
coronation gathering congratulation crowning gala rally
ceremony memorable clubbing attend plan date celebratory
outing thanksgiving cheer organize occasion

Cheerfulness

awed heartfelt cheerful cheerfulness happiness adoration glee
spontaneity bliss astonishment enthusiasm pride joyful enthusiastically
elated thrill contagious boisterous delightfully energetically friendliness
triumph optimism exuberant amusement giddy surprise joy
jovial amazement unrestrained bask fondness jubilant certainty
contented cheering sweetness emotion clapping delighted
satisfaction lively zealous cheerfully gratitude rejoice euphoric
euphoria victorious contentment clap happy gleefully overjoyed
happily appreciation determination positively uplifting glory
triumphant excitement exhilaration laughter eagerness joyous
blissful beaming buoyant elation exuberance triumphantly
ecstatic enjoyment gleeful delight cheery applause enthusiastic cheer
pleasure

Childish

hyper playful protest amusingly tickle swat enthusiasm immature
dramatically amusing goof babble rambunctious bashful complain
contagious pinch idiotic goofy boyish energetically joking imitate
squirm girl energetic giddy whining childish mischievous

jokingly prank surprise adorable childlike amused joy
giggle tease whine whiny innocently loudly playfully laugh cheesy
comical bubbly little girls kid hysterical happy gleefully
innocent happily ridiculous smile silliness hyperactive
excitement silly squealing fun laughter enthusiastic tickled
weirdness amusement schoolgirl annoying funny obnoxious
toddler mock ecstatic delight sheepishly endearing squeal
giggling cheer

Children

infant mom eldest nephew stepdaughter stepmother teenaged father
young teenager beloved dad woman granddaddy birth
orphaned diaper pregnant married brother grandfather
illegitimate biological conceive husband doll generation
teenage orphan girl stepson wedlock adoptive
behave playground womb parent youngest nanny spoil cousin
childbirth princess care boy sister daughter biologically
youngster grandchild unborn childhood grandkids family
mommy grandma crib son newborn twin little toy pup
infancy sitter loving innocent stillborn child baby kind fun
stepfather daddy precious household sibling offspring grown niece
toddler naive godfather granddaughter kid grandson
adopt playing responsibility mother

Cleaning

chore drying reorganize vacuum sanitary antiseptic adhesive
soaking fix dispose wipe wet showered scrubbing
apron mop launder dryer vomit bleach towel wring washer gel
washing dampen wash remove peroxide spotless rack
shave showering bucket sponge scrub bacterial hamper
residue closet shaven washed detergent cleaner
disposed dirt lotion toothbrush spray sink tub chlorine dry
water essential sweat disinfectant garbage soap bath hygiene
brush dollop redo bathroom filth splash wax basin laundry
dishwasher wiping cleanse soiled shampoo shower dirty
bathtub rag iodine deodorant tidy dripping bathe tissue
cleaned dab soak thoroughly cleansing housework cleanup
freshly brushing cupboard remover cleaning necessity fresh

hygienic drain clean cleanliness rinse

Clothing

gown lace pant shoe cape lacy skirt satin jumpsuit woolen laced
flowered oversize tweed wool wearing apron garb material
midrifftailor tunic striped silk flannel glittery frayed stitching
sleeve covering leather tights clad glove lingerie cashmere
stylish jumper clothes sew sneaker chiffon garment beret
knitted sweatshirt blouse jewelry washed uniform
studded attire oversized skimpy revealing raincoat slack
wear tulle zipper underwear blazer footwear nylon top scarf
suede tuxedo overcoat jeans layer snug polo pantyhose fabric zip
sweater sock designer robe suit white gaudy sleeved
shawl converse tee cloth slinky sleeves tattered wardrobe
corduroy fleece plaid tank corset sleeveless worn dressy threadbare
bodice vest fashion strapless pleated bathrobe maroon
sequined slip clothing cotton jacket cardigan shirt pinstriped
dress boot casual kimono quilt beige trouser accessory
starched ruffled patterned polyester coat turtleneck collared
fitted

Cold

shivering woolly sleet windy ice icy touch frostbite cold froze
snowing insulate freezing snowball frigid cool crisp
cooler gust snowstorm colder freeze drizzle shivers outside
glacial arctic blister climate sweater chilly torrential damp
hypothermia blizzard feel snowfall cloak nipping weather
frosty temperature solstice cooling shiver bitterly bitter
snowy brisk frost dreary chill wet air chilling coolness
wintry soak glacier snow shawl slush numb nip winter chilled coat
overcast breeze

College

schoolers office excel admission institution culinary program
teaching geology photography schooling roommate theatre
sorority secondary school workload scholar sophomore
university athletics grad require auditorium fraternity
requirement alumnus library college graduating educate funding

freshmen lecture math biology exam degree schedule tuition
overseas term dorm 101 abroad institute study economics
bachelor graduation elective grade profession community
semester learning registration nursing acceptance priority
tutor teacher handbook qualify building academy dropout
curriculum schoolwork brochure boarding midterm pursue
science enrollment career schooled doctorate orientation
engineering scheduling accounting education campus educational
academically 4 humanities studying preparatory graduate
application classroom department mathematics residency lecturer
literature assignment philosophy diploma student faculty
apprenticeship prestige transcript class placement applicant
theology civics classmate tutoring

Communication

text consult detail thesis decode clarification explain confide
confirmation read introduce mention report discuss texts list
email handwritten wrote respond communication idea convey
writing informed exchange communicate socialize mobile ask
interpret sender agree conversation connection context opinion
visit recite relate address rant message speak interact call
translate type tell listen dialogue relay memo clue understand
mail info word paragraph speaking informational talking overheard
chat phrase biography information eavesdrop discussion poetry note
answer advise advice translator meaning letter messaging
inform write talk suggest aloud mailing fact

Competing

scoreboard competitive unofficial elimination battle supporter scoring
candidate gymnast rivalry winner winning score halftime
versus ranking exceptional unbeatable conquer legendary
consecutive enemy success loses victory rival athletics
disqualify challenge showdown wrestling competition
heavyweight championship category competitor announcer
dueling won eliminate honorable worthy dedication
trophy contestant boast career qualification derby elect win conquest
contender rank losing playoff champ undefeated strategy nomination
swimmer leading outstanding fight victorious champion

successful racer representative talent duel pageant athlete oppose opponent bet acclaim nominee tournament promotional prestigious vs contest excel chess performance coveted medal achievement goal academic regionals compete reward

Computer

code safari laptop disc file keyboard hack recording disk web monitor handheld desktop program onscreen gadget grid desk scrolling electronics restart transmitter cable offline button server portable printout computer download programmer click hacker multiplayer mainframe internet recorder microchip thumbnail 3d screen techno interface projector plug technical programming circuit router browser navigation software battery coding glitch processor tuning chrome simulator system automate typing type website clicking stereo wireless optical profile technician logging outdated bug firewall setup cursor printing dashboard install hacking email scanner calculator mouse binary docking technology spreadsheet virtual online document charging gaming satellite electric computerized log device icon workstation database mobile robot scroll tech joystick

Confusion

stunned skeptical befuddled stumped uneasiness query worrisome clueless concerned vex suspicion astonishment incredulous falter surprised frustrate puzzled apprehensive unfathomable doubtful skeptical bewilderment bewildered inquisitive flabbergasted shock worried fearful conflicted worrying exasperated skeptically indecision disbelief distrust confusion distraught unsure unconvinced terrified questioning baffled hesitant disdain uncertainty trepidation question confuse frightened alarmed dumbfounded questionable sheepish perplexed astonished hesitancy predicament uncertain astounded apprehension hesitating dazed panicky mystified unease frighten confused puzzling shocked agitated suspiciously warily puzzlement flustered why pensive consternation remorseful uneasy appalled

Contentment

languid pleaser closeness pulsing fullness happiness
gentleness nostalgia fervor pleasing pleasurable amorous
compassion tantalizing kindness thrill profound delightful
delightfully sensation arouse momentary familiarity exhilaration
passion gratitude joy relaxation lightness bask fondness
deliciously certainty sweetness feel satisfaction remembrancemoan
contentment bliss tranquillity tranquility appreciation orgasm
warmth excitement feeling affection coolness contented
fulfillment genuine savor pure enjoyment delightpleasure
calmness relief intimacy gratification

Cooking

chowder steamed kettle serve muffin stove recipe mince silverware
spatula serving dough fillet oven roasted dish barbecue
chicken chili cheddar toast ham culinary savory mashed
pesto rice sauce ingredient plate food dessert appetizer
batter cook frying bread baking meat onion risotto platter cookbook
asparagus roast grilled tortilla meal nutritious pork seasoning
topping bacon prawn pantry waffle chef lobster bake spaghetti
sausage mutton marinate preheat cooking burner
microwave saucepan porridge grease cauliflower pancakes
salmon corn salami cookie stew pancake pasta mozzarella
kitchen steak beef oatmeal shrimp sizzling dinner
lasagna cinnamon curry cheese loaf pot tofu delicious broil
skillet crispy tuna custard turkey prepare spinach gourmet
buttermilk homemade basil fry garnish blueberry spicy
mushroom filet buttery omelet brunch eat casserole spice
grill edible potato batch ravioli soup cake fried vegetarian hamburger
gumbo apron broth sushi pie sizzle tasty pastry breakfast meatloaf
fixing toaster bowl bagel housework venison macaroni flour
vegetable pudding pan pizza timer gravy cheesecake delicacy
buffet garlic suppercabbage broccoli noodle crepe cooker baked
seafood mash cooked bakery egg

Crime

detective accuse criminally rob domestic trespass defendant kill

victim felon bail bombing fugitive flee organization
assassination crime arrest citizen maim criminal warrant prosecute
disappearance hostage massacre scene interrogation courtroom
execution report precinct assassinate swindle execute
brutality investigator heist policeman slavery investigate
officer robbery notorious undercover manslaughter perpetrator
imprisonment thief incriminate captive stealing corrupt
murderer harassment kidnapaccomplice rapist culprit ruthless
unlawful testify whereabouts investigation suspect custody
felony burglary convict theft corruption jury unforgivable
kidnapper blackmail slaughter killing cop imprison interrogate
brutal trial ambush mugging genocide commit assassin
conspirator vigilante shoplifting infraction sentencing bribery
abduction probation eyewitness killer burglar commission
illegal alleged inmateforgery manhunt wrongdoing prosecutor
terrorize enforcement murder riot smuggling prison cruelty
heinous gruesome gambler robber motiveabductfraud offender
outlawforensic transgression violence scam apprehend authorities
conspire prostitution conspiracy exile dealer rape condemn
ransom terrorist informant allegedly mobster trespassing
witness vandalism terrorism homicide kidnapping prosecution
assaultprisoner law mastermind murdering arson cartel trafficking
treason organization atrocity unspeakable

Dance

choreographydance chord ballet glee practice onstage jukebox hip
waltz dj song contemporary band practicing swaying turns
disco choir rock radio partying sync bounce gymnastics
twirling rehearsing chorus rehearse choreographer rendition
solo rapping guitar techno stage rehearsal drum bop motion
entertain studio gymnastic cd dancer rave classical jaunty
music upbeatballad rhythmic footwork club musician burlesque
accompaniment acrobatics sway medley bohemian spotlight
melodic performer tap classic swinging grind acrobatic
ballerina dancing perform freestyle speaker
performance pianistjazz ballroom hypnotic strut tune recital
musical cheer twirl

Death

11-Sep befall kill victim cancer pray cemetery beloved suffocation loss
devastate torture devastated eulogy suffering mourn closure
rebirth die brother fateful starvation burial slain assassinate
miserable grandmother avenge distraught perish funeral
revenge mourning death tragedy survivor corpse misery
grieving neglect son miscarriage stillborn sadly casket
hearse revive tragic doom bloodshed life murder graveyard grief
dead tragically gruesome ultimatum wish grieve war coffin
deceased illness haunt torment memorial dying lifeless afterlife
condolence sympathize leukemia heartbreaking deathbed
demise grave destruction wife devastating tombstone

Deception

traitor liar dishonesty deceiving deceitful betray cunning fool
shameful pretense treachery dishonest mistrust distrust
motive insincere corrupt sordid ruthless indiscretion
untrustworthy blame cheating deceit deception conviction
prove unclear cowardly accusation omission conniving
manipulate infidelity deceptive trickery intention doubt
cruelty manipulative unfaithful believe fraud folly ruse trick
cruel perpetuate FALSE unjust delusion conspire lie disloyal
illusion sham scapegoat betrayal corruption deny taint
withhold mislead lying deceive greed

Disappointment

discontent disinterest weariness uneasiness spite reluctance dissatisfied
frown hostility rejection dissatisfaction revulsion dismayed
loneliness dejected aggravation unsatisfied wariness displeasure
irritation displeased loathing derisive helplessness disbelief
disquiet distrust exasperation humiliation disgruntled devastation
sorrow weary hopelessness defiance reproach disdain
trepidation despair disappointment skepticism expression
resentment scowl unhappiness annoyance jealousy disapproval
derision frustration dismay disgust chagrin suppress
twinge sadness downcast misery prospect unease agitation
disapprove shame clearly jealously disappoint distaste betrayal
censure discomfort denial terror response longing

consternationsorrowful pained

Disgust

discontent unbridled vile weariness uneasiness fear spite disgust
indignation indignant condemnation loath repulsive belittle
revulsion rage mistrust aggravation feigned grimace
repressed deplorable humiliation malice displeasure selfishness
loathing distaste disbelief vehement distrust scorn
repugnant devastation confusion sorrow unease detest
defiance sneer greed reproach pity disdain enmitydiscomfort
disappointment miseryemotion madness inexplicable resentment
accusation sneering unhappiness annoyance disapproval unpleasant
dismay chagrin condescension twingeoutrage hateful
rudeness abject utmost evident shame bitterness aversion
dissatisfaction agitation irritation anger contempt loathe
meanness malicious ugliness hostility scowl mockery
betrayal disgusted palpable animosity hatred apathyloathsome
seething menace appalled contemptuous shameful

Dispute

protest controversial adamantly reasoning rivalry explain complain
policy petition dispute complaint complains disagreement
misunderstanding resent discuss confront verdict contradict
disregard bickering decision defendtestify debatesuspect
altercation issue squabble jury prosecution courtroom interfere
blame confrontation opposition accuse ridicule trial oppose argue
meddle negotiation shoplifting civil infraction mandate insist
accusation sanction custody petty prove fight refusalbloodshed
mutiny grudgedeclaration adjourn adamant politics
convince reprimand quarrel reconcile bicker argument
involve offense controversy court refute complaining discussion
abolish conflict scapegoat arguing disagree negotiate
law judgment refuse feud objection fact fistfight talk

