Innovating the Mind: Three Essays on Technology, Society, and Consumer Neuroscience

Joshua M. Penrod

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Janet Abbate, Chair
Dipankar Chakravarti
Ashley Shew Heflin
Ven Sriram

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ABSTRACT

This dissertation examines the emerging practice of consumer neuroscience and neuromarketing, combined called CNNM. CNNM utilizes tools and technologies to measure brain activity and human behavior coupled with scientific theories for explaining behavior and cognition. Consumer neuroscience is one of the newest areas of application of neuroscience and related techniques, and is of significant social consequence for its possible deployment in the market place to both study and shape consumer behavior. Concerns arise in terms of consumer influence and manipulation, but there are also concerns regarding the actual efficacy and utility of the technologies and the application of behavioral theories.

The dissertation's three essays each examine a facet of CNNM. Using historical sources, conference participation, and ethical analyses, the dissertation forms a multi-prong effort at a better understanding of CNNM through the use of science and technology studies (STS) methods. The first essay is an historical review of the usage of technologies to measure brain activity and behavior, parallel to the development of psychological theories created to account for human decisionmaking. This essay presents a new conception of "closure" and "momentum" as envisioned by social construction of technology and technological momentum theories, arriving at a new concept for inclusion called "convergence" which offers a multi-factor explanation for the acceptance and technical implementation of unsettled science. The second essay analyzes four

discourses discovered during the review of approximately seventy presentations and interviews given by experts in the field of CNNM. Using and adapting actor-network theory, the essay seeks to describe the creation of expertise and group formation in the field of CNNM researchers. The third essay draws on a variety of ethical analyses to expand understanding of the ethical concerns regarding CNNM. It raises questions that go beyond the actual efficacy of CNNM by applying some of the theories of Michel Foucault relating to the accumulation of power via expertise. This essay also points in the direction for actionable steps at ameliorating some of the ethical concerns involving CNNM.

CNNM is a useful technique for understanding consumer behavior and, by extension, human behavior and neuroscience more generally. At the same time, it has been routinely misunderstood and occasionally vilified (for concerns about both efficacy and non-efficacy). This dissertation develops some of the specific historical movements that created the field, surveys and analyzes some of the foremost experts and how they maneuvered in their social network to achieve that status, and identifies novel ethical issues and some solutions to those ethical issues.

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GENERAL AUDIENCE ABSTRACT

Consumer neuroscience, or neuromarketing, (CNNM) is a new and emerging field which uses different devices to measure brain activity and behavior. For many years, scientists and marketers have been seeking to understand and explain decisions and, more specifically, consumer decisions. It has only been in the most recent decades that technology and scientific theories have been working in a close fashion to help understand human decision and consumer behavior.

In three essays, this dissertation uses tools from science and technology studies (STS) to better understand CNNM. In Essay One, I track the parallel history of the technologies to measure brain activity and behavior with scientific theories put forward to explain them. In Essay Two, I analyze the content of presentations given by experts in the field to understand how CNNM expertise is formed. In Essay Three, I explore the ethical concerns and propose some new ways of solving some of the ethical problems (such as power, influence, and expertise.)

CNNM is an important social phenomenon because of its possibilities of helping marketers, but it is also important for its part in developing areas of technology and scientific theories. The dissertation represents some new approaches at helping to understand its complexities and consequences.

Dedication

To my parents, Barbara and Wallace Penrod, to whom this is dedicated. I recognize that too many in this world have reason to doubt their parents. I have never doubted my mother and father; I know that they have always been there for me. I'm blessed for that alone. My parents are always, and always have been, on my side. Thanks to the best parents one could hope for. This is for you.

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Dr. Sally Satel — the person who started me down this road of neuromarketing as a dissertation topic. Your plea to me was: “I just want to know if it works. Please tell me!” (And after all this, my answer is: “it depends.”)

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Keith and Jessica Mock – My oldest, finest friends. Thank you for the dinners and the visits and the understanding of my social scarcity from time to time. Thanks for looking out for me and for being encouraging voices. Thanks for the reality and sanity checks....and for always being there when I was ready to surface!

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Introduction and Brief Survey of Literature

> "…most striking of all was the flurry of activation in the insular cortex of the brain, which is associated with feelings of love and compassion. The subjects' brains responded to the sound of their phones as they would respond to the presence or proximity of a girlfriend, boyfriend or family member. In short, the subjects . . . *loved* their iPhones." (Lindstrom 2011)

These days, the brain is very much on the brain – on television, in newspapers, and in pop culture. This new and growing cultural fixation on brain activity and neuroscience occupies, at the same time, a sense of wonder, bemusement, critique, fear, and optimism. The growth of the interest in and knowledge about the human brain in recent years has not been confined to fresh research only in an academic sense, focusing on pure research for specialized scientific or medical interest. Instead, the brain boom has branched out –much like the dendrites from a neuron—in every conceivable direction, seeking understanding and application of the brain's role in complex and diverse human endeavors: theology becomes neurotheology (Satel); history becomes neurohistory (Satel); and marketing becomes neuromarketing. In this introduction and throughout the dissertation, I will use the term CNNM to encompass consumer neuroscience (the academic research side) and neuromarketing (application). The general meaning of this term throughout the work will be the use of technology and scientific theories derived from neuroscience to bolster, inform, or change marketing practice and theory.

What can be more profound than showing through a brain image that a person loves his or her iPhone, as CNNM proponent Martin Lindstrom claims in the opening quotation? The same enthusiasm and sometimes breathless optimism also begets skepticism…and worry. When is a purchase just a purchase? When does technology informed by consumer neuroscience intervene? When is it used to control? Negative reactions to CNNM tap into a long-held suspicion of marketing related to manipulation and loss of autonomy and privacy. The ultimate concern –sprouting from the darkest possible conjecture-- is that the practice of neuromarketing will lead to advertising and products which compel everyone to buy – the marketer's dream, as cast by those who have never marketed products, functioning under the assumption that the point of marketing is for everyone to buy the same thing. After all, the argument goes, if you can make someone love an inanimate object, there's a fair chance you can get them to feel or do anything. While marketing as a field is committed to the union of a person with value in terms of good or service, others see the practice as simple shilling or hucksterism. Neuromarketing, in the perception of the most suspicious, is the latest iteration in seeking to accomplish this goal. Due to the hype created by neuromarketers, many view CNNM as holding the key to create –in all of us—the perfect mindless, insatiable consumer of all things.

The other element of suspicion focuses on false or exaggerated claims for the efficacy of CNNM, borne out by quotes such as the one by Lindstrom. Besides the issue of the function of the insular cortex – possibly far more than just affection, as it turns out (see below)—the logical issue of reverse inference, the oversimplification, the

overclaims, the lack of transparency via peer-reviewed process, and the "carnival barker" publicity-seeking approach wrapped in a veneer of self-righteousness about cell phone usage, all combine to create a public persona of the "neuromarketer" that legitimate researchers agonize over. Recently, the Neuromarketing Science and Business Association instituted a Code of Ethics which specifically enumerates "overclaims" as a violation. Quotes such as Lindstrom's are exasperating to the majority of the community engaged in the work, either for academic or commercial ends.

But it's not just the "brand consultants" like Lindstrom that hold responsibility for the hyping of the field, and it's not just hopes of marketers to get John Q Public to buy more widgets. Several prominent neuroscientists, such as Marco Iacoboni, also shouldered and elbowed their way into media and publicity prominence by invoking mystical insight into the political process and the minds of voters. Iacoboni found his way into the *New York Times* regularly around election time in the early 2000s. He and co-authors wrote this in 2007, as a result of a 20-person and apparently non peer-reviewed study:

> 1. **Voters sense both peril and promise in party brands.** When we showed subjects the words "Democrat," "Republican" and "independent," they exhibited high levels of activity in the part of the brain called the amygdala, indicating anxiety. The two areas in the brain associated with anxiety and disgust — the amygdala and the insula — were especially active when men viewed "Republican." But all three labels also elicited some activity in the brain area associated with reward, the ventral striatum, as well as other regions related to desire and feeling connected. There was only one exception: men showed little response, positive or negative, when viewing "independent." (Iacoboni 2008)

But this shows one of the basic areas of confusion and problems with the underlying statements –particularly when it appears to be made for the larger purpose of headline generation—regarding brain imaging. Iacoboni notes that the insula is one area associated with "anxiety and disgust." Just above, Lindstrom stated that the insular cortex (also called the insula) is associated with compassion and love. Which is it? As it turns out, the insula is associated with many different affective states, and simply showing activity from the fMRI is categorically *not enough* to identify a particular state.

Similarly, after commenting that the voter response to Hillary Clinton seemed "mixed," the authors indicated that:

> **5. Mitt Romney shows potential.** Of all the candidates' speech excerpts, Mr. Romney's sparked the greatest amount of brain activity, especially among the men we observed. His still photos prompted a significant amount of activity in the amygdala, indicating voter anxiety, but when the subjects saw him and heard his video, their anxiety died down. Perhaps voters will become more comfortable with Mr. Romney as they see more of him.

Activity in the amygdala, depending on which side, might also be associated with pleasure, in addition to fear. Amygdala activity might also be a part of declarative and episodic memory, or a part of the reward system. (Satel) So yes, theoretically, Mr. Romney might be associated with "voter anxiety," but also might also be associated with memory formation, recall, or pleasant attitudes. Perhaps once voters see him more often, the amygdala will be bored.

Lindstrom, at least, has the excuse of being a marketer who could be expected to promote his own expertise. Iacoboni and colleagues, who presumably care about academic reputation, have less of an excuse for deriving publicity from logical errors and

selective evidentiary discussion. In many other fields, public opprobrium would follow, as in the case of cold fusion, or perhaps sightings of cryptids such as bigfoot. Instead, the public perception of brain science often seems an assumption of omniscience and, equally often, an accompanying sense of fear.

Another underlying assumption that seems to characterize much of the cultural discussion today is that the brain and the mind are cognate and interchangeable. If one can see the brain –or some part of it—in supposed operation, this *must* then mean that the mind is read, clearly understood, accurately predicted, and easily manipulated. This assumption underlies belief in the authority and credibility of neuroscience and its implications for consumer autonomy. Standing in the way of this simplistic connection between brain and mind, however, is a spectrum of epistemological, biological, physical, psychological, and technological questions. One person's advanced sales technique is another's mind-control and manipulation; while another's view of the technique is that the model used is antiquated…or over-hyped…or using new terms for an old model. The tools of science and technology studies can be deployed to render greater clarity on these issues involving social concern, individual autonomy, and technoscience.