Divine

divine biblical rapture deity heavens religious worship
divinity pray TRUE fate commandment immortality gods lord
scripture righteousnessexalted heaven miracle bless

priest gospel spiritual sacrificial creator mightydivine hymn god
religion paradise heavenly everlasting untainted incarnation
eternal faith goddess rosary redemption freedom ritual
resurrect protector glorious angelic blessed ethereal
rejoice apostle mythological almighty communion saint greatness
angels blessing wisdom virtue savior prophecy believe
cleanse spirit mercy praise baptism angel reincarnation glorify
purity goodness prayer holy afterlife merciful sacred disciple
covenant realm invoke salvation ultimate

Domestic_work

chore mom vacuum scrubbing cook washing baking wash morning
meal house chef laundry bake organizing cooking spotless
mum washer remodeling parent job nanny kitchen dishwasher
cleaning family cleaner bathroom errand sitter housekeeper serve
housekeeping tidy cleaned housework scrub organize home clean

Dominant_heirarchical

ambassador tribe hierarchy tyrant aristocrat elect descendant superior
organization royal aristocratic commander govern predecessor ranking
executive royalty lineage dictatorship leader delegate
squadron senate authority society empire corporate
honorable admiral monarchy lieutenant leadership advisor
cult powerful banker government senator rank empress
regiment mafia army privilege aristocracy tycoon overthrow heir
treasurer representative elite politician ruler diplomatic
governor influential ruling prestigious educated council
politics elder corporation chancellor esteemed monarch
privileged noble scion prestige appoint inherit mercenary
warlord nobility

Dominant_personality

cockiness smug attitude cocky aggressive overconfident talkative
arrogant jock arrogance personality rebellious pompous
overbearing pushy popular opinionated insulting smirk outspoken
assertive haughty boast brag hardworking condescending
charismatic narcissistic confident vindictive manipulative competitive
patronizing pretentious charmer stubborn intimidating heartless

jerk snooty defiant bragging ambitious headstrong brash
funny domineering egotistical ego controlling

Driving

taxi convoy cruiser pothole radio motorcycle speed skid
rundown asphalt tire shortcut gravel interstate roadway
snowmobile halt stop detour mph traffic intersection garage pavement
embankment parked mile neighborhood accelerator seat
street driveway parking neighborhood license driving rev
valet pickup dealership exit highway dashboard license convertible
cop veer jeep route ramp bumper safely buckle road key
caravan trunk limo drove motorbike automobile hearse destination
tow coupe vehicle expressway limousine paved engine turbo bus
buggy park downtown passenger honking minibus car ride
ignition cab arrive tractor swerve sunroof rode brake curb
backseat chauffeur skidding speeding gate pathway
wheeler cabbie petrol ambulance driver motorway crashed pave
tailgate sedan pedal lane shotgun drive freeway truck
minivan wrecked

Eating

serving cereal muffin roasted dish chicken apple toast snack grape
ham avocado celery savory pesto rice porridge junk plate food
dessert fridge appetizer lunch watermelon cook bread meat
risotto crunchy cider pretzel candy roast steak meal chew pork
cracker bacon prawn waffle burger crave ravioli spaghetti appetite
fattening slice soup cooking chewy yogurt mouthful chili
nutritious drink eating cauliflower munching pancakes corn
devour cookie buffet pancake pasta leftover raspberry
craving kitchen ate mush healthy vegetarian tasting feast
oatmeal takeout dinner healthier pudding berry soda
popcorn curry stew feed cheese unhealthy sugary cheeseburger
suppertofu delicious calorie turkey beef spinach gourmet bite
caviar homemade spicy gluten mushroom serve omelet brunch eat
crumb edible salad fries banana strawberry pizza gobble fried
pickle biscuit flavor hamburger taste chip sushi pie eats carrot tasty
pastry breakfast baguette meatloaf savor cashew bagel
mango vegetable lasagna mayonnaise flavored succulent

topping sandwich papaya fatty cheesecake pear diet fruit
cucumber taco tuna broccoli refrigerator canned noodle crepe
picky fatten seafood delectable hungry cooked pineapple
platter

Economics

surplus unemployment money cheap valuable supplement agricultural
livestock profitable investor revenue employer production
luxury merchant employment advertising finance economical
buyer trade tourism resource entrepreneur clientele affluent
banking shortage sustainable stock financial cost export
scarce insurance funding mortgage profit factory seller
payday expensive supplier import donate remodeling affordable
wage infrastructure marketing payroll monetary tuition job
lucrative auction industry banker contribution expense
allowance saving fundraising supply loan provision fundraiser
market manufacturing wealth housing locally accountant
amenities asset percentage farming drugstore manufacture
afford smuggling treasury fund pricey buying commerce grocery
budget employ compensation trading loot trader economics
costly tax currency rent politics accounting education sell
educational productivity bankrupt corporation storehouse consumer
investment earnings income overpriced economy
development product price debt salary paycheck retail invest sale
client pension businessman corporate

Emotional

suicidal vindictive infuriate attitude hating aggressive forgiving
tendency superficial unkind unhappy passive snappy
troubled pleads insensitive cranky disappointed cheerful rant bad
worrying cynical desperate demeaning miserable depressive
irritated depress whining mood childish outspoken
taunting pleading distraught frustrated outgoing pathetic
upsetting assertive pained uptight overreact plea frustrate
irritating pity seriousness whiny stressed heartbroken remorseful
tearful tone condescending sympathy stern sympathetic joking angry
threatening irritate humorous affectionate hurtful bitchy depressing
hateful patronizing negativity annoy kind depressed insulted

emotional frustrating pessimistic persuasive argument sad
torment optimistic disgusted irritable needy angered
headstrong insecure demanding impulsive bullying
heartbreaking resentful mad hurt upset persistent
melodramatic dramatic annoyed temperamental

Envy

discontent vindictive ambition yearn flaunt hate envy arrogance
attraction outrage passion dislike weakness hostility
resent belittle unrequited yearning selfishness heartache
unease wealth disdain misery hatred envious resentment
cynicism annoyance despised deception wrath insecurity
jealousy frustration determination hateful negativity rage
bitterness jealously meanness ugliness jealous animosity

Exasperation

weariness outraged tirade aggravate disgust noncommittal
disagreement dejected sternly aggravation overreaction exasperated
irate irritation loathing disbelief angered exasperation
anguished relent frustrated pent hopelessness wearily harshly
surrender uncertainty despair disappointment defeat irked
emotion hatred petulant irritate unhappiness annoyance
jealousy disapproval derision frustration bitterly tantrum
impatiently indignation displeasure agitation flaring fuming
desperation groaning grudgingly irritated scowl furiously
displeased frustrate impatient agony furious annoyed

Exercise

skate hiking athletic acrobatics swim flex workout practice tiring
warmups grueling paddling rowing snowboard fitness
exertion cramp competition gymnastics diving sport paddle exercise
maneuver leg trampoline jog training stretching swam
jogging snowboarding swimming gymnastic flexibility
basketball cycling swimmer stretch pool nutrition gym
weight strenuous instructor practice warmup soreness hike
biking rigorous activity yoga endurance treadmill tumbling
elliptical exhaust dive running jumping climbing
lifting surfing sprinting volleyball exhausting muscle

Exotic

aquatic humid inhabit tourist colorful indigenous scenic seaside
sparse freshwater meadow fish magnificent migration wondrous
paradise thriving scenery oasis flowering northern
island exotic majestic landscape mystical western foliage wild
diverse woodland enchanting grove ocean mango lagoon

Fabric

gown lace woolly skirt satin woolen sewn lining torn texture robe
wool blanket material tailor rumpled striped silk
translucent flannel frayed stitching covering glove patch cashmere
jumper sew chiffon garment fluffy knitted softness seam
ribbon blouse silky velvet ruffled opaque pattern bedding plush
mesh wrapping textured tulle blazer thread cape yarn layered
suede nylon scarf delicate decorative wear overcoat garb vest
cloak supple gauzy sheet fabric flimsy shawl lint cloth corduroy
fleece plaid tunic corset quilted smooth worn netting
threadbare bodice trim layer pleated bathrobe sequined
clothing cotton clung shirt necktie beaded dress handmade
kimono itchy quilt beige lapel trouser frilly pastel soiled
tweed headscarf patterned polyester drape patchwork coat cover
jacket linen sash

Family

mom nephew grandparent stepdaughter grandmother fiancee father
foster parents beloved godmother mommy dad granddaddy
orphaned estranged conceive married brother grandfather
illegitimate biological marry husband orphan relative
legacy reunion home stepson best leave wedlock adoptive
mum darling parent grandma cousin childbirth daughter
finance biologically grandchild childhood grandkids widowed
stepmother family caretaker son newborn twin divorce visit
adoption in-law loving heir sister child baby divorced surrogate
marriage stepfather daddy sibling offspring niece aunt matriarch
godfather granddaughter upbringing spouse grandson wife
adopt mother uncle

Farming

forage livestock chore cornfield settlement fenced hilly plantation
farmer herd wagon breeder farmhouse gardening meadow fence
prairie cattle agriculture barn farm overgrown stall rooster
gardener wheat corn stallion mule farmland cow grain ox
firewood fertile wilderness cobble boar sheep mare horse acre
farming marketplace mining buggy harvest mount cowboy
lumber tractor deer pig pasture cultivate woodland
gelding forestry forest animal goat perimeter lamb agricultural
countryside fertilizer orchard ranch corral outhouse rural

Fashion

gown salon slimming shoe wearing costume tailor vanity glittery
rumpled stylist nicely swimsuit flashy stylish jumper essential
sneaker jewelry garment beret bouncy mirror trendy
matching silky jewelry bikini lingerie hipster showy attire
oversized foundation unkempt loose outfit wear dress headband
magazine layered footwear supermodel clothes seamstress
sweater sock stylishly suit tacky gaudy grunge streaked
dressing mannequin glam wardrobe glamorous wore appearance
professionally glossy converse smeared layer fashion
sequined ruffled chic clothing stunning shirt fashionable
vintage styled makeover fitting dresser product designer
frilly classy necessity handbag flannel edgy dressed model

Fear

unbridled uneasiness fear anticipation frightening paranoia shudder
terror weakness horror dread adrenaline resentment revulsion
loneliness fearful distrust humiliation scared displeasure hysteria
unsettling horrifying alertness devastation unease
embarrassment hopelessness terrified insecurity uncertainty
discomfort frightful horrified misery emotion panicked
madness paralyzed tremor frightened unhappiness jealousy
terrifying overwhelming anxiety guilt feeling panicky
vulnerability fright agitation frighten crippling shame sense face
anguish contempt afraid tremble panic hostility pain
trepidation trembling agony menace

Feminine

cute gown haircut slimming lacy stunningly curled pretty redhead
appealing wearing woman wavy silk stylist nicely tights
finery cleavage stylish brunette lilac elegant supermodel
fabulous girl perfume matching blouse silky ruffled purple
bikini revealing voluptuous hairdresser complement makeup sexy
dress headband blazer layered perky clothes pair blonde
pantyhose comb jewelry fuchsia styling accentuate gorgeous
girls impress sophisticated flowery slinky glam wardrobe
glamorous girlish voluminous stunning beautiful hairstyle
fashion provocative chic skirt curl ballerina fashionable
dressed kimono skater frilly halter accessory floral jewelry
feminine curve curvy lipstick skinny

Fight

wrestle forfeit resistance kill participate battle battleground charge
overthrow dispute versus instigate taunt survival unbeatable
disagreement quest conquer militia annihilate terrorize enemy
resolve brutality confront intervene loses troop on-one
loyalist firefight battlefield force wrestling bickering
retaliate defend chaos foe warrior squabble perish brawl
confrontation opposition combatant heroic revolutionary blame engage
allies prove valiantly ambush oppose threat defeat argue rebel
win conquest ensue fight strategy attack fought mutiny spar
war opponent training domination train rivalry warfare
rampage rival challenge battling vanguard quarrel
soldiers heroically onslaught argument supremacy provoke
casualty chase cavalry protect veteran destroy
dominance conflict clash arguing rematch invasion
bloodthirsty destruction grudge fighter warlord weapon fighting
compete skirmish fistfight attacking outnumbered

Fire

ignite bomb scorched crackling burnt firewood brighter campfire
blaze engulfed blistering lighter molten afire melting
flammable ashtray blazing flickering steam bonfire torch
crackle emanate ablaze combustion scorching fireman
searing melt explosion burn burner broil spark temperature

firecracker boilingflare heating sizzling smoke heater burning
charred wildfire ash overheat hydrant douse fiery
inferno warmth sizzle fire overheated heat warm gunpowder
explodes inflamed flame light extinguish emit hotter flaring
engulf candle extinguisher flaming lava hot furnace oil cigar
eruption fireplace inflame explosive reignite coal
fireball flicker

Friends

flirted buddy friendly roommate always brother popular ex
reunion girl supportive best trust crush mate longtime
inseparable socialize cousin boy sister visit neighbor childhood
partied love girls friends friend neighbor gal boyfriend
fun chat girlfriend relationship nice acquaintance classmate

Fun

themed dance hockey goof skit celebrate charade bowling
partying play skateboarding entertainment multiplayer
playground trampoline socialize celebration joke favorite
sitcom entertain swimming partied spoil film win laugh
prank arcade gig music club excite controller karaoke twister
join silly fun bet cinema pastime chat dancing party
adventure celebratory surfing entertaining

Furniture

creaky office furnished bedroom chair tv cushy mattress television
blanket cushion desk fireplace furniture wooden sofa
backboard antique seating hardwood seat booth sectional
sprawl stool shelve bookcase kitchen cot armchair crib
furnishing table bench wicker comfy lounging shelf bookshelf
vanity room bed wardrobe seater decorative drawer tabletop
sits decor couch dresser cushioned upholstered furnish patio
chair

Gain

surplus obtain trade renown restore surpass reliance
fundraising achieve redeem conquer wealthy dowry
investor prize unify benefit excellence thrive gamble

beneficial trading funding profit innovation appeal boost
monetary expansion discount influential freedom industry
amount succeed negotiation winner significant conquest
commitment equality exceed privilege percentage prosperous
successful acquire promote potential accomplishment
compensation bet amass motivation currency substantial
prosperity inheritance credibility fortunate earnings
endorsement gambling pension privileged economy bonus
ownership retain payment achievement paycheck invest greed
reward consumer nobility gain

Giving

bring generous thank favor save return generously redeem earn gift
thankful benefit repayment fulfill voucher funding
giving assistance favor provider donate sacrifice exchange
credit job consolation deserved receive donation assure
ensure owe gratitude additional service privilege giver
offering offer gladly surrender generosity compensation
praise fulfill agree give contribute accept need grant provide pay
oblige paid unselfish payment repay reward order gesture

Government

sector negotiation agency protocol jurisdiction embassy welfare
safeguard implementation unethical organization program
homeland policy communist administrative petition global
government regional nation liability cultural govern resource
republican association dictatorship finance consensus
independence enforce amendment revolution financial
senate administrator applicable society election empire
decree funding constitution populace federal unlawful
activist cooperation international monetary poverty opposition
advisor obligation tyranny senator elect campaign
facility civil mandate involvement recruiting commission regulation
conservation utopian enforcement parliament ethical treasury
immigration societal unified politician accordance socialist
coalition employ ruling contribution propaganda citizenship
unjust partnership tax politics accounting regime democracy
civilian administration abolish allied republic terrorism

economy province illegally congress negotiate united
ambassador authorities law fund rule capitalist treason
organization democratic representative