Scope and Outline of Dissertation

The dissertation consists of three essays contributing to STS knowledge surrounding CNNM. The first essay represents an intertwined history of psychological decision theory and technologies used to assess behaviors and measure brain activity. This chapter addresses the following questions: How has the history of marketing theory

and practice, including psychological models and technological innovations, shaped the current body of expert knowledge about consumer decisionmaking? Can the framework of social construction of technology, particularly interpretive flexibility, illuminate the role of technology in creating theories about consumer (or more generally, human) decisionmaking? What is the relationship between a market researcher's choice and use of consumer research technologies and their theories of mind (implied or explicit)? How does this combination of theory and tools help constitute marketing expertise regarding consumer decisionmaking? The second essay is a discourse analysis from a succession of neuromarketing conferences, framing the discourse by using four categories which measure group formation and expertise. This chapter asks, What is the current relationship between marketing expertise and neuroscience expertise? Does the combination (sometimes referred to a "neuromarketing") form an intellectually coherent whole, or merely a marriage of convenience? The third essay is an analysis of the ethics of CNNM, with a special application of Michel Foucault's knowledge-power dynamic. Some have claimed that neuromarketing raises ethical questions that are different from those regarding traditional market research. I ask, What assumptions about the ethical implications of technology in general, and about neuroscience-based marketing techniques in particular, would be required to support such a claim? If such assumptions are valid, what are the public policy implications? Collectively, the three chapters uncover the social, scientific, and technological bases for the apparent authority and power of CNNM, which can offer a more realistic understanding of its potential by marketing practitioners and the public. This analysis also clarifies the basis for ethical

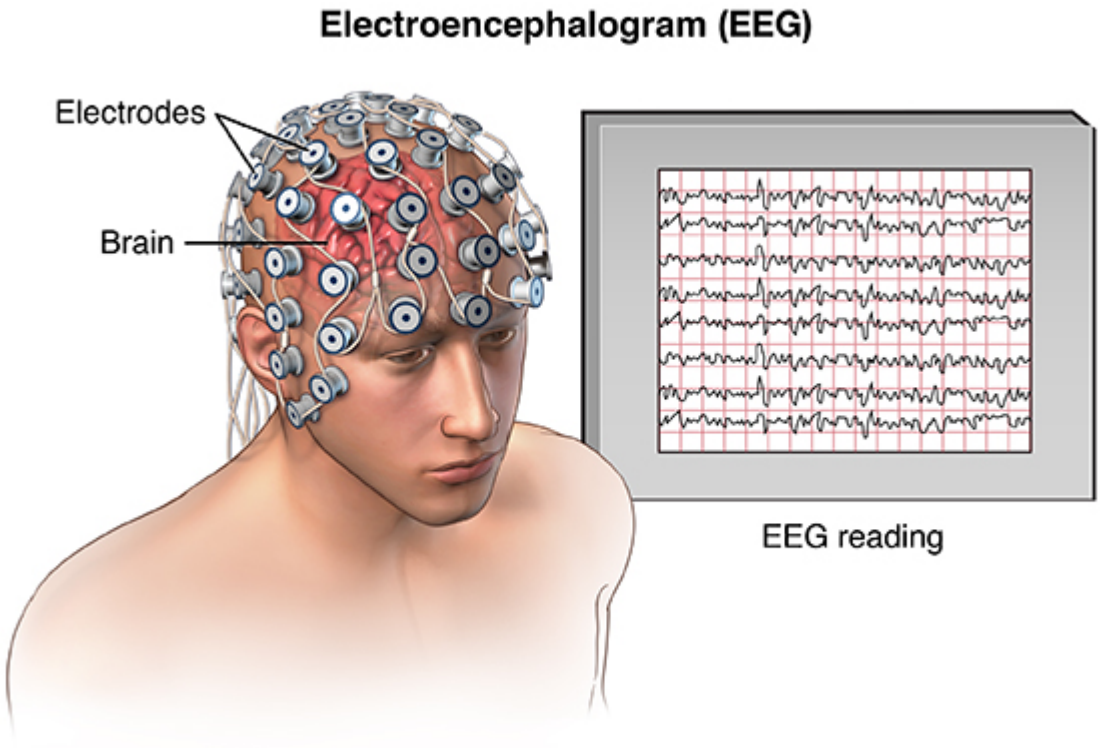
concerns involving CNNM, which can inform both practitioner guidelines and any future regulation.

For the balance of this introduction, I will introduce the reader to the different types of technologies that are used for CNNM research. Following this, I discuss the most significant literature connected to CNNM used in this dissertation, to orientate the reader for the different essays.

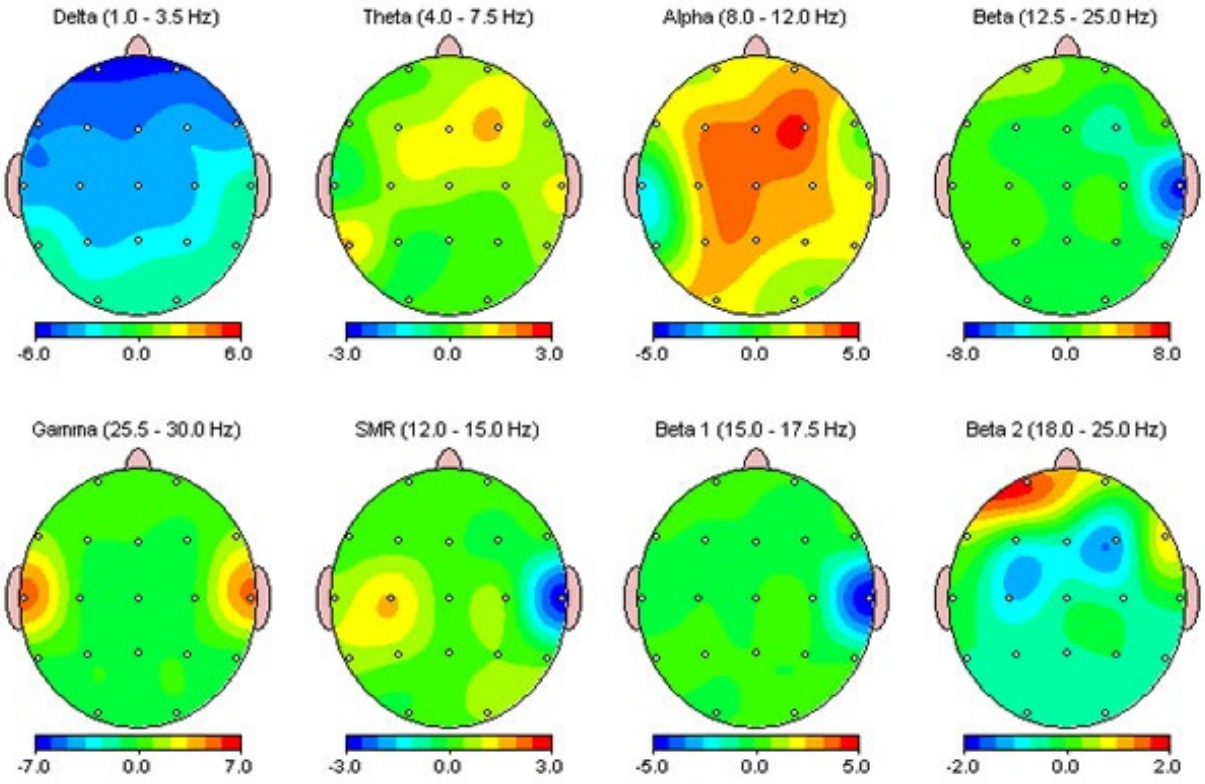
Precis of the Technologies

The technologies discussed in the context of CNNM all measure some physiological activity within the human body, ranging from fluid secretions to invisible brain waves. Each technology has brought along its own methodology for interpretation. In these essays I discuss several different types of technologies relating to CNNM; I have also described individual technologies as members of a given type, based on which parts or products of the body are imaged, measured , and/or recorded. The main categories described below are brain imaging techniques and techniques that measure other types of bodily responses. We can also see, through the analyses done over the course of the essays, that the technologies and artifacts can be understood in a number of different ways, including some relatively new characterizations that I propose. In essay three, for example, technologies which require direct contact with the body and which measure bodily processes such as levels of perspiration, respiration and blood pressure can be considered “visceral” technologies, while others which do not have penetration of the body per se, might be seen as non-visceral.

Brain imaging techniques. Brain imaging technology, which includes fMRI and EEG, directly gathers information from brain activity. EEG requires the usage of a network of sensors to be attached to the test subject, with each sensor trailing a wire to a central device. The central device then collects and processes the information and creates a visual representation of brain activity, either in the form of graph or a representation of the brain with targeted areas of detected activity. Importantly, the EEG detects electrical activity in the brain – called evoked potentials—with a high degree of temporal specificity. That is, the brain activity is detected quickly in relation to the time in which it occurs. By contrast, the EEG's spatial specificity is not as good; while it is improving, the ability to localize activity within a small, discrete part of the brain is not the EEG's best attribute.



This is the classic depiction of EEG, with the network of sensors, wiring, and then the graphical output. (http://i.imgur.com/ZrmxJRu.jpg)



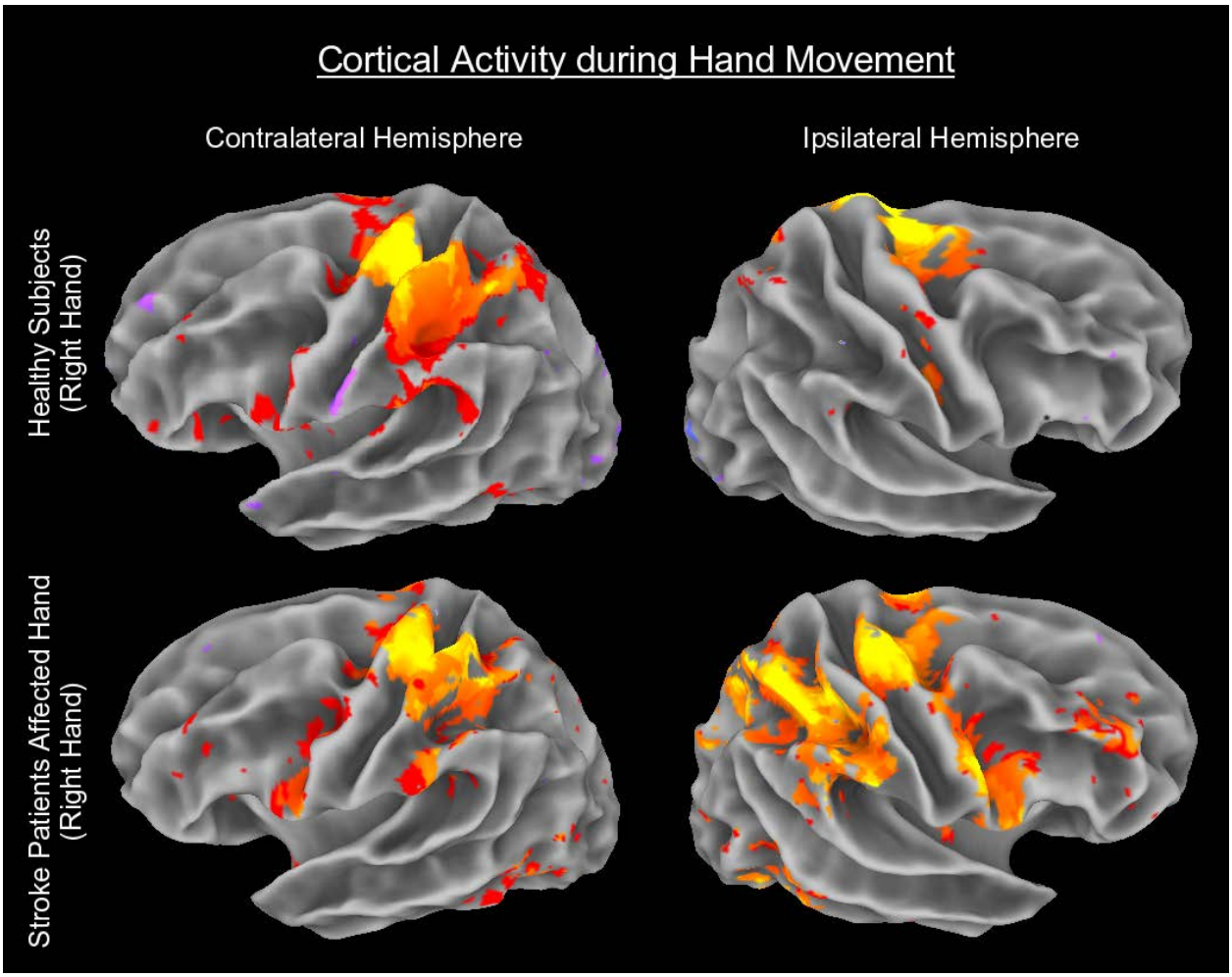
The above is an example of more exact "mapping" of brain activity via EEG, which shows several types of brain "waves" and roughly where the sensors detect the activity. https://scdcentre.com/services/child-assessment/brain-scans-qeeg/

Functional magnetic resonance imaging (fMRI) is widely associated with CNNM and related fields. The fMRI typically involves a person being placed in a supine position within a large, donut-shaped device. The biological process used by the fMRI to image brain activity consists of blood oxygen levels; the scanner is able to detect levels of hemoglobin (the iron-based coating of red blood cells) by generating a magnetic field and measuring the response. Hemoglobin levels are then equated with brain activity, under the theory that an increase or activation of brain activity will be followed in close order

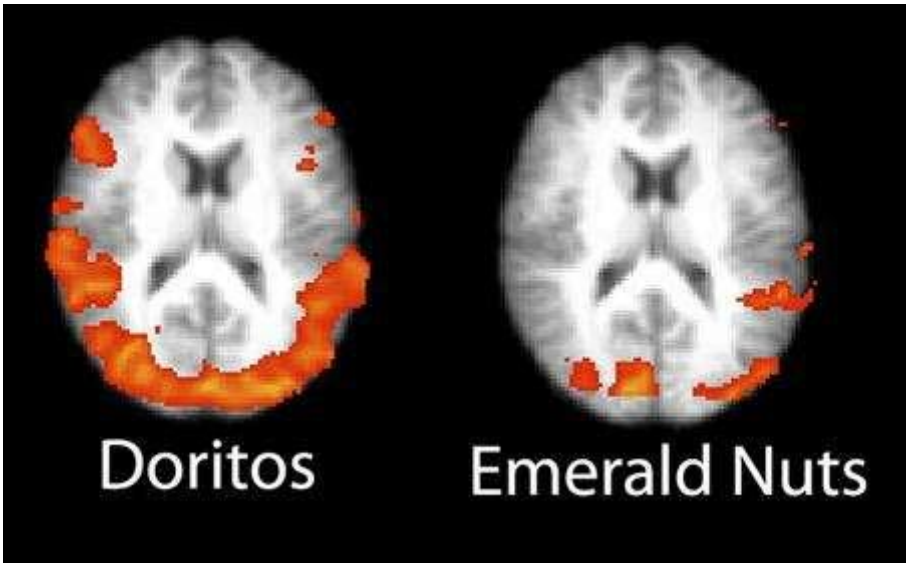
by an increase in blood flow to that area of the brain. The machine tracks brain activity in close to real time and, in the CNNM context, this is done while the research subject is engaged in some other activity, such as viewing commercials, tasting soft drinks or wine, or any number of marketing-related tasks. By contrast with EEG, fMRI has a low *temporal* specificity but a high *spatial* specificity; these orthogonal technologies measure different biological mechanisms or processes. The fMRI suffers from a lack of temporal specificity because it measures blood flow *to* an area of the brain, which is a response to an activity that the brain has already performed. The EEG can detect the occurrence of brain activity due to the electrical signal that occurs when a neuron fires, but the exact location and resolution of such activity cannot be currently detected by the technology. The end result of an fMRI scan is a colorized picture of the brain or region of the brain, in which localized activity can be detected and noted. The process itself is highly computerized, with each detectable segment of the image being called a "voxel," a constructed unit measuring a 3-D "chunk" of brain. Depending on the type of scan and sophistication of the device, a voxel might represent thousands or millions of brain cells.

Despite the cutting-edge perception of fMRI, the technology is still in its infancy. Some critiques of imaging technology have been notable from an epistemological and scientific standpoint; other critiques that hew more closely to STS-type of discussions also ponder the the software design and computer processes which construct an image of the brain. (Dumit) Other critiques from within the imaging field also note that fMRI's current laboratory-bound setting creates other deficits in interpretation; some EEG and other measurements (such as eyetracking) are more portable and can be used in different environments (like, for example, a supermarket or even at a desk while shopping online.)

In the above image, the subject is placed in a position to facilitate scans. One can see some of the difficulty associated with the way in which the subject must comply in order for the scanner to work properly, and the epistemological issues that sometimes come about as a result of laboratory settings versus environmental settings. (https://wiki.ucl.ac.uk/download/attachments/58429653/fmri-2.jpg?version=1&modificationDate=1449827212000&api=v2)



The above image is an example of a standard clinical fMRI comparing a stroke victim and a normalized average brain of non-impaired controls. The visual nature of the picture is striking and oftentimes compelling for some, though there debates from both within the imaging community and outside of it concerning the interpretation of such scanning data, particularly when it comes to CNNM. (http://www.martinos.org/neurorecovery/images/fMRI_labeled.png)



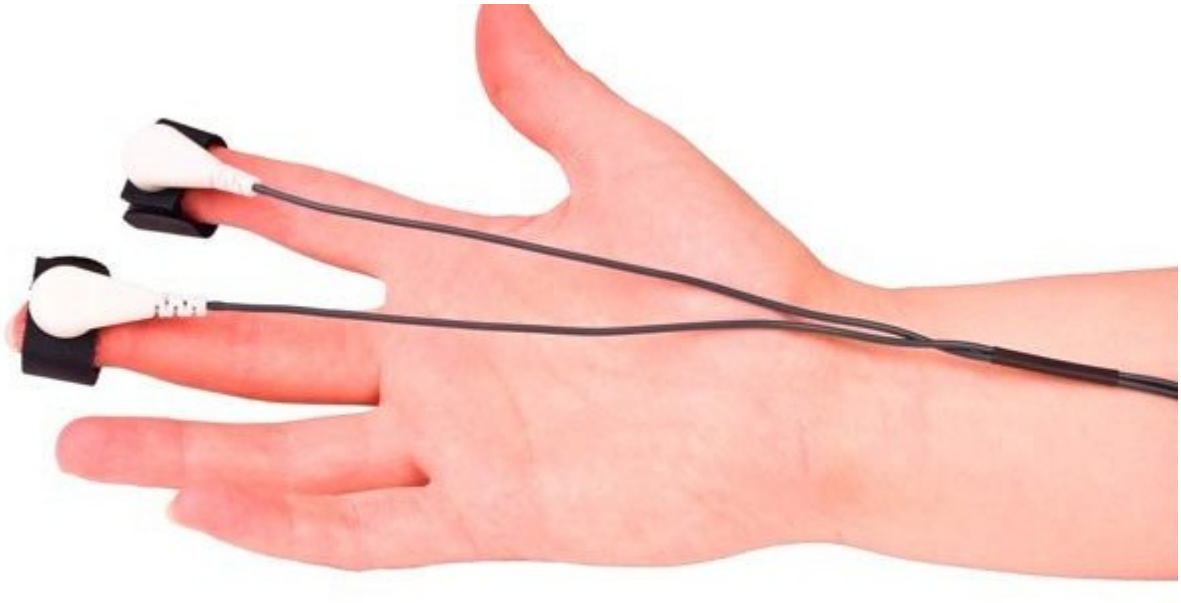
Above is a classic example in the aftermath of the 2007 Super Bowl, on scans interpreted to show a more favorable brain activity response to Doritos than to Emerald Nuts. (https://uk.reuters.com/article/television-nfl-super-advertising-scans-d/super-bowl-ads-fumble-brain-scans-show-idUKL0549647620070205)

Bodily response measurement technologies. In contrast to the imaging technologies, measurements of bodily functions –many automatic—are no longer considered highly technical. Many of the technologies seen in this context are familiar to large swaths of the public; visits to the physician frequently record pulse, blood pressure, and respiration. Even films and television programs frequently invoke biometric identification and measurements of galvanic skin response. Perhaps one day, with greater exposure, the fMRI and EEG will become prosaic as well. In addition, measures such as blood pressure, respiration, heart rate, perspiration, and similar parameters are well-understood biologically and have been linked to behaviors as diverse as truth-telling versus prevarication, interest and attention, sleeping and wakefulness, illness and health. Because these technologies are more familiar to many people, including non-experts, they seem perhaps less impressive or threatening. For example, blood pressure

measurement in cases of CNNM is also a clinical health care experience familiar to most around the world, even those who have been confined to the most rudimentary health care systems. Devices recording pulse and respiration rates for CNNM are also indistinguishable from those used in health care; the only real differences are the setting in which the testing is performed, along with the intended goal.

Often, these measures are in fact deployed in the environment in which a consumer is shopping, watching advertising, observing a product design, or some other CNNM-related goal of interest. This also tends to reinforce the rift between the lab and environmental settings (MOOC 2016)

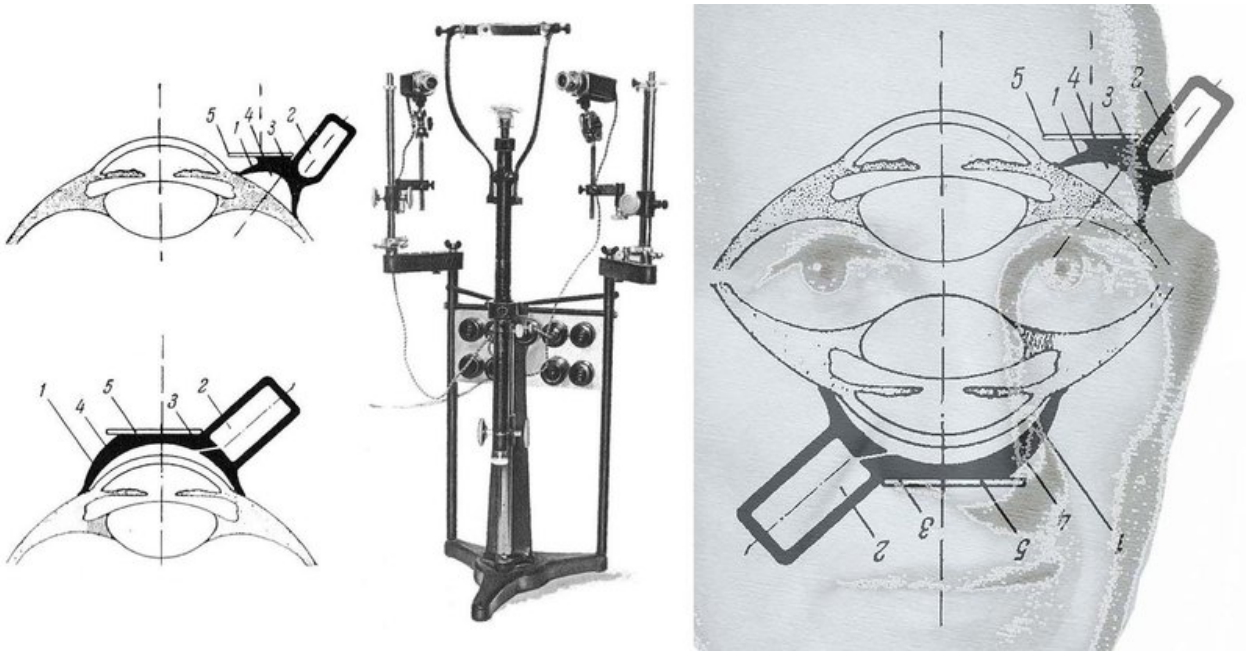
The amount of information that might be extracted from such measurements is, however, thought to be coarser than what is available via brain imaging. Is this consumer's pulse rate and blood pressure elevated because of the bright red paint of a Ferrari? Or is it because of the *thought* of a new self-perception by possessing the Ferrari, by putting oneself in an external perception, thinking about how others might (or must) perceive such car ownership (the car as the extended self)? Or the self-estimation of one's relative social worth if one is to possess a Ferrari (the car as a symbol of social class)? All of these questions are related to a specific product and a specific customer, but the biometric measurements show little more than what one might already guess at.