Hate

despise vindictive infuriate sexist kill hating hate envy unkind
hated degrading unhappy betray disgust dislike insensitive
worse disrespectful taunt resent loath suffering belittle awful nasty
rant mistrust idiotic ignore bad selfishness miserable loathing
horrid seriously horrible scorn bully pathetic blame scum
detest frustrate disrespect ashamed ridicule despicable
repulsive hatred betrayed emotion resentment accusation
distrust unhappiness worthless despised humiliation angry
racism irritate insult spat hurtful betrayal cruelty degrade
hatefulnegativity humiliate terrible rejection rage cruel guilt
unfairness venomous feeling frustrating vengeful disgusting
heartless anger annoying loathe selfish jealously discriminate harsh
meanness contempt rude bullying mad jealous animosity
murderous hypocrite unreasonable judgmental offend

Healing

restore salve replenish upkeep capable explain cripple
better treatment swelling mend affected remedy bandage
dose organ stabilize anesthetic antibiotic ailment healer
surgery stitch tend sustain herb medicine power forgive
healing extent elixir strong care undergo rebuild checkup
repair gauze antidote regeneration reopen resuscitate bandaged
transplant regenerate hospital revive toughen survive treat
cope heal save medically sedate medicinal medication spiritual
painkiller strengthen recuperate scab cure scar stitching
anesthesia sever damaged recover recovery medic prescribe
transfusion injured potion insure morphine medical purify
bruised

Health

influenza allergy clinic therapist maternity ulcer suffer vet asthma
sufferer pharmacy treatment trauma pill epilepsy
appointment remission psychiatrist prenatal psychologist therapy

epidemic tuberculosis surgeon miscarriage anemic condition
anemia respiratory mentalchronic dehydration supplement
malnutrition disorder cramp antibiotic ailment specialist
abortion heartburn testingschizophrenicschizophrenia surgery
incurable pills depression pneumonia traumatic dehydrated
health medicine nurse anorexia bulimia med patient
malaria dental prescribe vitamin vomiting coma vaccine
pancreatic prescription healthy diabetic rehabilitation tumor
medically neurologist depressant concussion checkup remedy
cancer disability antidote seizure psychological ultrasound
cancerous illness pregnancy transplant complication vaccination
syndrome hospital bedridden examination chemotherapy
injury aspirin nutrition transfusion infection liver trimester
injection institution symptom physician anxiety deficiency
flu psychosis infertile rehab pediatrician sedate behavioral
poisoning glucose dosagediagnose medication nursing
painkiller recuperate cure dementia anesthesia kidney recovery
doctor migraine diarrhea autism immune sick pharmacist
insulin fever sickness biopsy arthritis leukemia diet unwell
psychiatric relapse injuresdischarge diabetes prescribed
stress medical disease antidepressant severe diagnosis
gynecologist relievers nutrient

Hearing

echoing murmurs listening mute wailing splitting
eavesdropping pitch melody drumbeat shrill chattering
heard screaming grumbling softly radio soft audible ears hush
louder snoring soothing hushed resonate whispered noise
blaring wail murmur buzzing irritating noisy creaking
yelling shuffling gunfire loudly quietlythumping knocking
harmonic hearing speak shout music low call speaking listen
melodic eavesdrop volume hear ear chatter amplify
sound squeaky mumbling distract ringing hears whisper
talkingvoiced sounding siren speaker boom decibel blasting
quieter rumble squeak response tune scream
deafening aloud tapping yell sounded talk

Help

chore responsible help grateful maid housekeeping helpful stabilize
servant benefit financial aide supportive assistance favor
tend favor encourage wheelchair nurse patient honor protection
oversee guide hospitality duty advisor carry trust obligation
rely support escort friend treat offer serve cooperate
encouragement promote volunteer counsel kindly crutch aid
nursing helper request rescue provide protect generously
housework advise temporary assist entrust prepare

Heroic

underdog inspire renown battle defender character gutsy
heroism beloved save real rescue myth greatest quest
conquer legendary vigilante courageous bravery fantasy
knight timeless famed brave noble adventure legacy mighty valiant
gallant superhero genius honorable epic strategist hero fearless
spartan worthy tragedy heroic revolutionary redemption
survivor proud soldier protector synonymous classic heroine
victorious tragic greatness titan kind peril namesake emperor
determined conqueror persevere acclaim heroically novel
capture renowned daring daredevil credibility ambitious
inspirational sacrifice

Hiking

slope hiking boot hillside climb inlet hunting backpack lake hilly
duffel southwest downstream knapsack forested alpine scenic
seaside bag shoe steeply terrain packed camping
countryside hill lug foliage dune jog path steep jogging
highland climber wilderness mountainside uphill canyon
campground downhill landscape ridge valley gear western trek
hike venture grass biking excursion pack forest campsite
mountain northward mountainous cave field edge vegetation
encampment journey ravine climbing desert trudge scavenging hiker
summit jungle hilltop

Hipster

themed costume alternative label geek styled flashy sneaker
stereotype artsy design trendy looking hipster retro attire
urban iconic outfit wear stylish hairdo punk funky wannabe hippie

stylishly nerdy grunge 1950s brand converse sophisticated
wardrobe geeky hairstyle fashion indie fashioned chic
clothing fashionable vintage eccentric snazzy preppy

Home

chore cooking suburban bedroom mansion grandparent couch
guesthouse father foster dad fridge roommate mom basement
rental garage landlord housekeeper farmhouse neighborhood
upstairs attic house driveway reunion home living someplace
anywhere mum remodeling parent bathroom apartment condo
neighborhood kitchen orphanage neighbor family hometown
renovate dorm townhouse guest backdoor live door porch sister
neighbor cottage hurry downstairs room bungalow abandon
penthouse household rent mover loft dinner remodel brownstone
hallway staying suburb backyard stair refrigerator patio
mother foyer

Horror

stunned outraged strangle frightening paranoia shudder
astonishment terror shrill horror bewilderment surprise revulsion
maniacal brutality shock fearful humiliation overwhelm malice
freeze fear helplessness disbelief nightmare horrifying anguished
distraught stun screaming terrified shriek frightful stricken
despair hatred emotion mortified panicked panicking
paralyzed frightened agonizing fright jolt fury terrifying
violently ferocity panic fascination outrage recoil astonished
carnage disgust panicky horrific frighten frantic anger
tremble desperation anguish shocked morbid horrified
unimaginable pain trepidation gasp paralyzed deafening agony
hysteria scream shrieking

Hygiene

bathing fresh showered scrubbing shaving washing bleach
sanitary bath towel perfume clothes shave showering scrub
cleanliness washed detergent dental lotion toothbrush tub comb
deodorant dry underwear restroom toothpaste bathe wash
hygiene brush faucet razor bathroom cleanse chlorine
diaper cologne shampoo shower bathtub toilet deodorant

daily cleaned communal dressed cleansing soap brushing
cleaning hygienic clean teeth rinse

Independence

perseverance rebellious livelihood discipline feminist cultural
resource adventurous strive progressive thrive aspiration financial
pragmatic independent society thinker individual spirited
constitution activist resourceful independence visionary
idealistic empower monetary mindset lifestyle aspire
competent disposition hardworking intellectual entrepreneur dependable
successful mentality societal virtue diplomatic politically
optimistic individuality academically democracy ideal ambitious
headstrong upbringing independently

Injury

flesh swelling bruise dislocated clot suffer impact shattered painful
severely rupture cripple stabbing injured kick
hurting stung break bandage fall affect apart reopen
soreness sprain bone bleeding inflict pain hemorrhage bruising
stitch worsen cut searing trauma slash beating cause
burn itching fractured ache stab bleed blister accident broken
artery fatally bruised repair puncture burning limp injures
bloody ligament bandaged injure concussion infected injury
damaging heal infection hurt mend broke wince fatal inflamed
irreparable ooze scab stinging examine limping scratch
sting recover surgery sever weaken unbearable damaged
scar scarring oozing breaking wound damage scrape fracture
infect busted excruciating gash multiple shatter swell inflame
blood numb tendon severe swollen wounded

Internet

laptop hack screen web edits program homepage updated facebook
headeredit celebrity server page www google trend computer
download click hacker multiplayer segment publish research
access internet dating email editorial interface article post
search forum programming router browser firewall coding glitch scam
networking spam chrome subscriber website broadcast link
editing posted info account compute keyword cursor hacking

worldwide chat site tab information spreadsheet virtual archive
application online document gamer profile gaming explorer
reporting data icon wireless surf mobile cyber

Irritability

laziness irritable aggression aggravate snappy indignation
noncommittal complaint harshness cranky aggravation unsatisfied
disapproving exasperated aggravated displeasure irritation loathing
irritated irritability distaste dismissive unhelpful frustrated
disgruntled grumble ignorance sullen infuriating exasperating irked
perturbed vexed belligerent irritate cynicism annoyance
impatience unimpressed disapproval irritating frustration dissatisfied
pessimism boredom rudeness annoy irate temper
dissatisfaction stubborn grouchy agitation anger
condescension angered agitated aggravating displeased
frustrate discomfort whining palpable hatred stress impatient
seething scowl grumpy annoyed

Journalism

essay paperwork photo paper thesis research headline photographer
freelance writing literary photography gazette report
journalism journalist printout excerpt edition newsletter
tabloid publish paragraph print campaign jot reporter
journal article scribbling column magazine documentary
homepage guidebook publishing editor handbook cite booklet
inked bookstore copy outdated subscription printing editorial
newspaper informational history showbiz publicist site
biography obituary administration write composition typewriter
credential literature assignment notebook printed summarize
corporate analysis leaflet bulletin

Joy

cheerfulness happiness bliss enthusiasm pride compassion kindness
desire elated profound radiant tenderness friendliness triumph
overwhelm triumphant giddy humor playfulness relaxation zest joy
fondness jubilant gleeful sweetness emotion satisfaction
gratitude joyous euphoria contentment affection overjoyed
appreciation overwhelming accomplishment optimism joyful

excitement exhilaration childlike feeling vigor eagerness exuberant elation delight vibrancy relief

Kill

skeleton vile exterminate peril kill victim lethal fugitive death destroyer defenseless assassination dispose overthrow maim eliminate torture massacre mortally hunted execute hunt barbaric poisonous starvation hunter tyrant die savage lair ruthless vampire poison foe venom inject murderer slaying revenge slaughter killing scum dead injure soldier ambush threat assassin eradicate dagger danger wield slain extinct devil wrath mercilessly neutralize fight attack murder infect warn attacker threaten annihilate dangerous merciless endanger conqueror bloodshed slay heartless hound fearsome weaken deadly beheading toxin destroy assassinate capture sacrifice vicious vengeance stab prisoner bloodthirsty murderous destruction weapon mercenary warlord

Law

restriction responsible violation governabide welfare violate arrest policy criminal loophole petition dispute prosecute jurisdiction liability exempt mandate equality applicable enforce amendment attorney convict senate authority society lawyer corrupt funding federal legal activist international discipline accord monarchy interfere advisor boss trial permit government senator approve punishment elect forbid infraction profession authorities moral punishable sanction probation establish custody negotiate penalty illegal strictly regulation guideline strict legally prosecutor enforcement parliament punish solicitor counsel morally accordance socialist unwritten ruling unjust tax enforcer council dictate exile politics democracy inheritance congress defy decree sentencing law legitimate morality appoint statuterule treaty client responsibility treason democratic corporate

Leader

ambassador founder executive mission committee captain superior promote candidate organization father crew

administrative ranking federation hotshot supervise
politician association successor dictatorship leader employer
senate commandant authority negotiator election peacemaker
operation battalion directive strategist admiral obey boss
leadership rebel advisor in-command oversee government
senator emperor duty elect campaign rank competent
qualified leading informed responsibility specifically sergeant
parliament overthrow treasurer representative syndicate
commander elite join ruler diplomatic governor ruling briefing
supreme commanding supervisor chancellor agent general
enforcer council bishop trusted sir diplomat strongest
corporation veteran member chairman administrator assist
renowned director president adviser headquarters rule chief
command organization corporate order

Legend

archeologist saga fable deity wizard immortality primordial factual myth
royalty legendary occult magic storybook unheard immortal
culture legacy power vampire arcane hero medieval
personification slaying superstition fabled legend knowledge
goddess mythology theorize fantastical witch origin tribe
supernatural extinction fantasy ancient mythological historian
mystical relic ageless artifact lore folklore prophecy
unrealistic mythical society invincible originate ancestral
believer history mystic exile embodiment afterlife covenant
visionary realm magical fictional dragon tale

Leisure

outdoor enjoyable tv karaoke holiday evening dessert
leisure recreation activity enjoy partying play barbecue
socialized entertainment lazy socialize entertain exciting
carnival takeout adventure partied family sightseeing
vacation interest hangout hobby brunch mall fun
pastime spa conversation lounge clubbing party gaming
buffet bonding weekend surfing theater thanksgiving
entertaining spend

Liquid

trickle urine slime gasoline booze milk cup gulp carton coffee liter
squirt seawater spilling saliva steam dilute tepid puddle alcohol
whiskey mug champagne vinegar beverage pours quart elixir
water faucet soda spill drank spilled bloodstream condensation refill
watering paint beer splash douse frothy tea basin lemonade jug
leaking drain liquor broth whisky chardonnay vial bucket pour
soup cider vodka dripping juice syrupy gallon rainwater soak
oozing bottled pint oil drink fluid boiling blood liquid drip
bottle brew liqueur scotch wine

Listen

echoing murmurs wailing radio melody conversation crackling
blast drumbeat vibration shouting cue rhythm thump shrill
chattering listened song beat moaning listening reverberate
hearing screaming lyric audible ears classical whispering
louder static hissing snoring scuffling loudspeaker rapping
hushed resonate cd pounding softly call crashing
whispered noise blaring musical muffled sing buzzing
singing noisy drumming yelling shuffling quiet loudly silence
gunshot quietly shuffle clapping harmonic hear humming
mumble speak catchy shout symphony music whisper upbeat
booming listen melodic eavesdrop hum instrumental phone
tapping ear chatter sound heard raspy mumbling screeching
squealing sobbing voice rhythmic ringing hears stomping
ruckus talking rap trumpet echo quieter sounding cheering
commotion speaker boom decibel reggae muttering blasting
faintly siren whistling soundtrack thumping tune volume
stereo loud banging echoed playing deafening aloud yell
audio scream talk

Love

indulge closeness yearn love happiness attraction bliss passion
pride compassion touching kiss dearly kindness desire appeal thrill
profound unrequited tenderness passionate friendliness honesty
overwhelm revel crave attracted everlasting intimate joy
adoration fondness companionship empathy enjoyment
unfulfilled experience connection emotion feel commitment
satisfaction sympathy gratitude euphoria reciprocate

contentment interest togetherness loving affectionate affection
longing appreciation loved admiration adore lover unconditional
fulfillment sensuality brotherly lust ecstasy sincerity sense
ardent insatiable mutual devotion adoring blissful
elation sensual pure wanting lusty passionately cherish
fervent endearing yearning overpowering pleasure
intimacy

Lust

alluring ignite intensity rapture indulge desirable infatuation
happiness attraction compelling amorous overpowering
intensify desire thrill feverish passionate sensuality potent crave
arouse aphrodisiac enticing temptation passion satisfy intimate
adoration flirtation unrestrained intense fondness innate
sensuous magnetism connection affection emotion tenderness
primal satisfaction unattainable euphoria seduction heady craving
interest fiery fascination sensation uninhibited testosterone
admiration erotic feeling eagerness sinful lust ecstasy fulfillment
insatiable sensual jealously elation pure wanting lusty
longing coupling undeniable pleasure intimacy

Magic

earth kinetic conjure wizard immortality compulsion lore supernatural
reversal transformation casting invoke spell legendary
mythical magic ancient gifted summon fairy immortal
healer power witch elixir invisible aura charm theoretically powerful
cursed locator regenerate witchcraft wield alchemy destruction
mystical relic prophecy charmed morphing enchanted wand
hypnosis elemental illusion siphon mortal portal magician
summoning magical element unleash genie

Masculine

alluring cockiness attractively athletic cocky aggressive tattooed
jock arrogance masculine hormone dominate males
overpowering dreamy brutish stereotypical guy bulky
scruffy authority manly baritone hunky lad masculinity hunk
appeal surfer strong boy testosterone domineering male youthful dude
fella distinct charisma man chiseled puberty mentality

boys shouldered handsome ruggedintimidate stature figure
intimidating muscular brawny beefy attract physique athletically
biceps attractiveness stocky hormonal burly egotistical bodied
rowdy

Medical_emergency

medic birth swelling epilepsy ventilator ward pharmacy terminal
treatment trauma infirmary emergency biopsy surgeon
condition die pregnant diabetes relapse blackout
anesthetic injured antibiotic comatose bleeding flu
schizophrenicschizophrenia surgery stitch pneumonia coma
coroner health nurse 911 patient unconscious operating
miscarriage childbirth contraction pancreatic accident paralysis
tumor lifelessconcussion stretcher defibrillator cancer limp seizure
cancerous medication resuscitate bandaged labor transplant
paralyze intensive complication injure hospital revive bleed
bedridden examination unresponsive tuberculosis transfusion infection
morgue gurney overdose injection symptom physician
injury premature medically aneurysm medical diagnose
illness hemorrhage painkiller disease stroke recover anesthesia
rehab doctor sick panic breakdown fever sickness leukemia
unwell deathbed cardiac morphine wheelchair sedative
severe diagnosis ambulance paramedic

Medieval

gatekeeper armor commoner prince royal in-waiting servant knight
herald chamber barbaric peasant empire folk dungeon
armor medieval raider throne sultan majesty empress feudal
ancient palace relic joust king emperor ancestral conqueror
fortress crusade kingdom realm custom forge ancestor
noble castle dragon mercenary

Meeting

office paperwork planning participate announcement explain
discuss chat boardroom announce presentation brainstorm
colleague introduce supervise report arrange session
lecturer event acquaintance socialized schedule postpone email
assembly exchange socialize conversation privately cancel

conference attendance acquaint introduction interact visit tutor
consultation meeting project invite luncheon interaction
consult adjourn join briefing meet gathering supervisor
council scheduling seminar information upcoming discussion
arrangement attend collaboration convocation bonding plan faculty date
class lunch outing powerpoint inform client tutoring talk

Messaging

text query send device recipient respond status urgent computer video
notification messenger internet reply offline email exchange
communicate deliver incoming sender receive caption messaging
feed via mail communication private texts notify message
networking typing type relay memo phone copy info paragraph chat
write application coded attachment online answer document typed
alert letter response mailing contact

Military

sector ambassador warhead battleship mission battle captain
operative destroyer legion sniper division rescue nation scout rank
deployment enemy armored samurai troop uniformed squadron
battlefield invader ops coalition defender operation
battalion cargo bomber trooper uniform tactician
strategist admiral salute siege spartan lieutenant aircraft
rebel mobilize raider marine garrison naval army submarine
soldier militia tactical military commando duty cadet alliance
commanding colony arsenal dispatch regiment armada
armed unit corporal platoon warship soldiers recruiting
sergeant armory citadel artillery citizen training allied
general elite outpost pilot patriot airforce recruit
reinforcement vanguard fleet reconnaissance brigade
armored expedition covert infantry commander marksman
federation cavalry united personnel veteran medic camouflage
gunner squad freighter assassinate deploy patriotic weaponry
invasion scouting emperor fighter manpower enlist mercenary
chief colonel warlord

Money

drachma shilling yen money bail splurge bank treasury

employee worth paying finance dollar income allowance
buyer trade merchandise fortune prize banking wage deduct
financial receipt budget cost voucher employment investment
funding mortgage profit seller payday debit donate franc
repayment clerk monetary discount debt buck donation
millionaire membership credit banker retail trillion saving revenue
owe loan costly expensive bankruptcy lottery wad cent cash quid
change hundred nickel checkbook fund pricey bidding
buying count bill bargain coupon peso wallet compensation
rent tax currency buy mint ransom inheritance pay repay
earnings gambling pension gamble dime price bribe paid
cheque coin payment euro salary purchase paycheck
invest rupee sale deposit reward

Monster

inhuman alien fable superpower foe lore myth hunter predator
terrorize rogue legendary enemy feral hunt parasite immortal
ravenous monster savage ruthless monstrous vampire
extraterrestrial supernatural mutation undead ferocious
unstoppable witch legend wolf sighting danger extinct cursed devil
underworld mythological mutated superhuman mutate abomination
feared folklore mythical transformation mystical mutant
reincarnation demon villain fearsome deadly rabid hybrid demonic
creature vicious evil beast bloodthirsty werewolf dragon

Morning

toast showered coffee refreshed early awaken morning showering
tired groggy bacon waffle clock pancakes pancake oatmeal a.m.
cleaning slept errand wake cereal hour woke a.m sleeping
breakfast everyday hangover wakeup earlier rested alarm
omelet awake egg

Movement

walking dance move slow glide leap speedily manoeuvre swoop
rhythm sway kick waltz hit hop collide strut leisurely
retreat jump rotate swaying stroll zoom slide grab propel tumble
bounce carry sprint race movement run slower step jog
throw tug scurry motion turn swing climb shuffle suddenly

paced limp sweep walk spinning directly pivot skidding
proceed wobble smoothly swoosh forward abruptly
brisk wildly whirling landing lift catch spin sprinting fly
pull pace slam dodge dash swinging trailing chase whirl
stride fling gravitate circular waving wave upwards land
faster trudge dancing briskly gesture travel yank

Music

choreography background dance chord radio keyboard clarinet album note
drumbeat instrument theme playback cassette rhythm
harmonize choir piano practice onstage jukebox songwriting
dj song beat amplifier jazz rhyme band listening blast banjo
artist rapper disco soloist audience saxophone rock acoustic
gospel concert classical alternative chorus rehearse orchestra
lyric label violinist melody rendition solo bass rapping
guitar techno studio vinyl tuner sing lyrical stage soundtrack drumming
instrumental harmonic cd composer hear humming singing
tuning catchy verse gig symphony music tune upbeat ballad listen
melodic poster musician stereo drum karaoke choreographer
sound vocal recording record duet groove performer classic indie demo
rap tenor violin trumpet sings microphone dancing perform
guitarist songwriter drummer speaker harmony hum
percussion performance pianist composition reggae play rehearsing
collaboration flute rehearsal vocalist volume singer
inspirational audio musical

Musical

chord producer radio keyboard clarinet ballet harmonica glee
instrument production rhythm piano songwriting string song
songwriter band banjo artist audience saxophone acoustic
gospel quartet auditorium concert turntable medley
melody harp album chorus rehearse orchestra lyric violinist
rendition solo bass compilation guitar tuner genre sing impromptu
lyrical soundtrack drumming drum talented musically cd
composer singing classical theme interlude gig hymn
symphony music upbeat ballad melodic hum musician singer
instrumental burlesque soprano vocal video duet performer
classic soloist sax tenor violin trumpet mainstream dancing

perform guitarist actor note freestyle drummer harmony
performance pianist jamming composition reggae play jazz theatre
collaboration flute rehearsal audition vocalist tune nirvana
recital playing riff bassist audio musical

Negative_emotion

violent kill hell hate dieing death thinking hated crying surprised
hurting worse beat stop crushed break worst trouble
disappointed killed lost cry worried worst_part bad stupid
either die mean insane fucking scared hard dead beaten horrible
monster weak loose threatened punch killing blame reason
so_much_pain hurts losing wanted pissed care scary accident fault
guilty terrible swear last_straw heartbroken scare seeing drunk
terrified freaked raped frightened poor_girl lose angry fight
poor_guy hurt ashamed depressed unthinkable tortured crazy
confused sad hit alone lie afraid dying shocked angered
sick badly pain react wrong mad upset fighting furious

Neglect

negligence weariness fear suffer absence indifference suffering
detachment lunacy loneliness mistrust depressed withdrawal
intolerable cowardice humiliation emptiness loathing depression
helplessness worsen injustice hardship dejection sorrow
hopelessness separation pity unfulfilled carelessness despair
disappointment misery neglect emotion sufferer solitude
resentment cripple unhappiness devastation insecurity cruelty
failure negativity rejection bitterness guilt deprivation
unsatisfactory illness abandonment deprive torment
vulnerability anguish debilitating denial refusal betrayal misfortune
discomfort apathy inability

Negotiate

monetary appease barter diplomacy govern trade proposition wage
provision settlement contractor dispute merchant buyer
investor swindle benefit financially reasonable broker
negotiator persuade trading wager mortgage profit seller
spokesman supplier viable profitable repayment ration lucrative
consolation treasury debt retribution oversee trader envoy

feasible investment liaison contingency facilitate negotiation
alliance civil haggle loan bribery establish renewal
procure ploy concede compromise asset manufacture partnership
solicit favorable bidding loophole bargain ruse employ
compensation devise prevail guarantee sell reestablish ransom
price negotiate transaction commodity reward

Nervousness

unsettle weariness uneasiness fear anticipation paranoid nervous
paranoia terror nervousness embarrassment worried anxious
worrying stressful regret overwhelm scared irritation unsettling
worrisome confusion jumpy sorrow unease uneasy
tremor uncertainty discomfort emotion feel apprehensive
unhappiness impatience insecurity anxiety apprehension guilt
feeling panicky vulnerability fright agitation suspense tremble
worry afraid desperation anguish panic dread breakdown trepidation
curiosity stress jittery urgency

Night

sleepy rest midnight dark gloomy dreamt starry shadowy
sleepless oblivion night sleep blackout tired asleep dawn
nocturnal darkness nightmare moon bedtime nightmarish
nightly nightfall awoke dreaming slumber darker sleeping
tonight sundown blackness star dusk haunting darkening
nighttime moonlight darkened sunset dream

Noise

growling echoing barking tapping wailing rumbling pitch
resonate gasping crashing drumbeat staccato shouting
clamor shrill chattering crash honking intercom muttering
thump whistle shutting rattling reverberate blast screaming
grumbling booing uproar erupt boisterous audible clap crescendo
rustling crackle scuffle humming popping booming
thunder scraping pounding hollering bellowing crackling
noise explosion blaring smacking chanting buzzing
roaring shriek earthquake noisy hearing drumming creaking
yelling raucous noisily cheering loudly cracking loud gunshot
clashing clapping knocking harmonic squeak scuffling

groaning shout symphony storm music megaphone deaf thunderous
clanging volume bullhorn flapping pitched ear
chatter whirring amplify sound slamming squeaky crack
scratching screeching roar louder squealing holler slapping voice
gunfire ringing rattle stomping ruckus howling voiced
sounding bark snorting obnoxious boom thundering banging
loudspeaker blasting thunderstorm whistling rumble
crunching thumping clatter giggling snapping bang sounded
beeping deafening yell scream howl shrieking

Occupation

detective producer executive manager therapist actor electrician
occupation retirement office photographer maid cashier colleague
psychiatrist bodyguard psychologist qualified supervise politician
surgeon policeman businesswoman server journalist
housekeeper secretary attorney choreographer chef intern
lawyer interpreter employment retire nurse officer specialist working
hairdresser internship clerk job nanny waiter pediatrician pediatric
neurologist senator waitress retired profession entrepreneur
florist workplace service accountant worker singer catering
dentist technician analyst physician hire bartender hostess
consultant employ veterinarian caterer entertainer supervisor
publicist agent concierge coordinator receptionist accounting
inspector doctor owner assistant interview pharmacist chemist
foreman employee qualification workaholic businessman salary
baker banker gynecologist professional policewoman

Ocean

aquatic upstream fishing cruise underwater inlet flounder swam
whirlpool turquoise ship wave seawater pier mesmerizing
harbor seaside sailor bay sand dip seaweed fish turbulent
sea navy diving diver sandy blue oceanic swampy tsunami
pirate shoreline lapping surfer coastline ferry tidal algae
water mainland gulf lifeboat island coral swimmer aqua
scuba harbor seashore coastal majestic boat balmy submarine jetty
tropical pearl splash crab jellyfish shell shipwreck drown
typhoon reef misty sailing rippling saltwater anchor waterway
wharf dolphin vastness tide ripple salty nautical adrift

shimmering glacier sailboat depth port ashore beach surf lagoon dive
foam cove waterfront whale coast surfing yacht ocean shore
starboard swimming salt buoy

Office

office laptop bookshelf manager keyboard chair backroom staff
tablet clipboard employee folder administrative counsellor
colleague fax assistant supervise therapist consultant
computer organizing reception printing marketing lecture
schedule briefing binder advisor planner programming
registrar workplace secretary notify registration table cubicle
conference attendance projector desk copier tutor consultation
handbook typing timetable meeting blueprint paperwork
memo boardroom room presentation setup record informational booking
technician program supervisor desktop receptionist file
scheduling accounting organizer archive information
administration spreadsheet application client intercom interview
document typewriter administrator briefcase roster assist director
pager building workstation headquarters organize agenda

Optimism

perseverance enjoyable yearn happiness knowledge hopeful encourage
better eager enthusiasm pride joyful hope motivated elated expectation
anticipated ambition adventurous desire cheerful success
thankful optimistic friendliness triumph enjoy honesty liking
optimistically enjoyment hopefully progress satisfy willing entertain
surely exciting mindset faith outcome uplifting gleeful
outlook love delighted endeavor confidence rejoice positive
motivate intention wonderful lovely happy overjoyed excite
appreciation determination glad heartwarming optimism
excited excitement future fun joy feeling persevere motivation
eagerness worthwhile willingness encouragement elation ecstatic
thrilled curiosity enthusiastic appreciate validation