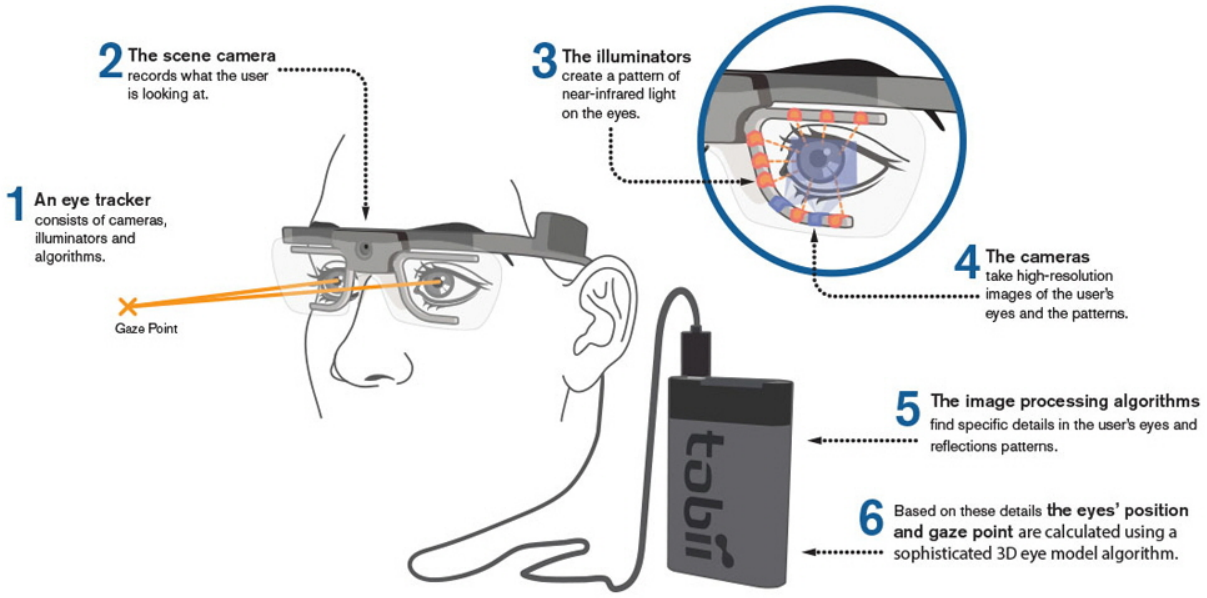
Galvanic skin response monitor
(https://media.licdn.com/mpr/mpr/AAEAAQAAAAAAAApKAAAAJGFkYWU0ODQ3LTI4YzYtNDI4OC04MTMxLTk5MTE2NTE5OGNlYg.jpg)

The above device monitors blood pressure and pulse rate. (https://www.biopac.com/wp-content/uploads/NIBP100D_V3.5_incl_setup_AcqKonowledge_8001.png)

A common proverb is that “Eyes are the window to the soul.” Likewise, the use of eye activity measurement has been thought by CNNM experts and others for decades to be a useful way of understanding the interest and comprehension of a research subject. Early work in eyetracking included understanding the mechanics of the eye, along with the mechanics of specific visual tasks, such as reading (Russo, Orquin). Likewise, gaze direction, eye fixation, pupil dilation, speed of movement, and other measures have all been a part of the shopping experience, but also are well-known to webpage design, smart phone displays, and virtually anything else that relies on a significant visual input.



An early-stage example of eyetracking equipment and eye movement recording, used most notably by Yarbus in the 1950s and 1960s. http://yarbus.eu/eye-movements-and-vision/



The above is an example of modern eye-tracking equipment. The research subject wears the device, while sensors track and measure eye movements. These are then compared to the gaze direction of the head, while all of the data are recorded for later analysis. https://www.tobiipro.com/imagevault/publishedmedia/1cr7b4clf3qahnqp031c/How_Does EyetrackingWork_GlassesPro2.jpg

Some eye tracking apparatus are more noticeable and cumbersome.
http://www.eyegaze.com/wp-content/uploads/Eye-Tracking1.jpg

The technologies used in current practices of CNNM are, therefore, several and varied. While the latest in imaging technology tends to occupy headlines (particularly when the reader is inveigled with the possibilities of prediction and control), practitioners and researchers use a variety of technologies which measure volitional and non-volitional bodily activity and responses. Some technologies do indeed study, measure, and image brain activity, but we are not "brains in vats." We are brains-in-bodies, and bodies-in-groups, measurement of which can show a wide variety of behavioral and neuronal activities and responses. The degree to which this can be established, much less

demonstrated prediction and control, is an ongoing process of many research programs in many areas. CNNM is one of them.

Indeed, much of the controversy involving CNNM is related to the efficacy of some of the technologies and the probative value of the results in a marketing context. The dissertation does not directly address efficacy, although it does come up in several contexts. The history of the technologies discussed in Essay One includes controversies involving the nature of the machines and the theories produced; Essay Two's content analysis of expertise internalizes much of the concern regarding facility and efficacy of CNNM methods; Essay Three explores ethical concerns in the face of the efficacy (or lack of efficacy) of CNNM.

Literature Review

There is a wide-ranging professional and popular literature on various aspects of CNNM, but very little from an STS perspective that specifically addresses this topic. Some of the topics raised in the literature include: research methods involved, especially with regard to the function of specific technologies; research and application ethics of CNNM findings; and the usage of technologies and findings therefrom in areas involved in broader fields of human cognition and volition.

This literature review will first consider publications regarding consumer influence and psychology, then move specifically to works about neuromarketing and/or consumer neuroscience. These vary widely in content and quality and illustrate different ways of thinking about CNNM; for example, a wide strain of the literature focuses on the

ethics of the practice of neuromarketing, while another strain can be considered empirical studies on the efficacy of CNNM in its entirety. For purposes of background, I've included some general works in the area of public policy and the development of neurosciences, which also include discussions of neuromarketing or areas where similar issues and concerns may arise. I then survey areas related to CNNM, including decision theory and social psychology. Finally, I will consider the extent to which the STS literature has dealt with issues related to CNNM. The STS theories that I use in my own analysis will be discussed in more detail within the chapters themselves.

Works specifically centered on neuromarketing

Robert Cialdini's *Influence* is frequently noted as a watershed work showing the overlap of psychology and marketing. Cialdini notes that he originally wrote it in an effort to help people *stop* being manipulated in sales situations and negotiations, but it has also become a jumping-off point for discussions of the interplay between marketing and the working of the mind. Kolenda (2013) follows in this vein, as does subsequent work by Cialdini himself. The move, however, to engage with specific technologies to detect psychological and physiological cues are where the rubber meets the road in CNNM and neuromarketing.

A number of popular books on neuromarketing have been published since the early 2000s. Many of these books cover much of the same ground, and they are all indebted to the handful of published peer reviewed studies indicating the basic efficacy of brain imaging technology linked to human affective state. One recurring theme is to

question the paucity of peer-reviewed literature, and the response seems to be something along the lines of the slogan “absence of evidence is not evidence of absence.” This refers in part to the fact that many of the studies conducted are never published, since they are proprietary and competitive, and disclosing the results –positive or negative—could lead to loss of economic value.

One widely-read work is Thomas Ramsoy’s *Introduction to Neuromarketing & Consumer Neuroscience* (Ramsoy 2014). The author is a trained neuroscientist and a member of active research faculty at the Cophenhagen Business School, as a part of the marketing department and the head of a research center and laboratory at the school. He is also the founder and principal of a neuromarketing and consumer behavior research firm, Neurons Inc. His approach in this work is a comprehensive overview of many different technologies which can be used to study and measure consumer behavior and reactions to products and advertising. Ramsoy provides the reader with a broader assessment of the types of instruments and technology used and a full spectrum of the type of biological and psychological responses measured. Ramsoy includes a significant bibliography of scholarly research and also presents information based on his own business experiences, along with the findings in his laboratory. In addition to this, Ramsoy critiques several other neuromarketing approaches and proponents, notably Martin Lindstrom and *Buyology*.

Several other works emulate the serious treatment which Ramsoy gives to the topic, with solid overviews of empirical research and noting epistemic gaps. Zurawicki (2010) includes this approach with a broad overview of technologies used in CNNM, while Georges et al (2013) also describe approaches by which neuromarketing as a

technique can fit into the larger marketing goals of an organization. Sharma et al (2010) emphasize empirical research findings at the time of its authorship and tie them directly to marketing tactics. Ariely and Burns (2014) focused in fMRI as a technology of choice for CNNM and give a balanced account of both the "over-hyping" of findings and the important opportunities for solid CNNM research, in a sense of increased efficiency and innovation. Du Plessis (2005, 2011) and van Praett (2012) both strike important connections with branding and CNNM, as does Weber (2016). All of these works represent, to some degree or another, inquiries into the nature of CNNM, potential applications, and assessments of the value of techniques.

By contrast, another strain of literature indicates an approach which is more promotional and, on the whole, less balanced in their assessments of CNNM. One, already familiar to us, is Martin Lindstrom's *Buyology* (2008), which is also popularly perceived as one of the most important works in the neuromarketing canon. Some of this is due to the timing of publication, which seemed to ride the first wave of broad interest in the field, while another important component is Lindstrom's unabashed promotion of the method (and, thinly veiled, himself as a global branding expert.) The punned title of the "buyologist" is a marker at the very beginning of this work for the approach, and it is consistently maintained throughout. Lindstrom's approach is part behavioral, but ties it strongly to imaging technology and the promise of a deeper understanding of the biological and neurological antecedents to consumer behavior. Consumer behavior is another "type" (or a brand) of human interactions with analogs in religion, sexual attraction, and sensory activation. Lindstrom's approach, while evangelical, is notable and interesting for its early and lasting influence, not only in the field of neuromarketing,

but also in the field of *writing* about neuromarketing. Renvoise and Morin (2002) provide early insight into this type of approach, using the disfavored "triune brain" theory to offer sales advice; their work, however, represents the earliest book-length usage of "neuromarketing" in the canon.[1] Pradeep (2010), a founder of a neuromarketing consulting firm, argues as well for a complete linkage to technological findings and consumer response. Dooley (2012), a blogger and podcaster on the topic of neuromarketing, includes one hundred chapters, each containing a specific technique or tactic to be used to aid the consumer in decisionmaking or, rather, to aid the marketer in influencing the purchase decision. Dooley's approach, however, is less overheated than that of Lindstrom and others.