Order

authorize respectfully follow superior explain shout restrain
dispatch immediately comply servant sternly enforce
direct authority bluntly leader obey authorization in-command

motion duty insist summons instruct speak charge proceed
ordering mastertell demand instruction commandant declare
dutifully supreme dictate advise repeat demanding commanding
assertive request rule chief authoritative command order

Pain

bruise kill suffer painfully stabbing terror kick harshness hurting
hit torture stung suffering moaning fall screaming loss
excruciating tear kicking cry bad headache bleeding
scared inflict prick heartache whimper slapped anguished
pounding sick despair beating tore wail pained pressure
struggle puncture ache harshly shriek bleed shaking
misery burning feel bloody screamed panicking paralyzed
uncontrollably injure angry painful groan hurtful hurt grief sore
wince soreness flinch tortured endure sobs thrash feeling
stinging sting torment scar anguish afraid migraine
agony wound aching spasm injured badly pain unbearable muffled
stab agonizing wrenching paralyzed crippling bruised
pinching scream

Party

summer exclusive dance wedding kickoff booze planning costume
participate barbecue drinking prom theme excited evening
blowout banquet celebrate formal gift venue partying
concert house rave reunion event special graduating attend
anniversary surprise festive socialize host come bash celebration
invited graduation nightclub festival dinner frat fraternity
invitation promotion homecoming family drunk fundraiser cancel guest
engagement celebratory extravagant friend happy invite club excite
award brunch present decoration holiday fun gathering
gala partied stripper ceremony dancing clubbing party
ballroom drink birthday plan date outing thanksgiving

Payment

refund cheap financially cheaply bail wage splurge rental owe
treasury debit worth paying generously dollar credit buyer investor
bank banking repayment deduct financial receipt cost
voucher employment insurance funding mortgage profit cash

seller payday affordable 5000 marketing clerk payroll
monetary tuition discount debt reward allowance revenue
loan fundraiser cent expensive bankruptcy fee quid monthly
payment overtime checkbook 400 cashier fund pricey
transaction buying customer bill bargain wallet compensation
tax currency rent finance ransom bankrupt inheritance
pay repay investment income pension price negotiate paid
donation visa cheque salary purchase paycheck expense
banker deposit bribe overdue

Pet

feed vet buddy furry prancing hind ferret snake kitten rodent puppy
parrot bunny piggy breeder kennel ears petting scruffy bark cat
pet feline affectionately goldfish pup retriever tortoise
carrier grooming reptile walk horse wag breed poodle collar leash
bulldog rabbit cuddly pig hound growl paw zoo animal kitty
terrier wagging snarling chasing dog

Philosophy

interpretation diplomacy religious reasoning knowledge teaching
enlightenment norm righteousness intellectually symbolism literacy
theory ethical learning intellect educate philosopher religion
humankind ethic perception idealistic doctrine ideology logic
radical intellectual philosophical moral enlightened morality theoretical
mentality societal wisdom virtue morally accordance
socialist utopia history pessimism theology democracy
enrich conflict belief literature philosophy psychology academic
democratic

Phone

cellular text automated blocked disconnect vibration answered
device digit texts signal calling rung button respond operator
unlock message loudspeaker dial cell speak 911 screen dispatcher
incoming vibrating receiver messaging rang number
hotline ring service beep call jingle listen phone dialing
beepercaller ringing ringer handset telephone receptionist
earful speaker answer charging cordless communicator
cellphone mobile switch contact hear hello talk

Plant

pollen cherry underbrush sprout wreath hillside olive greenhouse
thicketgrape sunflower field willow rose fenced bouquet flowered
wood fig verdant gardenmow cedar tropical forested
hedge botanical prune wooded freshlyvibrant patch gardener
sparse bamboo ornamental meadow fence greenery lavender
crop multicolored pasture cactus colorful orchid swampy
dense shrub overgrown flourishing scenery wheat dirt herb stem
courtyard flowering algae wildlife farmland yard blossoming
grain berry daisy uproot canopy shaded flower exotic trim
earthy fertile fragrant fern wither backyard thatched potted
grazing landscape lime lilac blossom watering bush
vineyard acre overhang cypress centerpiece landscaping
walkway harvest uncut edible wilt apricot tree ripen dew
foliage blooming mound grass root decorative withered
grassy ripe soil lush cluster seed spruce pond leafy cotton mountain
colorful woodland pine oak forestry forest branch
pathway vegetation evergreen succulent plant compost
planting farm mulch rainforest pear springtime weed fruit moss
birch fertilizer leaf vase bloom lawn orchard flowery grove
thorn tulip thorny prickly jungle shade clearing grassland

Play

wrestle golf disc buddy basketball winning pinballhockey
soccer jukebox goof dj game competitive cd toddler token
fiddle bowling doll participate wrestling play scrimmage
skateboarding sport entertainment multiplayer playground
juggle charade football trampoline guitar baseball kiddie card
boy carnival skateboard win badminton comic prank bingo toy
arcade tennis checker twister controller cinema child
monopoly trick tag silly fun hobby inflatable banjo player
balloon chess gamer gaming ball watch poker rematch kid
lacrosse theater instrument volleyball playing

Politeness

cheerful thoughtful grateful attentive considerate mannered
earnestly admirable friendly obedient earnest politely

charmingly kindness helpfulplacate respectful compassionate
greeting courteous civilityunderstanding amicable gallant
gentleman appreciative honorable doting caring pleasant hospitable
dutiful friendliness compliment hospitality gentlemanly subtlety
empathetic gratitude unselfish mollifypoliteness agreeable
ladylike formality charming approachable flattery admiration
kindly accommodating deserving manner cordiallikable sincere
sincerity genuine dignified nice flattered amiable
polite reverence humble humbly

Politics

diplomacy jurisdiction controversial candidate liberation presidential
citizen policy communist dispute division nation governunify
republican dictatorship spokesperson consensus delegate loyalist
committee senate national extremist election constitution
conservative activist corruption nationwide monarchy leadership
advisor revolutionary influential controversy ideology senator
negotiation amendment elect fundraising campaign community
doctrine sovereign aristocracy tyranny parliament overthrow
representative declaration federation politician society
socialist governor ruling politically liberal citizenship conspiracy
council politics regimeprovincial diplomat democracy
divided monarch province advocate congress philosophy
decree ambassador involvement democratic

Poor

monetary unemployment financially welfare suffer negligence wage
smuggling pitiful alcoholism finance penniless unemployed
suffering orphaned resource shortage starvation financial
squander orphan immigrant famine scarce corrupt misfortune
funding populace malnutrition job slum debt joblesslaborer
unpaidmisery poverty neglect sacrifice homeless bankruptcy
haggle afford charity budgettrader beggar deprive servitude
bankrupt meager earnings income widespread economy
poor donation malnourished filthy salary failure charitable

Positive_emotion

happiness enlighten better enthusiasm pride joyful compassion dearly

forgiving kindness bravery closure thrill honestly
triumph bond honesty alive concern reunite joy
surprise forgiveness assurance sympathize understanding
reason rejoice care faith great empathy certainty keep trustworthy
affection cherish emotion love family trusting respect
trust gratitude confidence adoration friend happy overjoyed
determination reassurance glad loved admiration wish
accomplishment optimism excitement convince hope freedom
feeling eagerness willingness sincere sincerity honest genuine
comfort elation thrilled loyalty curiosity unconditionally
proud

Power

unified hierarchy govern superpower superior knowledge destroyer
overthrow kingdom ranking ruler nation royalty destroy
resource lineage execute persuasion dictatorship capability
enforce force authority obey defend leader power veto monarchy
leadership oppose emperor alliance indestructible powerful
rank sovereign respect manipulate law influence obedience
fight master authorization privilege domination demand king
invincible ruling control supreme surpass command
supremacy enforcer dictate strength monarch commanding alpha
magician fighter rule responsibility

Pride

integrity happiness heroism overcome righteousness unbeatable
ambition smug dignity success proclaim victory
proudly mighty triumphant exuberant recognition applaud
honor fortitude joy leadership gloat heroic jubilant joyous
truthfulness curiosity overshadow satisfaction resilience confidence
victorious contentment succeed reign determination admiration
pride conviction glory accomplishment joyful determined praise
supremacy gleefully boldly elation triumph reverence achievement
proud glorious

Prison

gatekeeper chain kill bail abduct arrest charge restrain prison torture
hostage interrogation jailhouse compound burglary execution

cage policeman chamber investigate imprison security
manslaughter correctional imprisonment captive dungeon
trooper cell barricade officer murderer occupant cop
convict trial ambush overseer vault secure facility sentencing
guard inmate platoon patrolling escort citadel confiscate confinement
ward outpost captivity walled locked sentry containment executioner
patrol apprehend lock escape escaped enforcer authorities
capture informant secured surveillance guards vandalism
underground gate confine cuffed perimeter criminal warden
prisoner penitentiary shootout blockade jail

Programming

code protocol operate developer desktop program
technological input grid transmission server simulator administrator cyber
computer network internet microchip email screen processing
interface installation programmer technical programming processor
software robotics coding engineer data system prototype
module automated analyst compute mainframe browser
website tab file technology binary format virtual application
coded document activation information computerized virus icon
tracking database navigation robot tech

Rage

discontent spat unbridled enraged infuriate visceral aggression
pent spite disgust outrage indignation murderous hostility
intimidation livid snarl fearsome uncontrolled lunacy revulsion
ruthlessness sneer mistrust repressed malice potent intensity
displeasure irritation savage loathing hysteria vehement
venom hiss ferocious annoyance menacing unrestrained reproach
disdain roar flare hatred emotion unrelenting madness
angrily resentment accusation devastation wrath angry torrent
dissipate fiery threaten ferocity bitter onslaught
uncontrollable frustration twinge cruelty terror hateful darken
savagery brutality rampage rage bitterness irate enmity boil
venomous temper implacable agitation fury snarling
fiercely aggressiveness anger anguish contempt growl
fuming desperation angered mockery betrayal vicious
bravado boiling vengeance fierce animosity vengeful viciously

ablaze seething unleash furious menace

Reading

essay ideas thesis research note writer writing literary overview
enjoying memoir homework descriptive read reader diary
literacy summary informative page paperback reference
series excerpt library edition compile review publish
creative reading compilation exam dictionary booklet
journal binder teacher chapter commenting informational study
prequel revise comment manuscript rant learning comic
fiction poem story script quiz quote handbook editor website novel
paragraph novella history dedicated textbook nonfiction
yearbook biography autobiography anthology author studying
poetry write book composition revision literature description
assignment summarize class synopsis encyclopedia narrative

Real_estate

duplex suburban cheap upkeep mansion rundown guesthouse
residential contractor plantation local finance buyer rental
decorator debt landlord neighborhood house owner trading
advertise insurance neighborhood investor mortgage seller
relocate remodeling affordable profitable broker apartment
condo tenant farmland auction residence negotiation
advertisement community renovate townhouse expensive
bungalow monthly housing commission acre buy landscaping
bookstore cottage town budget banker compensation
property supervisor estate resident tax upscale rent
remodel sell brownstone manor farm price ownership waterfront
renovation realtor purchase transaction invest ranch sale client rural

Religion

pope sanctity deity religious worship devoted divinity pray
mosque unity commandment righteous scripture
righteousness glorify virtue orthodox congregation historic govern
symbolism pious missionary immoral sin priest steeple
gospel fertility revere preach ethical worldly pledge blasphemy
sabbath preacher cathedral divine hymn decree pew religion
funeral belief satanic superstition devout cult pagan universally

bible rosary revival expressly prophet ritual ideology crucifix
superstitious apostle testament distinction symbolize salvation
messiah vicar reverence cemetery symbolic spiritual
penance moral doctrine church sermon convent renewal
archbishop obligatory communion saint biblical altar repentance
pastor societal folklore extremist morally pilgrim
society socialist believer baptism devotion
reincarnation monk crusade prayer condemn brethren offering
parish repent shrine sacred pilgrimage disciple covenant mecca
blessing monastery philosophy mankind proverb tradition
morality profess cultural theology sect fundamental
sinner

Restaurant

serving food dish barbecue menu cheeseburger cashier pesto
coffee cappuccino deli dessert appetizer lunch fancy cook
delivery iced hostess risotto server steakhouse subway steak
tray meal burger takeout entree lobster booth canteen
spaghetti pizzeria champagne bistro pub pasta kitchen
coffeehouse diner eat restaurant waiter vegetarian ordering
dinner waitress dine suppertable gourmet caviar ravioli luncheon
serve catering eatery brunch chef customer grill salad
tavern fries inn mall pizza counter hamburger lunchtime sushi
swanky upscale downtown cafe breakfast cuisine
dining lasagna establishment sandwich cocktail cheesecake
buffet outback taco reservation plate platter seafood order
bakery wine

Ridicule

ludicrous imitate spite scold degrading taunt sarcastic resent jibe
belittle affront snide exaggerate contradict idiotic stupid cynical
preposterous dumb demeaning insulting childish mockery
jokingly disprove hilarious scorn silly cynically insulted
disgraceful hypocritical humiliating detest laughable unbecoming tease
joke ridicule foolishness audacity retarded cynic mortified
humor cowardly vulgarity teasing laugh comeback wimp
comical petty irritate insult derision blatant bitterly
hurtful hypocrite appalled humiliate annoy judgmental silliness

outrageous offended embarrassing disapprove weirdness jest ironic obnoxious blatantly provoke stupidity amusing mock rude scoff amuse retort absurdoffend

Royalty

ambassador queen aristocrat prince baron homage regent royal regal descendant crest ruler nation royalty wealthy successor lineage knight tyrant honored crown duchess elegant mightyempire decree renounce feudal honorable monarchy extravagance treasury dutiful princess throne daughter sultan adored castle honor duty duke majesty birthright empress elder majestic wealth illustrious sovereign imperial privilege aristocracy magnificent honorary heir reign lord king ruling heiress conqueror coronation distinguished insignia kingdom supreme palace crowning respected crusade council bow diplomat realm esteemed monarch noble princely chieftain prestige tradition rightful emperor emissary grandson pampered rule treason nobility

Rural

ramshackle barren cornfield schoolhouse quaint plantation townsfolk folk forested idyllic scenic farmhouse meadow uninhabited prairie migration southwest settlement farm wheat outlying farmland environment settler road secluded colony county village campground landscape vineyard west locally lakeside live acre farming farmer wildlife landscaping western cottage valley heartland bungalow property tractor grassy pasture cultivate picturesque woodland isolated barn province agricultural countryside resident grove ranch south grassland rural inhabitant

Sadness

discontent denial weariness uneasiness diminish fear suffer happiness spite sufferer nostalgia cripple discomfort betray terror tormented mournful troubled overcome depressing suffocation gloom weakness void condemnation insomnia resent scorn suffering mourn burden disappoint saddened loss profound loneliness dejected mistrust strife depressed distrust repressed sympathize unrequited wariness lethargy regret

overwhelm somber turbulent malice yearning irritation
selfishness miserable depressive emptiness loathing depression
concern heartache depress helplessness darkness forlorn
remorse humiliation distraught despairing turmoil melancholy
hardship sorrow pained hopelessness innocence deceit mourning
reproach sullen pity numbness uncertainty heartbreaking
stricken despair disappointment misery hatred sorrowful
emotion madness distress jealousy solitude inexplicable
resentment sympathy unhappy cynicism remembrance unhappiness
devastation impatience insecurity agitation dissipate frustration
exhaustion dismay pessimism cope twinge cruelty unending
failure drown dismal boredom overwhelming pitiful negativity
harshness apprehension anxiety rejection evident
indescribable isolation grieve bitterness tortured sadness guilt
endure unfairness emotional feeling bittersweet unease
vulnerability empathy abandonment sad shame torment anger
anguish contempt unbearable jealously desperation agony
heartbreak resignation conflicting pain mockery betrayal
despondent wallow longing tragedy grief greed apathy
crippling depth shameful

Secret

hiddensecret secret hiddenhiding secrets dark_secret identity
true_identity many_secrets concealed uncover so_many_secrets
protected hiding identities public_eye plain_sight hide dark_secrets
mystery secrecy unveiled big_secret prying_eyes true_nature
revealed huge_secret treasure hid safe intact ruse true_self
unseen watchful_eye sheltered discovering real_identity discover
treasures other_world Hiding lurking existed

School

essay schoolers recess advisory administration participate geography
kindergarten culinary program teaching literacy homework
geology school primary preschool secondary term schoolwork
sophomore university performing journalism handout composition
honor auditorium mathematical lecturer testing library college laboratory
subject graduating educate grading veterinary freshmen
research registration experiment lecture principal math biology

exam sixth tuition binder dorm teach 101 teacher enroll geometry
study economics graduation drama period elective grade schooling
2nd semester learning elementary orientation attendance
transfer physiology examination scientific assessment academy
gym extracurricular instructor junior midterm science
enrollment locker learn doctorate history textbook engineering
accounting academically yearbook campus seminar practical
educational education technology preparatory graduate application
civics test mathematics tardy arithmetic calculus administrator
literature attend algebra assignment diploma lab detention
student faculty freshman astronomy class classroom tech
classmate studying chemistry tutoring scholarship

Science

evolutionary archeologist invent scientist extraterrestrial advancement
literary researcher program technological geology specimen
innovation progress advanced literacy evolution lecturer
mathematician microscope archaeologist testing discover library
astronomer invention cloning quantum laboratory theory
genetics operation veterinary publish research physiology
experiment mutation formula engineer math discovery
specialist biology scientific component physicist
anthropology hypothesis teacher biologist geometry study
experimental software robotics learning experimentation
pharmaceutical computer genetic prototype theoretical
mutate curriculum atom technician inventor molecular
science dissect forensic project doctorate procedure
forensics textbook sample engineering technology radiation
subject chemist development evolve lab anatomy astronomy
class database documentation robot analysis revise behavioral
chemistry

Sexual

kiss kinky spanking horny porno violate frisky cheating hump attraction
attractive condom cum pleasurable hormone sucking smut
touching preference rape indulge desire erection consensual
naked quickie passionate sensuality porn heated sex steamy
orgasm erotic arouse sexually pornography harassment aroused

aphrodisiac intimately hormonal intercourse inappropriate attracted
sexuality passion flirting fetish satisfy intimate fantasize sexy
testosterone tease abstinence violence penetration vaginal
threesome pornographic virginity seduction teasing fantasy
romantically manhood lewd moan stimulation virgin vagina relationship
thrusting nudity uninhibited penis romantic inexperience flirt
innuendo suggestive mature lover kissing sultry provocative
climax topless prostitution lust ecstasy whore infatuated
seduce sexual heterosexual sensual seductive homophobia lusty
libido enjoyment promiscuous sensuous pleasure perverse
lesbian prostitute coupling yearning explicit grind
tantalizing intimacy oral masturbation

Shame

discontent cockiness uneasiness suffer arrogance betray disgust
terror pitiful indignation deceit judgement shameful burden
sorrowful dejected mistrust distrust foolish cowardice
wariness regret humiliation overwhelm irritation miserable
loathing helplessness confess bad remorse scorn devastation
sorrow pained unease embarrassment hopelessness betrayed
tragedy carelessness guilty foolishness stricken disappointment
misery consequence remorseful emotion feel saddened realization
deception intention hurtful cruelty hurt failure ashamed
negativity harshness rage guilt feeling disgrace sad shame
anguish contempt deserve stupidity worry ugliness
disappoint momentary conscience pain betrayal heartbroken
heartbreaking animosity judgment undeniable crippling
dread agony

Shape_and_size

rounded enlarge shape enclose dainty corner diagonally minuscule
compact giant spacious circle rectangle trim triangle
boxed big little shaped sized small round smaller colossal
frame inverted slanted horseshoe large appear squared
roomy expansive diagonal cylindrical gigantic enormous side
miniature massive diameter oversize square boxy oval
smallish dome size area stretch tiny structure wraparound
flat form crisscross triangular sizable outline rectangular

	mound	mini	cylinder	sizable	curved	gargantuan	huge	spaced	bulky
	blob	circular	domed	resemble	cramped				

Ship

sail	rocket	deck	battleship	steamer	fishing	cruise	helm	convoy	
	captain	underwater	lake	crew	rudder	boating	dock	seawater	
	skipper	upstream	pier	harbor	rowing	coastal	armada	sea	
	overboard	port	transport	cargo	rigging	seaman	pirate	hull	
	diver	ferry	marine	cockpit	river	lifeboat	titanic	shipping	
	anchor	aboard	coastline	voyage	float	harbor	sailor	vessel	
	navigator	boat	lighthouse	warship	canoe	submarine	raft		
	shipwreck	oceanic	reef	commander	dolphin	berth	sailing	fleet	
	shark	wharf	crewman	surface	tide	nautical	ship	waterway	
	ark	adrift	sailboat	tempest	freighter	rower	wreckage	yacht	
	ocean	mast	lagoon	starboard					

Shopping

shop	selection	overpriced	cheap	splurge	cashier	restock			
	customer	coffee	vendor	tourist	food	salesperson	buyer		
	merchandise	bag	convenience	stuff	rack	clothes	antique		
	jewelry	product	voucher	advertise	boutique	novelty			
	seller	grocer	dealership	expensive	affordable	souvenir	discount		
	supermarket	bazaar	aisle	diner	auction	inexpensive	storefront		
	browse	retail	emporium	necessity	shopper	supply	coupon		
	florist	jeweler	market	toy	ordering	locally	haggle	errand	mart
	checkout	store	buy	shopping	brand	kiosk	pricey	bookstore	
	mannequin	ware	buying	town	grocery	drugstore	budget	mall	
	marketplace	plaza	boardwalk	upscale	sell	convenient	handmade		
	roadside	warehouse	to-school	isle	stock	shopkeeper	designer		
	price	collection	catalog	spree	purchase	goodwill	consumer		
	sale	bakery	outlet						

Sleep

sleepy	rest	sleep	bedroom	yawning	mattress	hammock	blanket	
	tiring	crib	cushion	wakeup	dreamt	awaken	laying	
	morning	sleepless	quilt	tired	asleep	snoring	undisturbed	
	bedding	lazily	lazy	bedtime	awoke	dreaming	sheet	slept
	peaceful	exhaustion	resting	relax	hotel	slumber	bed	exhausted

half sleeping tonight comfortably lull comfort nap settle
nighttime lay nightmare napping pillow dream

Smell

urine aroma revolting rot decay disgusting sulfur citrus toxic
overpowering tantalizing bleach sanitary sinus stinking
flavoring tobacco freshness perfume delightful nose
sewage fragrant lavender potent cologne stuffy intoxicating
enticing alcohol acrid musty polluted detergent rotten
sweat nastiness repugnant cigar mildew whiff odor lotion
pleasant spray chlorine vinegar sniff incense repulsive
distinct cinnamon smoke disinfectant stink smelly scent stench
inhale scented earthy heady overpower unpleasant fragrance spicy
flowery fishy gag sulphur rotted spice vanilla vomit stale fruity
cleaner coconut taste deodorant marijuana manure mint
lemon concoction aromatic cloying smell cigarette smelling
pungent rotting delectable feces axe fresh skunk

Social_media

follow web tablet homepage bio onscreen facebook password texts
follows

Sound

growling echoing murmurs barking wailing resonant
rumbling pitch melody gasping drumbeat loudspeaker
pounding shouting shout thunderous clamor shrill chattering
resounding panting slamming moaning rattling reverberate
screaming grumbling audible crescendo monotonous rustling
crackle louder static scratching hissing snoring humming
popping booming baritone thunder whimper resonate
staccato bellowing noise explosion blaring wail thump
smacking chanting whistling roaring shriek drumming
creaking yelling raucous roar vibration loudly footsteps
noisily gunshot clapping echo whispering ring buzzing
gurgle groaning monotone symphony music rhythmic clicking
hum volume hear pitched ear strident whirring
amplify sound squeaky raspy mumbling screeching gruff
squealing slapping voice gunfire melodic ringing rattle

stomping ruckus howling voiced sounding bark thud scuffling
commotion speaker boom thundering decibel hammering
crunching blasting muffled clanging rumble thumping
clatter giggling loud snapping banging echoed sounded
incessant beeping deafening hushed tapping scream
howl shrieking

Speaking

saying murmurs sentence understandable query conversation
announcement pause explain shout announce stuttering
mention politely lecture interrupt term hello greeting
respond interruption learn stern pronounce hush imply manner
hoarse chuckle vocabulary hushed bluntly seriously reply
refer whispered interrupting slur monotone communicate clarify ask
teach fluently interpret remark joke swear context act
restate argue recite quietly tone murmur spoken rant laugh
whispering mumble speak spoke introduction question insult tutor
pronunciation call statement whisper translate tell
speaking apologise mutter warn understand sound word language
raspy mumbling gruff gibberish voice agree talker lilting talking say
voiced phrase sounding clearly assure inquire suggest discussion
speech emphasize answer mock dialect repeat translator meaning
slurred serious formalities apologizing retort inform mimic aloud
yell accented talk

Sports

coach golf athletic sporting competitive fishing participate handball
captain coordination golfing scoring gymnastic sprinter
dribble coaching hockey halftime soccer footballer
goalie polo swim workout practice layup warmups kickoff net
school hitter skills rowing playoff swimsuit fitness athletics
cheerleader surf sneaker turf wrestling gymnasium competition
scrimmage ball gymnastics skateboarding racket sport goalkeeper
dugout uniform score jock linebacker exercise dunk
trampoline outdoor baseball jog teammate boxing trophy
league pitching rugby gymnast jogging derby skiing volley
swimming trainer outfield hiking hoop snowboard badminton
champ touchdown racquet basketball cycling sporty swimmer

tennis stadium umpire tournament referee gear fanatic gym
cheerleading court varsity extracurricular elite lifeguard practice
judo warmup undefeated athlete mascot match wrestler
bowling biking skating runner pro player snowboarding
batting champion sideline yoga fencing backstroke field
quarterback club play championship equestrian track football
memorabilia running softball medal lacrosse surfing
volleyball cheer regionals compete spectator tryout professional
playing scholarship

Stealing

monetary responsible theft violation rob jurisdiction valuable
burglary nefarious victim felon mobster crime penalty
arrest prison criminal offence liability fraud accuse swindle
heist investigate robbery liable notorious steal thief stealing
accomplice culprit unlawful investigation suspect custody
convict instigate felony fugitive cheating cop involved
violence trial mugging commit smuggle shoplifting
infraction sentencing smuggler punishable petty burglar
forgery illegal eyewitness possession confiscate smuggling
robber offender outlaw abuser loot property scam evidence thug
stole piracy allege discredit trespassing witness vandalism
illegally kidnapping raid pillage prosecution assault abuse addict
authorities law mastermind stash jail trafficking perpetrator

Strength

perseverance athletic resistance competitive battle aggressive resourceful
agile solid might overcome advantage unbeatable courage
courageous bravery resolve invincible withstand brave force
weight hard manly toughen defend willpower indestructible resilient
power fearless empower unstoppable strong rely adversity
tough toughness powerful determine formidable resilience
confidence leverage intimidating brute overpower dependable
survive superhuman agility crushing powerfully determination
gain flexible effort muster admirable harder hardest
determined control bravely exert strengthen willed muscular
strength incredible skillful endurance build headstrong though
unyielding fierce assertive fighter sturdy forceful stronger

Suffering

torturous yearn kill fear suffer death painfully prolong tears
stabbing terror tormented pitiful hurting grievous worse
torture mercy suffering mourn burden loss brutality
excruciating cry strife discomfort indescribable throbbing regret
crushing inflict miserable emptiness loathing strangle
depression perish heartache misfortune helplessness nightmare
whimper searing bad anguished exhaustion beating
turmoil hardship sorrow pained broken hopelessness ache
numbness vulnerability terrible despair misery heartbroken
sorrowful madness burning unhappiness paralyze devastation
afflict injure tragedy injury painful bloodshed hurtful cruelty
hurt grief wince overwhelming cruel captivity rejection
soreness grieve inflamed tortured sadness trauma guilt
emotional feeling powerless horrific abandonment stinging sting
torment anguish weaken unbearable debilitating desperation
agony wound heartbreak aching relive injured badly unimaginable pain
sacrifice betrayal damaged heartbreaking stab agonizing
betray destruction longing dying devastating helplessly severe
scarring wounded scream

Superhero

disguise costume superpower legendary cape identity knight
armoured samurai logo superhero masked epic hero hulk
ranger gauntlet legend heroic garb mascot robin insignia
mutant armored classic phantom symbol cartoon
headdress sidekick marvel

Surprise

stunned utter comically astonishment terror enthusiasm surprised
puzzled speechless enthusiastically bewildered flabbergasted
shock shocking unexpected unbelievable unexpectedly delightwow
amusement mystified surprise stun outburst gratitude
boldness joy amazement gleeful expression panicked froze
suddenly realization aback revelation breathlessly realization
overjoyed reaction beaming curiously astonished astounded
excitement exclaimed grin awestruck fright momentarily sudden

sincerity perplexed dazzle awed elation recognition horrified
excitedly puzzlement ecstatic astounding curiosity gasp awe
alarmed shockingly pleasantly surprising amuse amused
astonishing amazed

Swearing_terms

hell nasty bad whore curse screwed ass disrespectful swear bitch crap
damn bull damned fuck shit bastard hoe moron rude mad
retard

Swimming

bathing deck splashing goggles underwater swam soaking lake
swim seawater paddling seaside saltwater swimsuit eel
fish sea diving sport diver paddle dunk surfer outdoor tubing
water drowning river swimmer swimming float seashore wade
boating frog splash dolphin freestyle riverbank lifeguard
bikini scuba shark plunge pond floating waterway backstroke
bobbing catfish beach surf shoreline dive pool surfing
ocean shore lagoon

Sympathy

gentleness unhappy compassion mourn kindness saddened loss
sympathize miserable concern conscience empathize assurance
sympathetic understanding consolation fondness pity empathy
friendliness heartbroken emotion distress humility sympathy
empathetic grief grieve feeling affection sincere sincerity
genuine sympathetically disappoint condolence forgiveness
heartache