The authors of NM books range widely on a spectrum from a fairly balanced treatment to blatant self-promotion. Pradeep and Lindstrom appear to the reader as somewhat self-aggrandizing, overly promotional, and over-promising of the efficacy of neuromarketing, especially since they have either reputational or financial links to neuromarketing. Other approaches, more balanced and self-critical –while still fully disclosed in terms of commercial interests, such as Ramsoy and du Plessis—are far more credible and balanced in their treatment of the material. Several of the works also seem to be bandwagon works, in the sense that they are superficially part of the "neuro"-mania aspect. While Renvoise and Morin are the most obvious in this attempt, their work is an earlier one and had less source material available; some of the other works –even the

[1] Paul MacLean is credited with the original "triune brain" model, wherein the different layers of the brain can be traced back through evolution. For example, the most "primitive" area of the brain, the brain stem, has a similar structure to the brain of the crocodile; from this, some labeled it as the "R-complex," for reptilian-complex. Younger areas of brain evolution come in the form of cortices for mammals which were associated with more complex behaviors; the neocortex was thought to be the "youngest" portion of the brain, and associated only with primates (particularly humans.) (Bloom)

stronger ones—tend to be plowing the same furrows in the same fields. As the field continues (if the field continues), then the next decade may prove to be more fruitful in terms of further book-length works containing greater insights into neuromarketing, its applications, and, possibly, its ethics.

Much of the literature surrounding the construct of CNNM technology and interpretation includes some conflict about what the basic terms even mean, and, of course, what a measurable outcome might look like. Several of the most important and foundational articles in the field are included here for reference, though the epistemic issues with CNNM technologies are not directly treated in the essays. They are, however, alluded to in some areas and do have a contingent role in acceptance of the technologies throughout history (Essay One), the credibility of the field (Essay Two), and potential ethical concerns (Essay Three.) As a basic foundation for relevance, I have included them in this review, along with several articles that serve as examples of CNNM research. Given that the field has ballooned over the past decade and many thousands of articles published, however, these few mentioned only scratch the surface.

In 2015, the *Journal of Market Research* produced a special issue in which many of the thought leaders in the arena of CNNM, largely in the academic world, contributed articles, consisting of review pieces, articles reporting some original experimentation, and works which pondered the efficacy and direction of the field. The articles in that issue provided a strong pillar for the analysis contained in Essay One, which recounts a parallel history of both the development of measurement technologies and psychological models of human decisionmaking. Uses of such technologies to study *consumer* decisionmaking and theories to explain consumer decisionmaking followed not long after the general

theories (see Russo, 1978); after all, most of the early work done by von Neumann, Morgenstern, Simon, and others, had a strong economic and "gaming" bent. Orquin and Loose (2013) published a strong review of eye-tracking and human decision-making dating back to the 1950s and even earlier, providing evidence that many researchers, explicitly or implicitly, understood a connection and correlation between the two worlds.

The articles in the special issue include excellent histories and assessments by Plassman et al (2015) and by Venkatraman et al (2015), which also described the departure points of some technologies used in CNNM (how, for example, fMRI came to be desired by researchers over and above eye tracking and others); Boksem and Smidts (2015) indicated positive correlation between types of brain activity when viewing film trailers; Cascio et al (2015) found consistent findings of brain activity in subjects being studied for group compliance and word-of-mouth recommendations; Cerf and colleagues (2015) reported on methods of using an EEG to measure the activity of a single neuron to record consumer reactions; Chen et al (2015) found consistency in non-local brain patterns when subjects were tested for brand awareness; Karmarkar et al (2015) studied the relationship in brain activity and relative importance of perception of price on consumer decisionmaking. These and several other articles form a solid introduction to the parameters of the science and marketing discussion active in CNNM today.

An early article –frequently cited as canonical for neuromarketing and one of the pieces criticized as over-hyping the possibilities of neuroscientific applications of marketing—is by Erk and colleagues (2002) in *Neuroreport* and involved DaimlerChrysler and an fMRI study of brain patterns when estimating social status by the type of car. This empirical study showed that certain parts of the brain undergo greater

activation when seeing images of sports cars, rather than other vehicles. Areas of the brain with particular activation were associated with rewards.

Likewise, McClure and Montague's 2004 piece is considered to be the seminal neuromarketing article, published in the journal *Neuron.* This is an original article developing the findings of empirical research relating to consumer preferences for Coca-Cola over Pepsi. The critical outcome of the study is that subjects in fMRI machines displayed brain patterns of preference relating to brand recognition rather than flavor. The authors believe that cultural inheritance vis-à-vis branding is the dominant factor in such consumer decisions. This article is cited heavily by other scholars and is a touchstone in many of the book-length works described above.

Berns and Moore in 2011 provide another example of an important milestone in empirical research of neuromarketing, exploring possibilities of predictive power of fMRI. Published in the *Journal of Consumer Psychology*, this article reports the results of a study of teenagers' brain activities relating to snippets of brand-new music. While the population study size was small (n=32), the authors found that eventual sales of certain songs were higher in those linked to activation of the nucleus accumbens. In short, a more activated nucleus accumbens meant higher sales.

A 2008 piece by Plassmann et al showed a unique pattern of brain activity for wine drinkers. When consuming an identical brand and vintage of wine, the study group showed far different brain patterns when they were told that the wine they tasted was far more expensive than what it actually was. This showed a responsiveness to price (and possibly interaction with a luxury) rather than just the sensory effects of tasting wine. Many other works associated with luxury goods, such as Pozharliev (2015) also show

similar consumer patterns. Yoon and colleagues (2006) showed different brain activity depending on brand awareness. Kristen Knutson and Brain Knutson works (2006, 2007) also traced discernable differences in brain activity in different regions of the brain. As alluded to above, tracing brain activity to specific locations and attempting to correlate them with psychological processes or physical behaviors is an ongoing major project in the neurosciences, far beyond what one sees in CNNM. Vecchiato and colleagues (2010, 2011) outlined several technical areas of inquiry regarding the limitations of technologies on brain mapping and, if one reaches back far enough, Wendy Gordon's early (2002) article in the *Journal of Consumer Behaviour* explored some early questions about brain and mind structure and the possibilities of neuroscience in better understanding consumer engagement with brands. The article is heavier on phenomenological questions and theory but is an interesting example of the nascent ideas involving the field. Almost as early, in 2003, Ambler and colleagues in *Business Strategy Review* ("Brands on the Brain") called for more targeted study of neuroscientific applications to solving questions and issues of marketing, especially branding and emotional engagement.

A simple literature search involving the term "neuromarketing" turns up many more publications over the past 15 years; some representative examples follow. Brautigam and colleagues (2004) found differences in brain activity between men and women. Kenning, Plassman, and Ahlert (2007) in *Qualitative Market Research* explored the technical possibilities and meaning of fMRI usage in understanding consumer decisionmaking. Fugate (2007, 2008)) gives a critical overview of neuromarketing and also explored its applicability to the marketing of services. Butler, in a 2008 piece in the *Journal of Consumer Behavior*, notes a research-practice gap in neuromarketing, in terms

of current business school research models. Plassman, Ambler, and colleagues (2007) in the *International Journal of Advertising* take on the task of reviewing and summarizing the nascent field of neuromarketing, with a particular focus on its application in advertising. Garcia and Saad (2008) in the *Journal of Consumer Behavior* seek to address an ongoing question in the discussion of neuromarketing: the lack of a unifying model of understanding behavior; they propose evolutionary psychology as a viable plan forward to ameliorate the theoretical gap. Wilson et al (2008) discuss neuromarketing and consumer free will and present a summary of neuromarketing and consumer persuasion models in the *Journal of Consumer Behavior*. The spur for this work was due to the critique by Fugate (2007) that noted that neuromarketing suffers from a lack of a unifying model to describe the linkage between neuroscience and consumer behavior. Lee et al in *Der Markt* (2010) examine neuromarketing as a way of helping to organize business structure. Suomaa, Palokangas et al (2012) in the *Technological Innovation Management Review* seek to consider neuromarketing as a measure of customer engagement. Javor, Koller, Lee at al (2013) in *BMC Neurology* explore the reflexivity of neuromarketing back toward neurology. The authors present a separation between what they view as "scientific" inquiry as opposed to commercial interests. Fortunato et al (2014) in the *Journal of Management Research* also perform a review of studies of neuromarketing, but seek to place some discipline on the type of definitions used in terms of what neuromarketing sets out to accomplish. These definitions include research, scientific, and tool-oriented studies. Lee et al (2006) in the *International Journal of Psychophysiology* make a case for the term of "consumer neuroscience" encompassing more than branding and advertising. The authors suggest new directions for consumer

neuroscience research, namely in the areas of trust, price, and negotiations in an effort to generate theoretical and practical congruence with marketing theories. Interestingly, this piece also briefly explores the possibility that neuromarketing can improve the ethics of marketing generally.

Other pieces, as one might imagine given the hype surrounding elements of CNNM, appeared to attempt to ride the wave of CNNM popularity, even when the studies recounted did not seem to fit the bill. Neto et al (2011), for example, purported to be a CNNM-styled study on price anchoring but was, in reality, a behavioral survey. The recurring Morin, in a 2011 article in *Society* entitled "Neuromarketing: the new science of behavior," recounts the triune brain theory and reiterates the work with Patrick Renvoise regarding the value of neuromarketing.

Marichanny and Sathiyavathy in 2014 *Tactful Management Research Journal* give a history of neuromarketing, which dates back, in their estimation, to 2002. This is also similar to the theory offered by AK Pradeep in the book *The Buying Brain*. The original critique of neuromarketing, also echoed by other articles, is traced back to 2004 in *Nature Neurosciences* in an editorial entitled "Brainscam." The bulk of the article surveys the different technological devices used in conducting neuromarketing studies, including fMRI, MEG, EEG, galvanic response, and so on.

Works on neuroscience in general

Zack Lynch's *The Neuro Revolution: How Brain Science is Changing Our World* (2009) presents a neuro-optimist view of the neurosciences, and includes application such

as neuromarketing. Lynch summarizes much of the ongoing research in diverse fields and their relationship to the neurosciences, such as finance, religion, the law, emotions, art, and others. Neuromarketing in this sense is another level of life improvement, delivering better understanding of products and the consumer's interactions with them. Tim Wu (2016) offers some parallel counterexamples, focusing more on smartphone and related applications and addictive design, but his history traces back several decades.

Sally Satel and Scott Lilienfeld's 2013 work, *Brainwashed: The Seductive Appeal of Mindless Neuroscience*, pumps the brakes on some of the more exuberant interpretations of neuroscience and its applications. This work has a thorough and critical examination of neuroscience and its potential, raising significant questions relating to the possibility of a "picture" of a brain's activity –a snapshot in time—equating with likelihoods of emotional outcome, and therefore reliability in terms of prediction of affect. Satel and Lilienfeld leave the door open for neuromarketing's possibility but also advise caution for a field whose "purveyors lean heavily on hype." (28)

Jonathan Moreno has also contributed to the literature on the general topic of neuroscience. In *Mind Wars: Brain Science and the Military in the 21st Century* (2006, 2012), Moreno examines neurosciences and advances in the studies of the mind through an examination of public policy, warfighting, and emerging technologies. This work provides an overview of some of the potential directions of the neurosciences in general, with a particular eye toward policy questions that should be considered as the future unfolds.

Works on Decision Theory, Behavioral economics, and Social Psychology

Essay One of this dissertation analyzes and recounts a parallel history of decision theory and technologies used to assess behavioral and brain patterns. Many of the decision theory works are original research, performed by some of the most important figures in the history of economic and policy research. These works include the central theoretical constructs of much of modern psychology, including machine learning and artificial intelligence, behavioral economics, and neuroscience.

Von Neumann and Morgenstern, in *Theory of Games and Economic Behavior* (1953)[2], provides the starting point for the field. In *Theory of Games*, the authors formulated first theories about the ways in which humans think about –and should think about—taking risks and gambles. This served as the foundation for vast array of controlled economic experiments including, eventually, the seeds of its own undoing in the form of behavioral economics and prospect theory.