Technology

laptop radar spacecraft scientist keyboard hack developer web
upgrade console tablet handheld desktop firewall
program technological integrate format gadget digital grid cellular
advanced transmitter cable futuristic malfunction portable
simulator manufacture computer cloning download laboratory
programmer server hacker network nuclear multiplayer research
internet electronics microchip sensor 3d invention scientific
screen interface generator technical programming intergalactic

router navigation processor experimental software scanning
battery communication coding glitch researcher operational
engineer projector powered system connector camcorder
automate typing spaceship wireless optical module solar
technician outdated inventor ipad prototype compute
mainframe install hacking browser website interactive
scanner nexus monitoring site quantum engineering technology
binary virtual online android gaming satellite innovative
computerized virus messaging device data cellphone database
mobile robot cyber tech machinery audio

Terrorism

11-Sep bomb unrest rebellion bombing abduct catastrophe assassination
infiltrate homeland criminal global hostage nation abduction
vigilante terrorism annihilate enemy quarantine loyalist
hijack atrocity extremist firepower infiltration explosive
anarchy annihilation bomber nuclear evacuation sabotage
espionage orchestrate explosion fugitive rebel revolutionary
propaganda soldier ambush threat anarchist eradicate nuke riot
overthrow evacuate missile syndicate warfare aggressor
coalition extermination grenade conspiracy casualty
terrorist warhead assassinate kidnapping uprising genocide
invasion mastermind destruction mercenary

Timidity

sympathetic shocked observant nervous concerned passive
obedient innocent mannered personality guarded bashful
shy anxious demeanor uncomfortable intimidated jumpy
unsure demure weak uneasy terrified bothered cautious
hesitant coy antisocial quiet apprehensive unnerved
embarrassed secretive depressed wary meek fearful nerdy skittish
panicky geeky reserved frighten shyly gentle protective
afraid flustered insecure polite fragile timid shyness jittery

Tool

rod surgical butcher hack equip flashlight handheld stabbing
cutter gadget screwdriver cutting drilling locked defibrillator
transmitter lever keyboard computer hammer wire trusty claw

knife belt casing hatchet cog 9mm supply device scissors
sledgehammer razor wield attach armory sharpen gear tool
precision crate scalpellaser launcher blade detonate sheath
mechanic latch welding blueprint manually hardware rig
ax gizmo rotor shelving mechanism machine equipment
furnace machinery contraption sewing machete weapon
metal wrench axe

Torment

torturous victim suffer dreadful senseless cripple depravity
terror tormented torture taunt condemnation resent loath
suffering mourn grueling humiliate terrorize excruciating
ceaseless grief imprison starvation intolerable relentless
penance humiliation turmoil depraved inflict miserable
helpless helplessness nightmare hardship taunting scorn
beating despairing endure bully humiliating sorrow
revenge mourning hopelessness nightmarish ridicule harass
despair misery sadistic punishment vengeful sufferer
brutality wrath mercilessly hellish captive bloodshed wretched
punish cruelty captivity countless abused cruelly grieve soul
tortured cruel merciless afflict horrifying horrific sinful
onslaught torment brutal anguish unbearable agony unforgivable
pain inescapable vicious insanity bullying abuse ruthlessly
agonizing torturing

Tourism

embassy location holiday leisure cultural historic tourism
recreation scenic seaside architecture populated culture
export port theatre locate souvenir lucrative bazaar wildlife
tour museum aquarium colony coastal accommodation sightseeing
visit vacation tourist abroad exhibition hotel downtown
western brochure commerce international itinerary ferry
exhibit metropolitan migrate travel gallery renowned lakeside
outing landmark geographic

Toy

handball coloring buddy harmonica pinball hockey dinosaur doll
play bounce seesaw skateboarding racket sport superhero

boogie football trampoline guitar entertain imagine precious
box yarn baseball softball puppet basketball arcade teddy
stuffed toy buy child monopoly pretend trick fun player
trumpet sideline miniature balloon handmade chess
toddler ball collection kid volleyball playing

Traveling

taxi move embassy cruise find resort suite holiday tourist far
detour international arriving shop scenic leave went heading
populated traveler port hostel camping motel someplace
relocate booking transportation venture souvenir
packing cab luxurious accommodation luggage route
explore excursion tour journey airline expense depart
touring limo lodging campground disembark sightseeing
spending destination visit vacation abroad expressway flight
passport bus hotel downtown brochure runway boarding
metro getaway itinerary suitcase ferry arrive transport
traveling secluded navigate departure inn airplane trip
travel airport wander depot map staying stay
overcrowded plane adventure waterfront drive baggage landmark
rural overseas

Trust

obligated convinced save safe loyal truth friendship honesty deal
confess connection defend understanding care capable
wrong trustworthy assure confide reassure commitment promise
respect trust truthfully prove intention secret compromise rely
relationship TRUE matter convince agree trusting honest guarantee
faithful deserve responsible responsibility truthful advice
loyalty entrust friends upset reputation honestly

Ugliness

despise balding slimy acne grotesque degrading horrible fat
diseased repulsive awful nasty brutish grotesquely distasteful
unworthy scruffy chubby gross insulting crooked revolting
unappealing hairy pathetic cockroach abnormally unsightly
crippled lousy wrinkled freakish disfigured disgusting
pudgy tacky obese disgust degrade horrid deformed hideous

bloated ugly scum demeaning pig obnoxious blob wart disgraceful fatty bald overweight disgusted unattractive wrinkle filthy loathsome

Urban

avenue northeast local warehouse cultural ghetto skyline neighborhood populated borough street neighborhood populate skyscraper bustling thriving bistro metropolis infrastructure apartment slum legend centralmetro residence nightclub housing community uptown landscape boulevard brownstone museum locally urban hub eastern club downtown bookstore lifestyle midtown nightlife metropolitan resident diverse diversity theatre ethnic building theater abuzz

Vacation

summer hiking cruise rental lake resort location suite traveling holiday boarding tourist coast observatory harbor ticket scenic seaside venue night villa adventure skiing getaway inland traveling hostel camping outside shoreline explore coastline condo luxurious abroad carnival restaurant casino packing tour promotion yearly honeymoon touring seashore limo coastal campground sightseeing spending museum destination visit vacation accommodation tropical expressway hangout hotel brochure ride inn condominium nightlife fun ferry excursion secluded lakeside overnight upscale rent spa trip flight travel airport beach surf countryside stay outback journey lax plan waterfront reservation weekend surfing outing yacht drive ocean shore landmark overseas spend nightclub

Valuable

money valuable trade financially upgrade coupon cash luxury premium finance dollar endorsement wealthy fortune investor merchandise collector prize benefit repayment broker financial bargain cost voucher expense insurance funding mortgage seller affordable wage lucrative auction inexpensive amount revenue loan quality expensive wealth

monthly shilling percentage possession afford treasury fund
pricey cent bidding buying bill value compensation profitable
bidder attain costly substantial sell inheritance pay price paid
cheque euro purchase transaction commodity invest rupee sale
pension reward

Vehicle

taxi chariot convoy cruiser pothole diesel limousine
spacecraft motorcycle airbag windshield tire interstate crash hatch
shuttle haul traffic intersection rental refuel wagon tram oncoming
bumper garage tanker trailer parked motor accelerator brake
street driveway parking transport driving wrecked
pickup dealership tyre highway transportation aircraft
license fleet veer jeep submarine carrier aboard road caravan
transit trunk limo chopper pedal drove boat motorbike automobile
destination tow station vehicle helicopter expressway engine gear
bus buggy train junkyard wheeled honking minibus
license collision car ride spaceship regulator ignition
mechanic ferry tractor cab passenger sunroof rode ship
backseat hangar chauffeur helmet steer airbags port speeding
freighter wheeler ambulance driver motorway crashed plane
tailgate sedan lane drive freeway truck minivan starboard

Violence

scratch bruise violent kill strangle impact death senseless stabbing
kick hurting hit beat suffering angry bad mean harm
bleeding scared dead inflict bruising wreck trauma beating
bully punch aggravate struggle harshly bleed bash violence
tough feel injures bloody punching resuscitate injure fight dislocated
threaten injury cut minor abusing punish hurt sting wince fatal
toughen painful slap torment damaged afraid scarring
wound damage rape abuse stab mad shatters severe agony
wounded

War

convoy battleship resistance kill battle defender battleground
bombing destroyer legion brigade assassination carnage
overthrow sniper civilian conquer outbreak flee terrorize

enemy execute obliterate samurai troop mobilize squadron
firefight battlefield revolution invader famine melee
extermination firepower infiltration subordinate empire
battalion perish extinction frontier nuclear defend chaos foe
evacuation strategist leader warrior spartan slaughter rebel
opposition conqueror combatant raider adversary heroic
revolutionary cavalry comrade garrison allies survivor
loyalist refugee army brutal soldier ambush allied militia
threat defeat anarchist assassin commando alliance fatality
surviving civil conquest javelin regiment armada strategy
armed nuke warship marine brute fight attack war bloodshed
regroup citizen evacuate missile attacker general
overrun annihilate peril readied reinforcement
counterattack annihilation vanguard barricade fleet reconnaissance
opponent grenade armored soldiers commander crusade
federation capture horde veteran rebellion terrorist tactic
destroy terrorism encampment deploy weaponry genocide
invasion warfare bloodthirsty destruction stronghold fighter
blockade weapon fighting mercenary warlord trooper

Warmth

friction thermal balmy humid fuel blistering radiator closeness
blanket intensify inviting covering blazing humidity
steam overheated magma lukewarm steaming scorching
searing simmer cozy burn broil spark climate heating
emit thermostat burning weather heated insulation radiate
overheat temperature warmth boil sizzle fiery fire sensation
heat warm air glowing melted outdoors hotter conserve
flaming hot warms furnace sauna fireplace boiling boiler
warming muggy refreshing cover jacket sun

Water

afloat saturated reservoir splashing rushing underwater gulf
swam lake sparkling whirlpool downstream freezing wave dock
seawater upstream pier harbor bay monsoon freshwater
steam creek fish bubbling freeze coastline sea ripple diving
swampy glistening hurricane tsunami icy fountain
flowing shoreline lapping water rain tidal algae swimming

river island float harbor seashore coastal mist murky canoe paddle
splash frothy basin puddle rainfall shallow drown riverbank
lifeguard misty sailing rippling stream grotto rainwater dolphin
tide saltwater pond waterway floating soak swamp
ashore swirl beach dive evaporate waterfall pool refreshing
rainstorm ocean cascade shore lagoon salt

Weakness

shaky weariness soften sickly brittle gentleness emaciated cripple
weakening falter scrawny loss weakness fatigued defenseless
feeble bony fragile softness shaking exposed sensitivity
tender helpless pale fear whimper pathetic strained weak
weary crippled tremor soft vulnerability lifeless putty puny
delicate cowardly limp shameful struggle paralyzed
flimsy wobbly hurt meek powerless withered defeated
vulnerable weaken damaged weakened desperation frail
injured insecure malnourished weakly ragged incapable
wounded helplessly unsteady

Wealthy

shop lavish financially flaunt profitable socialite rich earnings
merchant finance richness billionaire famous royalty
valuable wealthy buyer dowry fortune businesswoman
affluent flashy jewelry heirloom cost lawyer trendy investment
funding jewelry profit donate affordable extravagance greedy
lucrative boast influential millionaire banker hardworking fancy
respectable owner expensive wealth asset privilege tycoon prosperous
successful fund buying charity glamorous prestigious budget
heiress mogul upscale fabulously fame pay fortunate
luxury income snob privileged gamble designer luxurious
prestige pampered invest inheritance independent businessman

Weapon

archery warhead shot armor gunman atomic lethal equip shield
hunting pellet charge spearhead stabbing disarm sniper dodge
cannon baton aiming handgun enemy pistol gun samurai
arrow skewer kill gunfire throwing melee firepower
scissors bomb strike slice armor trooper revolver slash

torpedo ammunition knife explosive gauntlet tactical
casing hatchet firing soldier projectile armored assassin 9mm
ammo turret gunshot dagger spear 0.45 arsenal loaded armed
firearm sledgehammer razor to-hand wield detonator
attack trigger armory scope sharpen slasher mechanism fire
precision missile attacker rifle gunpowder scalpel shoot laser
shrapnel blade barricade slicing grenade executioner soldiers
artillery gunpoint unarmed marksman sheath ax extinguisher
shooting deadly stake butcher sword magnum caliber cartridge
gutting bulletproof weaponry stab puncture machete
bullet shotgun weapon shooter fighting assailant axe
barrel

Weather

raining atmosphere humid shivering weatherman sprinkling frostbite
cold stormy snowing sky outside sweltering thunderous
clouded downpour misty drenched freezing gloomy frigid
cool dampen gust windy cloudy lightning monsoon snowstorm
quake colder puddle hail humidity drizzle sun hurricane balmy icy
fog cloudless cyclone polluted scenery umbrella
raincoat pours rain climate chilly damp blizzard scorching
snowfall weather frosty turbulent mist cloud pouring
temperature sunlight storm spring rainfall moisture snowy brisk
frost whirling dreary warm typhoon springtime foggy lightening
air outdoors chilling distance predict coolness
autumn dew rainstorm muggy rainwater wintry rainy glacier
soaked snow tempest moist forest thundering sodden
sunshine tornado sunny thunderstorm flurry visibility
drought temperate condensation overcast breezy breeze howl
thunder vapor wind

Wedding

planning oldest wed fiancee debutante jeweler beloved
announce appointment finalize propose commemorate
wedding dowry courtship valentine celebrate arrange gift
marry married official husband someday pledge church marital
stepson ecstatic wedlock anniversary prince priest marriage
officially honor relationship dutiful pronounce engage finance

agree cherish honor plan prospective vicar family tuxedo honeymoon
commitment son lawful cancel ring rejoice engagement suitor vacation
proposal celebration in-law happy invite overjoyed altar promise
planner newlywed boyfriend pact arranged divorced wife
lawfully bride caterer declare groom congratulation
engaged vow girlfriend ceremony faithful inheritance
remarry party romantically invitation bonding wedded
spousetradition reception

White_collar_job

detective executive scientist biologist surgeon vet office
photographer employer colleague psychiatrist psychologist qualified
wealthy businesswoman manager therapist attorney
forensics lawyer employment workaholic coroner nurse specialist
internship job neurologist senator promotion retired researcher
profession engineer accountant entrepreneur paperwork counselling
successful dentistanalyst physician hire politician consultant
retire veterinarian supervisor examiner inspector doctor actor
pharmacist chemist pediatrician pediatric director professional
law salary chief gynecologist