Herbert Simon, roughly contemporaneous with Von Neumann and Morgenstern, was himself a voluminous contributor to the field and, likely, one even more important than his intellectual predecessors. Simon's work in the area followed *Theory of Games* in the early 1950s with his theory of bounded rationality, most relevant to the content of Essay One in the form of *Volume 2, Behavioral Economics and Business Organizations* (1984).[3] Simon's work built on that of von Neumann and Morgenstern, largely by showing the limits of knowledge and what constitutes "rationality."

[2] Von Neumann and Morgenstern first published this title in 1947, but I was only able to acquire an edition dating from 1953.
[3] Simon's earliest concepts of bounded rationality were developed in the early 1950s.

Norman Anderson first contributed his information integration theory in the 1960s and 1970s. In his *Methods of Information Integration Theory* (1982), Anderson provided models of decisionmaking and choice in the context of different routes and amounts of information being operated on within a psychological framework. The exact cognitive framework that he used was less important than the algorithms demonstrated in the work itself for dealing with differing levels of knowledge and understanding.

While this unfolded in decision theory through the 1960s and 1970s, a new psychological model started to edge out the behaviorist paradigm that had dominated for the prior decades. While behaviorism tended to avoid or deflect questions about processes of thought –in deference to what was then observable: only behavior— the new model of cognitive psychology would become more favored. (Solso 2004) This is an important scientific departure from the previous paradigm, opening up new areas of inquiry, which had already begun to manifest itself in the 1960s and 1970s, with what would become prospect theory and, eventually, behavioral economics.

Kahneman and Tversky, in *Choices, Values, and Frames* (2000), collected the most important and salient journal articles and book chapters exploring behavioral economics, from its beginnings in the 1970s through its rise and (likely) toppling of the "rational" paradigm portrayed by Von Neumann and Morgenstern. Kahneman, Tversky, and their contributors all show the results of experiments done that help contextualize and define human cognitive biases in decisionmaking. The area of behavioral economics has, in recent years, begun to count a growing number of Nobel laureates in its stable, showing not only significant levels of scholarly and practical importance, but also internal respect from those within the field itself (however grudgingly given.)

The review of decision theory then leads us directly to the doorstep of neuroscience and social psychology. Cacioppo and Berntsen (2005) set the stage of social neuroscience with an essential link between brain imaging technology, particularly fMRI, and behaviors. In their introductory essay to their edited book, they describe the inception of the field of social neuroscience as being inextricably linked to the availability of the technology that allows researchers to "see" brain activity.

Other chapters in that same edited volume include Damasio et al (2005) discussing the localization of brain function identifiable through imaging, and its history stemming from the famous case of Phineas Gage; Liu, et al, (2005) describing their work with MEG brain imaging technology and how the brain processes and recognizes faces; Moll, et al (2005), describing patterns of brain activity, detected through imaging technology, associated with social decisionmaking and moral judgments.[4] All of these chapters, and others, outlined a significant research program using brain imaging technology and associating the findings with different and documented affective states.

An important ongoing area of controversy and investigation is the role of the human unconscious and implicit processing. Banaji and Greenwald (2013) recount their work in developing the famous IAT: the implicit association test. The general set-up is that a research subject is shown imagery or words and must make a forced association so quickly that it minimizes conscious processes (such as overrides.) Similar to Bargh's work in priming, the IAT has generated notable headlines and heightened debate. For

[4] Phineas Gage was a railroad worker who suffered a severe head injury during his employment: that of having an iron rod driven vertically through his skull, which obliterated some parts of his brain. His subsequent behavior was affected, though disputed according to the veracity and exaggeration of later reports (some later reports claimed him to be an anger-filled, sex-addicted alcoholic). At a minimum, it can be said he suffered from convulsions, that some manual and mental tasks were no longer achievable for him, and that was otherwise deleteriously changed by the accident.

purposes of this work, however, it is notable for its focus on the emotional/fast-response area of decision theory, also traceable and made clearer by more modern scanning and imaging techniques (Knutson 2006).

Relation to STS literature

STS provides a set of valuable and viable alternative analyses of issues in business and policy. Theories of technological change and innovation over the course of history, the formation of social connections, and concerns regarding ethics and power structures abound in areas of business. Theories within STS can provide alternate frameworks that can generate fresh viewpoints and approaches for practical solutions.

Much of neuroscience in general and CNNM in particular has been subject to epistemological study, with controversy over the meaning and accuracy of data produced, especially by imaging technologies. (Dumit, Joyce, Penrod) Some of these scholars have also focused on the relationship of the image itself and the privileging of the "visual" nature that image-production entails (Dumit, Joyce). Andrejevic (2012) in *Somatechnics* discusses some heavily STS-related themes of technological assessment of people, as opposed to behavioral observation. Andrejevic explores questions about the "privilege" of technology, and suggests that technological elicitation of brain activity is as much performance as it is discovery or revelation. Usage of instrumentation in the study of behavior and the brain is also an important development in the post-phenomenological approaches first discussed by Don Ihde, in his conception of technological artifacts extending the ability of human senses such as vision and hearing. The epistemological

questions link quite readily to ethical questions; ethics in terms of biometrics has been studied from an STS perspective, at least partially by Pugliese (2012), working with Foucault (I take a similar, but distinct, approach in Essay Three.)

Group formation and demonstration of expertise has a rich history in STS. Bruno Latour and Michel Callon, whose work I draw on heavily in the context of Essay Two, are architects of the actor-network theory, which offers the basis for analyzing expertise and group formation. Callon's work on early designs and uses of the electric car, but more especially his studies of French fishermen and bivalve harvest, were significant models to show the description needed to outline the relationship between and among actors in a network. Latour's (2007) explanation of all things ANT also provided a basis for understanding the shifting and ever-changing nature of an ANT-type approach.

Given the relative newness of CNNM and the rapid expansion of neuroscience and its manifold applications, there is ample room both in terms of business and management and STS to grapple with issues that are newly arising. This can be seen in innovation and networks, as in Essay Two, but also in the development of attempted explanatory history theories, which would include the social construction of technology and technological momentum, explored in Essay One. This portion of the STS-relevant arena were the obvious ones of Pinch and Bijker (2012), exploring the social influences on the developments of technology, and also Thomas Hughes (same volume), with technological momentum.

As mentioned earlier, the link to ethics between STS and business is also a strong one, particularly when done in the context of emerging scientific knowledges and technologies. Some of the CNNM-specific concerns are addressed in a separate section

below, but at this point, the most important construct that I used for guidance and further refinement is that of Foucault, in *Discipline and Punish* (2012), and his link between power and knowledge, in that the more technical and rarified the field of knowledge, the more power those who hold the knowledge have.

CNNM and Ethics

The recent book *Ethics and Neuromarketing: Implications for Market Research and Business Practice,* edited by Andrew Thomas, et al. Ducu (2017) gives a capable overview of the many points of ethical concern in CNNM in the research setting, and touches more lightly on ethics of CNNM as applied to consumers operating in the marketplace. Lungu (2017) and Clark (2017) in that same volume also point to the parameters of ethical concern, largely in the construct of business and research ethics. The new work I've offered in Essay Three, involving Foucault and considerations of biopolitics, represents a significant extension of this area of inquiry. To further refine several of the arguments I've used invoking Foucault's connections between power and knowledge, I also consulted with Pugliese's work on biometric technologies and Foucault: *Biometrics: Bodies, Techologies, Biopolitics* (2012). Much of Pugliese's analysis focused on the history of the struggles with the technology and racial elements (such as face-scanning technology being unable to discern non-Caucasian faces), but the basic framework of applying Foucauldian thought to such technologies withstood proof of concept in the work.

Two chapters from *"Neuroethics: An Introduction with Readings,"* edited by Martha J. Farah warrant special notice. First, Racine et al in *fMRI in the Public Eye* discuss the discourse using neuro- as a prefix for technologies and its trend in usage in the media. The concern raised in the article is whether there is a disconnect between the expectations of the public and the true probative value of neuroimaging technology (particularly fMRI). The concern is amplified because the authors consider that social expectations can already change and shape policy choices and behaviors ahead of the actual impact of the technology itself. Areas of specific inquiry include the "reality" presented by fMRI, in that "seeing" is an actual reality with greater validity than a behavioral estimation or a surrogate measure; neuroessentialism as a "shortcut" to the equating of the brain to the person (such as in the Pradeep work); and neuropolicy as an area in which usage of an fMRI is advocated on the basis of policy goals, such as the elimination of pornography.

Tovino describes the arguments behind why neuroimaging must be more tightly regulated and controlled as a matter of non-scientific practice in *Regulating Neuroimaging*. The argument Tovino makes is that while the technology itself undoubtedly has provided scientific and clinical benefit and improved the lives of many, the concern and fear about improper usage outside of a narrowly-defined scope involving the practice of medicine militates in favor of preventing commercial entities from its usage. She expresses concern about non-experts interpreting the meaning of fMRI, in terms of lie detection and legal discourse, but also in the sense of the possibility of manipulation. Tovino equates discredited practices, such as phrenology, to the over-

promising and puffery made by purveyors of neuroimaging's application, certainly in the commercial realm, but also in the judicial and sociological realms as well.

The editorial "Brainscam" (2004) in *Neuroscience* is one of the touchstone pieces of critique that spurred neuromarketing research. The piece is frequently cited in both the book-length and peer-reviewed journal literature. It accuses neuroscientists of "jumping on the bandwagon" in an effort to cash in on gullible business executives seeking out the next trend and competitive advantage, even though skepticism and greater caution is warranted.

Levy provides an ethical analysis of some other considerations in neuromarketing in "Neuromarketing: Ethical and Political Challenges" (2009), published in *Ethics & Politics.* Levy opines that too much focus has been on the internal aspect of ethical considerations when thinking through issues relating to neuromarketing. Behavior, according to Levy, validates neuroscience as much as neuroscience validating findings regarding behavior. Levy urges scholars to not neglect psychological ethics and ethical concerns and that the "internal" aspect of the neuromarketing equation, while important, is not solely determinative of the true dimensions of ethical concern when it comes to neuromarketing.

Murray et al (2008) in the *Journal of Consumer Behavior* discusses the neuroethics of neuromarketing by tracing claims of manipulation –overt and covert— over the past several decades. The history begins with the Vicary subliminal experimental claims in the 1950s and the subsequent bestseller by Vance Packard. The authors focus areas of concern mostly on stealth efficacy of manipulation, where a consumer has little or no chance of detecting manipulation by the marketers. They make

recommendations of subject and population protections, disclosures, accurate representations, and assurances of internal and external validity of the studies and the practices.

The area of neuroscience (more generally than CNNM) and its linkage to ethics and policy was thoroughly explored in a special issue of *Res Publica* (2017). The articles in that issue were fairly diverse, but many of them shared a common thread: an assumption that neuroimaging and related techniques possess, or will possess in the near future, a high amount of efficacy. The assumption manifests itself in several ways, but includes common tropes such as "mind control" and "reading thoughts." Only in this context do the questions posed by the contributors in *Res Publica* actually seem pertinent, such as normative discussions on the limits to invasions of privacy (including the sanctity of thoughts), policy constraints on incursions into autonomy, and so on. Jesper Ryberg (2015a, 2015b) both creates the context and sets the balls in motion for these discussions within the special issue, authoring the introductory piece and an essay discussing mind reading and mental privacy; this work also provides a springboard for much of the Foucault-oriented analysis contained in Essay Three. Tunick (2015) also registers privacy as the dominant ethical concern in his work. Many of the arguments in the articles in *Res Publica* are well-reasoned overall, given such an assumptive jump; however, the reality behind the technology associated with CNNM, closely related to many of the discussions currently held in areas of public policy, research subject protections, and evidentiary rules, is that the technologies are just not close to this type of ability. The pervading notion through this strain of literature is that the technology's efficacy is such that such things are now possible, or will be possible next week. While

some of the ideas about being able to forecast emotional response are with us now, the specificity and sensitivity of the testing technology has much ground to cover before that efficacy truly exists.

Conclusions

The literature consulted in this project is a mix of historical, empirical, theoretical, and ethical. As befits a project with such a broad footprint, there are undoubtedly other articles or books that might bear great relevance but, with restrictions of space and practicality, not all have been actively named or consulted. What we can see from the literature, however, is the shape of the theories which have been deployed, along with the topography of much of the controversies and the implications not just for ethics and policy, but also for the possibilities of understanding an emerging technology and science. It also offers a new approach for understanding how groups of experts can be formed in a milieu that is marked by ethical and epistemic controversies.

Essay One:

More than the Impulse Buy: A History of Theories of Decisionmaking and Technologies for Observation in the Service of Marketing

> Like teenagers, neuroscience is in the grip of technology; it has a grandiose sense of its own abilities; and it is entirely lacking a sense of the history of what, for it, seems so new and exciting. (Noe, 2010)

This essay explores the historical developments that lead to consumer neuroscience and neuromarketing (CNNM). These developments include theories of the operations of the mind and brain and technologies that have been used to measure, mark, and map those operations in the service of both science and marketing. The definitions of both areas are and must be broad in order to best cover the theories and instruments that are of the most relevance to CNNM, and the ways in which they developed are wide and varied. They do not, in short, lead in a single unitary way to the state of affairs seen today but instead mark out an often-lateral pattern of development. Sometimes, the developments themselves are even recursive, with the use of older technologies being re-discovered, redeployed, and re-imagined. Development of theories of brain processes are similarly convoluted and sometimes unsettled. Even in the presence of technologies which offer enticing glimpses into neural processes, ancient questions of agency and epistemology will re-surface and temper grand claims regarding insights into human behavior, decision-making, and the nature of consciousness. This essay views the "unsettled science" of both neuroscience and marketing not as a historiographic inconvenience but as an opportunity to ask, "How have these two areas converged in the face of such uncertainty?"

This essay pursues a chronological approach to the historical development of the technologies and the decision theories which are part of the "models" used in psychiatry and psychology to explain the workings of the mind and brain.[5] I trace the parallel developments of technology and psychological decision theory beginning in the late 19th century, as the antecedents of later controversies were sown then (and in some cases, even earlier.) The controversies and developments truly blossom in the mid-20th century, however, which is where the bulk of the analysis occurs. I end the essay in the first few years of the 21st century, with the full integration of many technological methods in the scientific and quasi-scientific areas of inquiry. And the essay ends with a portentous warning by Daniel Kahneman, one of the leading architects in the arena.

The scope of this review is necessarily limited given the extensive network of researchers, engineers, inventors, and related expert groups, along with the convolutions of the history itself. This chapter begins with an overview of decisionmaking and CNNM, and then introduces two theories from STS literature that help in explaining some of the historical developments related to neuromarketing technologies. The two main theories are that of the social construction of technology (SCOT) (particularly in the context of interpretative flexibility and notion of closure) and technological momentum (TM). I use SCOT as a departure point to ask if "closure" is really necessary for technological success. I suggest the systems theory concept of "momentum" as an alternate explanation for the success of CNNM despite its possible lack of theoretical coherence. The inclusion of the element of "time" in the concept of TM is an important

[5] This mind/brain distinction is an important area of ongoing controversy, in broad terms regarding philosophical and scientific debates involving the nature of consciousness, but also in a practical sense of the mind-brain-body relationship. I've tried to make the distinctions clear in my usage when I reference one over the other, and it is not my intention to use mind or brain as interchangeable terms.

one which not only marks TM's departure from other theories, but also represents a variable in which other factors might be subsumed. Iterative cycles of development, hand-offs and communications among different disciplines, innovation, re-work, and other considerations all could occur within a span of time in which technologies change, are adopted, or discarded. Most importantly, I also note that the notion of "closure" from within SCOT might be better understood as "convergence" when used in conjunction with TM.

The historical narrative I sketch follows a rough chronology of the developments of the technologies and sciences linked to CNNM, using these two theories periodically to help explain the phenomena and to identify critical milestones of increasing collaboration between previously disparate areas. The essay culminates with a review of CNNM today, linking those findings to what I observed during the content analysis present in Essay Two.

The Nature of Decisionmaking and Its Relation to CNNM

Attempts to explain and ultimately predict decisionmaking are at the heart of what marketers do: try to understand a particular type of human behavior known as consumer behavior. Why do people decide to make or not make a purchase? Looking at the history of this endeavor, how have the explanations of decisionmaking and related processes developed, how has measurement technology developed over that same span, and what does the relationship between theory and technique mean for CNNM?

The scientific theories involve a progression of paradigms regarding how human beings make decisions. So much of classic economic theory depends on "rational"

modeling, which is where the analysis within this essay begins in earnest. But a separation from that model came almost simultaneously with its original issuance, and we've witnessed over the past seventy years almost a complete about face in how decisions have been psychologically modeled. This progression has now ended up, in today's environment, pointing at the primacy and immediacy of human *emotions*, rather than strictly a mathematical summation of probabilities. Note, however, that the use of the word "rational" in the latter sense is missing; part and parcel of the latest theories is the recognition that emotions themselves are indispensable elements in the decisionmaking process. Experts in the area have come to believe that the dichotomy between "rational" logic and "irrational" emotion may be a false one; indeed, more recent conceptions of decisionmaking readily include emotions and also point to deeply flawed decisions as ones which have not included emotion (A Damasio). Some studies have found a simple impossibility of decision in the absence of emotion. (Moll 2005)

An underlying theme throughout this brief history is this repeated distinction between emotion and non-emotion, and whether such a dichotomy exists in decisionmaking. Even the use of words such as "logic" or "rationality" pose risks of being value-laden, and so the inquiry becomes one of an estimate of where on a scale does a given emotion's impact fall. Even the degree of awareness of impacts on decisionmaking is largely unrecognized by the decisionmaker. Such a "blindspot," so apparent with reasonably close analysis, should give pause to many who take risks in their decisionmaking (i.e., everyone) to ensure that close attention is paid to *all* inputs and possible areas leading to unwanted bias.

Thus, decisionmaking reflects a combination of psychological and physical activity. While this combination may vary, the attempts to track and analyze the different types of activity have also been of interest to marketers. But for many decades marketers and brain researchers followed separate, parallel paths in attempting to understand and measure human decisionmaking. As the theoretical focus shifted from a narrowly-tailored and defined "rationality" to include emotions and the feelings within body—which are seen as more accessible to the technological gaze—this opened the way for a new alignment of theory and practice. Market research technologies that had been developed in a world consisting of practical considerations, wherein pragmatic criteria for "what works" in the context of business judgment rather than adoption of psychological or sociological theories as a whole, began to converge with the new theories and practices of neuroscience and social psychology. Beginning in the 1970s with the work of Russo and others (Russo) with eyetracking, we start to witness an effort at a unification of the research on human decisionmaking and technological scanning and measurement which was successful enough by the 1990s to seem to enter more widespread public awareness. This coincided with the advent of neuroscience and social psychology.

This introduces another theme: the increasing usage of technology in assisting decisions *and* understanding of decisions. First truly recognized with the use of eye-tracking and attention, both the theories and the technologies needed to keep pace with each other in order to reach a point of agreement. To witness, through technology, how thought and feeling are intertwined in the brain of another becomes the best way to bridge emotion and cognition, to recognize its essential unity. We may now recognize that the use of technology may well have altered our definition of what it is to be

"rational." It is my contention, in fact, that it took the direct influence of technology to instantiate the new theories of mind which represented such a complete departure from "classical" teachings. This instantiation catalyzed the burgeoning field of behavioral economics and directly tied brain anatomy and activity to decisions. The use of the technology continues to be explored, in both the visceral and non-visceral sense, and it is likely that the use of both types can be mutually reinforcing not only in the sense of understanding consumer purchases or decisions, but in terms of understanding the relationship between the brain, the mind, and the body.

At the same time, there are serious concerns offered by researchers regarding the effectiveness of the technology and the meaning of the interpretation of the data gathered. One famous example is that the fMRI scan of a dead salmon, taken while the researchers read questions to the fish while in the scanner, showed artifactual data in the scanning device (Bennett et al). These data, the researchers argued, were akin to that of data being interpreted so as to show brain activity analogous to affective states. In other words, the emotional responses of a dead salmon seemed comparable to those of live human subjects. Another example stems from Kahneman (2012), who criticized many studies within the arena of social psychology for lack of validation and reproducibility; this note of discord, recently struck, still rings today and echoes within the analysis in this essay. Discussed later in the work, this also represents an inflection point with unanswered questions for many within the field of social psychology and the role of the unconscious. While many of the early studies showed significant impact of, for example, the principle of priming, many follow-up studies have been unable to demonstrate the same significance. This situation has generated greater and greater controversy and potentially

undermines much of the social psychology experiments that were originally thought to be uniquely insightful.

Controversies involving this field are manifold, but the underlying concerns really are ones of efficacy and fear. The controversies afoot today have roots far in the past, but the transformations that have occurred have magnified the controversies involved; what once might have started as a scholarly argument about the meaning of a portion of brain activity, or a measurement of attention, has become highlighted through popularization in mass media and in the possibilities that such technologies might offer in a variety of contexts, including the political and commercial. There is, therefore, an active issue of controversy linking the power given to the results of such studies with the frailty of the knowledge that they might contain. This is explored in greater detail in Essay Three of this work; we can just note at this point that the field of predicting human behavior has been awash in claims about knowledge and insights relating to human behavior, along with the possibility of influencing and controlling that behavior. With the chipping and cracking of the basis for such knowledge, that power might be on the wane.

Science and Marketing: A Gradual Convergence

Marketing in terms of studying consumer choice with an attached and dedicated empirical research program maintained a fairly low profile in its early decades. It was not until the 1970s that several researchers (Russo, Orquin) began to unite the theories of attention with the usage of eye-tracking devices, and, in the 1980s, Weinstein and colleagues experimented with EEG and reactions to advertising (Weinstein 1984). In the

1990s, with the advent of fMRI and its attendant lore, the combined constituent fields of CNNM finally and truly converged.

Why then did marketing seem so slow to absorb the latest theories of science and the technological implements? The answer has as much to do with ideas of expertise and professionalism within marketing, along with pragmatic usage of tools to solve practical issues, as with the efficacy of new technologies. The experiments used by psychologists and economists alike from the 1940s to the 1970s seemed to have little relevance to the marketers as a profession. Some, of course, used what they believed to be valid psychological theories, such as Dichter and his Freudian interpretations of automobile design (Wu), but the actual external validity of these approaches was virtually nil. In general, the "art" would still prevail over the science, at least in terms of design and promotional cues. Other research, such as consumer surveys, interviews, and focus groups, would have greater and earlier success.