Work

office laptop executive assigned manager therapist busy equipment
desktop program boardroom schoolwork folder presentation
colleague fax appointment finance assistant photography
psychologist supervise report school paper secretary intern computer
lawyer laboratory programmer employment insurance interview
funding agenda administrative construction dental mechanic
schedule internship marketing clerk boss job teacher
planner programming workplace promotion assign electrician
employer engineer conference attendance working overtime
desk tutor accountant editor blueprint paperwork worker
paycheck employee consult technician hire consultant work
project record briefing industry supervisor engineering
receptionist file scheduling accounting agency administration
spreadsheet application online department document typewriter
administrator briefcase assignment assist lab cleaning librarian
transcript salary workstation freelancer applicant principle

reception

Worship

gods sanctity unite deity religious worship devoted divinity
pray commandment immortality lord righteous scripture
virtuous righteousness glorify invoke orthodox exalted
congregation pious occult heaven glory benevolent priest gospel
revere preach spiritual sacrificial pledge noble creation preacher
deliverance divine god religion humankind forsake belief
satanic superstition devout cult obligation pagan goddess bible
redemption prophet superstitious testament profess salvation
blessed penance moral church sermon worshipper apostle
hallowed almighty communion saint biblical altar repentance
virtue savior pilgrim believer ruling praise baptism devotion
reincarnation monk atone prayer brethren embodiment proclaim
repent shrine sacred pilgrimage disciple commune blessing
sacrifice mankind reverence tradition morality theology
sect sinner

Writing

essay poetry paper thesis portfolio creative parchment write calligraphy
tablet writing blackboard clipboard stationery brainstorm
homework descriptive notation read eulogy diary postcard list
summary revision page wrote lettering excerpt scribe
compile font publish pen paragraph assignment print
reading email blurb handwritten jot booklet journal
binder article scribbling planner informational revise manuscript
pamphlet marker poem sheet script transcript handbook
typing pencil paperwork paperback detail brochure copy word
instruction chalk printing neat editorial newspaper handwriting
prompt rewrite file ink autobiography typed author
alphabet note book composition typewriter quote notebook
printed letter bulletin entry

Youth

schoolers cute rebellious teenaged delinquent young teenager
stereotypical redhead immature sixteen orphaned pregnant
chick girl parent spunky boy boyfriend grandchild youthful

grandkids teenage son adolescent virgin behaved youngster
teen puberty naive orphanage loving child baby youth fun
toddler rambunctious preteen kid age pretty

Zest

unbridled overwhelmed happiness eager spontaneity bliss fervor enthusiasm
ardor expectation ambition desire thrill zeal freshness delightful
victory craziness triumph giddy invigorate humor exhilaration
boundless passion wondrous infuse overflowing satisfy zest joy
alertness spark zealous gleeful youthful heady adrenalin
adoration rejoice joyous euphoria tranquillity overjoyed vitality
admiration optimism joyful excitement feeling vigor invigorating
exuberant fill buoyant compassion exuberance enjoyment
delight curiosity vibrancy elation energize enthusiastic wildness
determination

Appendix D: Adjusted EmPath Term Frequencies

	Student Data	Interview Data	Occult Corpus
'anonymity'	-0.66294881	-0.083193693	0.382376033
'achievement'	-0.936406408	-1.222995687	0.049882537
'affection'	-0.155146909	-1.634494012	0.692724864
'aggression'	-0.650000236	-1.581406136	0.111114804
'air_travel'	-0.673670924	-0.586046437	-0.8641673
'alcohol'	-0.971080783	-1.481510071	-0.272628578
'ancient'	-0.478697659	-1.184617454	0.417872316
'anger'	-0.263129553	-1.785142114	0.458965475
'animal'	-0.632038269	-1.456358163	0.214987777
'anticipation'	-0.575870302	-2.050915266	0.497810671

'appearance'	0.040916467	-0.403095942	-0.264311866
'art'	0.005981356	-0.128503474	-0.094488793
'attractive'	0.482452005	-0.971619608	0.051495154
'banking'	-1.14540212	-1.192647224	-1.473943385
'beach'	-1.436931395	-2.11746928	-0.296654393
'beauty'	-0.718180046	-1.162860164	0.650411105
'blue_collar_job'	-0.764786647	-1.134880614	-1.882098328
'body'	0.11697504	-1.245397986	0.60196498
'breaking'	-0.323241782	-0.796142551	-0.223764093
'business'	-0.121672111	-0.441742353	-1.24681478
'car'	0.941397578	0.283335537	-0.9770239
'celebration'	-0.964102386	-0.897628403	-0.43092245
'cheerfulness'	-0.446325803	-1.724471947	0.577614651
'childish'	-0.11804837	-0.804993377	0.154896646
'children'	0.087308465	-1.327198286	0.054239849
'cleaning'	0.392569233	-1.073369044	-0.164826171
'clothing'	-0.782901149	-0.848325615	-0.16922554
'cold'	0.797187392	-0.671875799	-0.069123973
'college'	-0.033579315	-0.308962356	-0.646109742
'colors'	-0.083084677	-0.282623107	0.549928035
'communication'	0.969391006	0.468124548	-0.187997234
'competing'	-1.126353277	-1.182619975	-0.975129071
'computer'	2.39751795	1.427066992	-1.917688321
'confusion'	0.790575828	-0.578223256	-0.108376391
'contentment'	0.68182517	-1.253928729	0.800926073

'cooking'	-0.361407502	-0.907435041	-0.053986549
'crime'	-2.619689707	-1.324515395	-0.595959816
'dance'	0.234283595	-0.790285561	-0.273026392
'death'	-1.034457354	-1.632938379	0.535630518
'deception'	1.56660539	-1.074861766	0.581201922
'disappointment'	-1.349705664	-2.110043651	-0.830624891
'disgust'	-0.256717636	-1.822464724	0.775801331
'dispute'	0.194314145	-1.04194625	-0.475265037
'divine'	1.064332106	-1.289900007	1.85196336
'domestic_work'	0.121919376	-1.250009855	-0.594853386
'dominant_heirarchical'	-1.384838656	-1.753776927	-0.575870302
'dominant_personality'	-0.117370429	-1.178968188	-0.351868884
'driving'	0.72449522	0.183889388	-1.026169904
'eating'	-0.487249594	-1.358771302	-0.054621371
'economics'	-1.203793711	-1.273026689	-1.968084184
'emotional'	0.639004234	-1.011479336	-0.12644899
'envy'	0.018324238	-1.739882275	0.446780345
'exasperation'	1.295255311	-1.584366645	0.094675807
'exercise'	-0.753685063	-1.098134681	-0.880757258
'exotic'	-3.180357585	-2.294817956	-0.337025187
'fabric'	-1.068904164	-0.504076322	-0.182061708
'family'	-0.542632577	-1.377956088	-0.287053457
'farming'	-3.299121059	-2.468254619	0.241769536

'fashion'	-0.949499164	-1.038194802	-0.494045468
'fear'	0.16597745	-1.47571873	0.564508551
'feminine'	-0.472007015	-1.256072724	-0.142312774
'fight'	-0.971889129	-1.446814271	-0.43092245
'fire'	-0.05134595	-1.084468156	0.978466077
'friends'	0.614614272	-0.665717455	-0.032647802
'fun'	0.218894236	-0.646498101	-0.997554354
'furniture'	-0.374861328	0.121126472	-0.39991815
'gain'	-1.029590878	-1.19331927	-1.166781216
'giving'	0.283335537	-0.175562375	-0.308549573
'government'	-1.801495516	-0.949499164	-1.468635847
'hate'	0.351398072	-1.025032173	0.350844242
'healing'	0.48154781	-0.879527944	0.059141794
'health'	-3.053140978	-2.611714019	-1.036468092
'hearing'	0.99770674	-0.509468352	-0.191893219
'heroic'	-0.22590968	-0.40917762	0.127801545
'hiking'	-1.149255583	-0.250866191	-0.359376348
'hipster'	0.465919748	-0.535493016	-1.210267759
'home'	-0.188483376	-1.112920359	-0.097914334
'horror'	0.103693819	-1.697633687	0.548974114
'hygiene'	0.599786901	-1.674712169	-0.167796526
'independence'	-1.449408284	-1.536582325	-0.414990483
'injury'	-0.114100405	-0.796368512	-0.134463301
'internet'	1.822064399	0.838086131	-1.769636005
'irritability'	1.233396332	-1.402045471	0.143857992

'journalism'	-0.78871457	-0.361407502	-1.682295938
'joy'	0.115557668	-1.674712169	0.941802981
'kill'	-1.183285361	-1.253571838	0.541364309
'law'	-2.51073293	-1.551306108	-0.995344241
'leader'	-0.754984693	-0.7858036	-0.562404399
'legend'	0.762756809	-1.171375168	1.053295814
'leisure'	0.077949759	-1.192983191	-1.219194899
'liquid'	-1.710406232	-2.418554383	0.067660378
'listen'	1.590652848	-0.066763121	0.08419904
'love'	0.696713774	-0.95399012	0.742064991
'lust'	0.447093153	-0.982730045	0.712218348
'magic'	1.137371862	-0.719642981	1.52227499
'masculine'	-0.799990901	-1.377956088	0.766635979
'medical_emergency'	-1.214721449	-2.013533659	-1.032164301
'medieval'	-1.414935428	-1.026169904	1.033825073
'meeting'	0.485459742	-0.13251085	-1.162208138
'messaging'	2.095360164	1.178315133	-0.760854221
'military'	-1.283631358	-1.310451321	-0.479516725
'money'	-0.965172817	-0.855734988	-1.464673274
'monster'	-2.406486719	-2.003095581	0.910169914
'morning'	-0.029239945	-1.15054336	-0.327861389
'movement'	0.467145273	-0.048186755	-0.058226616
'music'	0.41120373	-0.36300638	-0.422846683
'musical'	0.669909059	-0.26103121	-0.629935213

'negative_emotion'	0.572700735	-0.581308711	0.08419904
'neglect'	-1.574531441	-2.009047348	0.238735466
'negotiate'	-2.155411461	-1.397099407	-1.079053246
'nervousness'	0.760609648	-1.164165485	0.267969762
'night'	-0.152449292	-0.975399541	0.929525613
'noise'	0.880612427	-0.375597856	-0.084721207
'occupation'	0.08419904	-0.567947967	-1.330658196
'ocean'	-0.860303656	-1.147969454	-0.308687148
'office'	1.5552878	0.886028613	-1.744493004
'optimism'	0.231225545	-0.65881035	0.312620655
'order'	0.350774991	0.144632281	0.352643007
'pain'	0.142479928	-1.019928326	0.208333972
'party'	-0.686126807	-0.804765444	-0.206396573
'payment'	-1.444657635	-1.19668624	-1.896053929
'pet'	-0.840734714	-1.145081663	0.29037292
'philosophy'	-0.040855341	-1.347745557	0.794427481
'phone'	1.331030927	0.587527694	-0.603182077
'plant'	-2.055586338	-0.816226705	0.167825807
'play'	0.790272212	-0.207015941	-0.787593954
'politeness'	0.16252321	-0.846184808	0.489654519
'politics'	-2.561283537	-2.21640516	-0.847849481
'poor'	-2.052469961	-1.773193672	-0.940577427
'positive_emotion'	0.608310945	-4.123468823	0.455871935
'power'	0.150718671	-0.188848143	0.356230329
'pride'	-0.96758549	-1.801495516	0.255955137

'prison'	-1.000878711	-0.898128966	-0.887421917
'programming'	1.881257115	1.036156786	-2.387032888
'rage'	-0.019292201	-2.195676122	0.53705303
'reading'	-0.05652835	-0.0160329	-0.477552115
'real_estate'	-1.081456265	-1.019080209	-1.376343423
'religion'	-0.337166844	-2.087274249	1.315320192
'restaurant'	0.150633216	-0.037106519	-0.245436468
'ridicule'	-1.331814131	-1.143161066	0.073421208
'royalty'	-3.010010168	-1.986171854	0.583206991
'rural'	-1.529065247	-1.495907552	-0.572441462
'sadness'	-0.253202541	-1.290640057	0.477437884
'secret'	0.341029521	0.52963237	1.572516116
'school'	0.500769875	-0.48675418	-0.584586244
'science'	1.215784917	-0.256978521	-0.85286029
'sexual'	-1.821841858	-1.891381107	-0.061205801
'shame'	0.189403253	-1.111060199	0.347861852
'shape_and_size'	-0.3618433	-0.420992478	-0.097361004
'ship'	-1.620065851	-0.028724654	-0.583128215
'shopping'	-0.340430647	-0.784462951	-1.529533446
'sleep'	-0.179288139	-0.776899991	0.230832776
'smell'	-2.152838626	-2.502338524	-0.247372172
'social_media'	1.692581168	0.920633752	-0.784239686
'sound'	0.843878274	-0.153035091	0.079699987
'speaking'	0.978997139	-0.173884459	0.167909739
'sports'	0.39811917	-0.362279292	-1.146364102

'stealing'	-1.674712169	-1.318790171	-0.393743525
'strength'	0.063644541	-0.693431988	-0.074943417
'suffering'	-0.357494057	-1.551784622	0.463955592
'superhero'	-1.805777985	-1.015131809	-0.07278397
'surprise'	-0.470869262	-2.180614425	-0.411009529
'swearing_terms'	-0.284231809	-0.368257472	0.096667068
'swimming'	-0.952402769	-1.86442784	-0.084175388
'sympathy'	0.021556479	-1.532816865	0.201228253
'technology'	2.052440781	0.63265791	-1.87946134
'terrorism'	-2.729213917	-2.130802356	-1.265416328
'timidity'	0.138420339	-1.083262314	0.278490292
'tool'	2.722761907	0.785575262	-0.8348444
'torment'	-0.730790245	-1.808233121	1.27944588
'tourism'	-0.888661025	-1.067123764	-2.040096973
'toy'	0.611362842	-0.331798309	-0.626693835
'traveling'	0.507658308	-0.295296402	-0.302515449
'trust'	0.707631849	-0.576593688	0.328776039
'ugliness'	-1.569162147	-1.739307384	0.17485045
'urban'	-1.232735548	-1.106116552	-1.555140513
'vacation'	-0.359231428	-0.741850588	-1.116651047
'valuable'	-0.782009793	-0.864651313	-1.327966134
'vehicle'	0.422570276	-0.13549855	-0.935626279
'violence'	-0.153503985	-1.17236232	-0.091625105
'war'	-1.67633255	-1.557063127	-0.579129738
'warmth'	-0.002102296	-1.467753941	0.488697357

'water'	-0.989565832	-1.910200378	-0.110168511
'weakness'	-0.958767376	-1.721078575	-0.065156758
'wealthy'	-1.482403977	-1.629834185	-1.238695239
'weapon'	-1.174669447	-0.745708141	0.011925726
'weather'	0.072772523	-0.821775463	0.320017625
'wedding'	-1.097523312	-1.571111355	-0.230342062
'white_collar_job'	-0.571721122	-0.942931311	-0.740781708
'work'	1.197911473	0.501950959	-1.235185277
'worship'	-1.48643629	-1.862482974	1.713376738
'writing'	0.174933766	0.929488274	-0.355471029
'youth'	-0.397503894	-1.398333666	0.017047939
'zest'	-0.392693211	-1.092645717	0.78492103
help'	0.014785711	-0.453640419	-0.799764114