It should also be noted that, through the 1940s, 1950s, and 1960s, the dominant intellectual theories in the realm of economics were largely based on von Neumann and rational-utility theory, with general glossing over of the inconsistencies in data that might be found (Thaler 2017). Since rationality was not readily mapped onto the body, the dominant theory did not lend itself to technical interventions. The departure from orthodoxy represented by Herbert Simon's critique of rationality (discussed below), which would eventually lead to the behavioral economists a la Thaler, Kahneman, and Tversky, was not especially prevalent in the academy. There is a mix, however, in the history of marketing where marketers would only go so far with mainstream economic theory and were plainly intuiting areas that "worked" irrespective of whether the

economists thought so. (Sutherland) Sutherland has argued that the earlier, Austrian school of economics as typified by von Mises and Hayek, were much more amenable to the inputs and insights of psychology than the later "rationalist" and utility-based theories of the 1940s and 1950s.

Rather than focusing on these debates, the discipline of marketing, as an applied discipline representing a combination of insights from sociology, anthropology, and psychology, was preoccupied with things that could actually work in the marketplace, even with a high rate of error. The struggle to contain that error began many decades ago with the famous quote of John Wanamaker, in that half of every dollar spent on advertising was lost…the problem was the unknowability of which half. This signal of despair of the unknown unknown, hailed from the inventor of the price tag. (Wu) The fact that the effectiveness of marketing is hard to verify partly explains why the field has been open to new techniques but has not reached SCOT-type closure on the optimal ones to use. The ongoing practical concerns for expenditure and efficiency also go a long way toward explaining other gaps; marketing does not address itself toward resolving *only* scientific questions but instead looks for solutions for problems in the market or the firm.

With the increase of the use of eye-tracking to monitor attention and the gradual growth of the "irrational" side of economics in terms of prospect theory (eventually behavioral economics) in the 1970s and 1980s, marketers apparently began to smell their own. By the time of the invention of the fMRI, refinement of EEG, and other technologies that promised to show more brain activity in a more accurate and timely way, the brain activity related to decisions could be seen in colorful images. Why not

look at the decisions to buy, or at least, decisions related to buying (such as assessment of advertising or product design)?

The question of the alignment of theory and practice in marketing is one of availability and transferability of knowledge. Marketing, with its eclectic constituent parts, still uses old assumptions in many places (Armstrong and Kotler); in many cases, while not the "best" practice, these still might be the accepted practice. Much like, at one point in time, one couldn't get fired for buying IBM, many marketing managers might be loathe to depart from the traditional teaching. And the question may not be even one consisting of a gap between psychology and marketing (there has always been a bit of overlap in some applied senses), but a gap between economics and marketing, along with economics and psychology.

Even after the rise of CNNM, the battle between the "trads" and the "neuros" continues to this day, though at least a large contingent of the "neuros" also recognize the value of social science research such as surveys and interviews. The battle regarding the "hyping" of the imaging studies has even carried over into the realm of the construction of the code of ethics for neuromarketing, and is still largely the echoes of both skepticism and carnival barker. The debate continues, but all marketers know that they *must* know the customer, and decisions are made on pragmatic grounds; the pragmatic factors include expert business judgment, along with accepted degrees of risk that comes with competing in a marketplace. To the extent that one firm may understand customers better than their competition (and, furthermore, can leverage that intellectual advantage in practice), the outcome becomes a measurable one. If, in fact, such advantage might be directly linked to neuroscientific insights, more of the "trads" will be able to make a case

–either to themselves or to decisionmakers within their firms—that the CNNM axis of knowledge might be worth something.

Applying Science and Technology Constructs to Business and History

Interpretative flexibility is an STS concept from the "Empirical Programme of Relativism" or EPOR, which states that "the interpretative flexibility of scientific findings is displayed; in other words, it is shown that scientific findings are open to more than one interpretation" (Pinch and Bijker 20). Pinch and Bijker suggest to extend this flexibility to understanding the development of technology; if the controversy of several interpretations is an attribute of EPOR in the scientific realm, then any technology or artifact with multiple potential designs and uses must also have analogous controversy-resolution processes.

Instead of EPOR, this process can be labeled as the social construction of technology, or SCOT, distinguishing technology from specifically "science" research. The analogy comes forward as the result of a constructed process that results in a technology or artifact: "technological artifacts are culturally constructed and interpreted; in other words, the interpretative flexibility of a technological artifact must be shown . . . . there is flexibility in how artifacts are *designed*. . . . In principle, this could be demonstrated in the same way as in for the science case [EPOR]" (Bijker 33-34). Each point in the history might show, or not, whether the process converges on the resolution of such a controversy. Early in the history, however, even the recognition of a controversy would take different forms.

In using the piecemeal process of SCOT, a result appears to be a series of partial interpretations by different social groups involved with the technology; this is the case for CNNM, as it is for the development of the bicycle in Pinch and Bijker's famous example. The partial interpretations in fact lend some descriptive resolution to understanding some of the processes behind adaptation. Also informed by exogenous factors involving society, culture, and economics, interpretative flexibility points a direction toward a "final" stage of *closure*, where the resulting technology or artifact is stable.

The process involved in CNNM, however, is still very open and very controversial. It is, in fact, only recently that the technologies and the theories have been well and truly married in the sense of an ongoing research program (though seeds of this program may reach back further into history than some may think). Interpretative flexibility might well describe and classify factors that we need to examine as we go through the history, but we should recognize the limitations of ascertaining whether closure has not yet been reached, and we may have little to no perspective on that for years or even decades. If anything, it appears that historically and today, CNNM actors have been struggling to achieve that very closure, which promises scientific legitimacy for CNNM, widespread adoption, and marketing success. If closure is not forthcoming, is there another way to explain and measure the success of CNNM, as a practice and a loosely-linked interdisciplinary community of experts? There is the possibility of an alternative concept: that of convergence.

What we see in the forms of the technologies used in CNNM is a spread from medicine to specific psychiatric and psychological measurement to commercial deployment. With the specific development of fMRI as an example, this transition

moved rather quickly, though it has continued to be limited by the expense of the technology. In other cases, technologies such as biometrics have had such broad application that the usage has been very widespread and rather unremarkable (and unremarked upon, as opposed to the news reports of fMRI finding "buy buttons" in our brains.). I will develop the argument throughout the essay that the availability of technologies in adjacent disciplines (medicine/psychology/marketing) created pathways and, in some cases, facilitated its spread and adaptation to new uses. There is also a linkage to Essay Two and its discussion about the ways in which technologies are "translated" into usage in the context of CNNM.

The area of technological change might be best described in the STS context by comparing this history with the features of Thomas Hughes's technological momentum. Hughes developed the concept of technological momentum as a way of bridging a perceived gap between the theories of technological determinism, wherein technology was thought to find its own way, irrespective of human or social inputs, and social construction of technology, which tends to elide situations such as path dependency, market forces, and related non-social issues. To this, Hughes also added the feature of "time" which is the combinatorial laboratory between SCOT and determinism, to create the concept of technological momentum. Technologies might have certain tendencies or affordances, but they are not immune from external forces in society; likewise, society does not have complete control or foresight over what an artifact or technology might become. Technological momentum is manifested in things like sunk costs, infrastructure, standards, trained and experienced workers, laws and regulations, and other past investments and habits that shape future decisions. Technological momentum can explain

why a technology spreads from the field that made the initial investment to other users attracted by its apparent success and falling marginal cost, like water leaking from a reservoir when the walls have been lowered.

The movement of technology from the medico-psychiatric field to commercial usage in the context of CNNM is one that might be best understood using technological momentum as a series of guideposts. One of the most important constituent parts of TM is the factor of time, in which many other occurrences, circumstances, and objects might be packed. In a sense, it serves as an all-person variable within Hughes's theory, but we might best understand time in the context of the development of science and technologies within CNNM as a set of events, circumstances, and artifacts acting as an area of convergence. In this conception, convergence includes scientific theories, technological artifacts, human factors, external factors, and, of course, expertise.

Convergence acts as a connection point between technological momentum and SCOT. In a complex, dynamic, and unfolding nexus such as what constitutes CNNM, it might be thought of as an idiom[6] in which various factors and actions might be conceptualized as taking place. This conception advances and expands SCOT's use of flexibility and closure, and stretches the Hughesian idea of "time" into something slightly more specific, acts as a continuity point between technological, historical, and social theories, but also occupies an area of generality in which an unfolding field such as CNNM might be captured.

In summary, I will examine milestones in consumer decisionmaking research and practice including scientific controversy, technological spread, differences in interpretation and usage, and finally the catalyzing moment when science and technology

[6] Inspired by Sheila Jasanoff's "idiom of co-production."

combines. One essential question throughout this analysis is to determine if convergence might be marked and what specific circumstances can be reached and defined. I will also look for evidence of the broader applications of technological momentum as an additional or alternative explanation of the apparent success of CNNM.

Early theories: Mind and Soul

With much of today's perceptions, we may have the temptation to view historical or even ancient views of things such as the soul to be, at best, quaint. Ancient Greek philosophers who proposed different "ruling elements" to describe a persona (phlegmatic, for example) might be viewed with the same skepticism and eye-rolling as astrology. But for more than a millennium and a half, what Socrates and Plato started by considerations of mortality and immortality, Aristotle solidified with his description of the "pneuma," or the vital air that drives a living body. Aristotle's work also established, perhaps far beyond his time, the metaphysics of a thought consisting of consideration of an object, the object itself, and the relationship between the thought and object.

While elaborated for centuries, the central Aristotelian view held a comfortable position within the canon of the best of late antiquity and medieval education, kept sacred (and yet still notably debated) within the Catholic Church. Aristotle –otherwise known simply as "The Philosopher" – became the rock against which many others broke themselves.[7] Some of the power of Aristotle came from the strength of the reasoning that he developed, based on observation, but the bulk of his theories' rhetorical strength came from their doctrinization by the Catholic Church.

[7] Whether Aristotle would have actually approved of this is remarkably dubious, given his own life's history of being chased out of various city-states when his teachings ran afoul of political authority

It would be during times of great religious schisms and continental warfare across Europe that studies of cognition, mind, and soul would unwind and separate different considerations. Much of the known debates occurred in Britain (most notably with John Locke and his *Essay Concerning Human Understanding* in 1690), but the degree of passion and the time and place at which a debate about abstruse concepts such as soul and mind that could challenge conceptions and shake the very foundations of reality and state came in continental Europe. It may well be that faith had been shaken in England at a far earlier time (perhaps with the downgrading of kingly influence in the 13th century, but without question by the time of the 1500s, when King Henry VIII happily ordered monasteries and churches burned and met his own excommunication with a new marriage and presumably a yawn after an enormous feast.)

On the continent, Rene Descartes and Baruch Spinoza entered the ring as the first champions of lines of thought still debated today: dualism and monism. The first debates raged about the nature of humans, the degree to which the soul could be identified (or even should be identified) and, ultimately, what it might mean to be ethically human. Battle lines were drawn around the mind and soul, and it might be said that debates today still carry with them the echoes, both in terms of the science and in terms of the public meaning of humanity. But while mind and soul would divorce, mind and body would gain succor in the company of each other.

About the brain-medicine scene in France in the late 17th century, George Makari writes:

> By proposing a unified medicine of the moral and the physical, Montpellier doctors could attempt a synthesis, a unification of bodily animal functions with

> mental life. Over the next decades, a number of French writers avoided the language of body and soul and pursued instead the physical and the moral. . . . Baconian experimentation and empiricism alone made it difficult to recognize the big picture. . . . Medical research should focus on the law that governed the whole, what the Montpellier school had dubbed the "Animal Economy." This intricate assemblage linked the physical and moral aspects of humans in sickness and in health . . . . sensations affected the inner organs thanks to the nerves, which sent oscillating current into the brain. The brain then acted to regulate the entire bodily system. . . . When the mind was in a state of reflection, it produced electric currents that led to nerve sensation and willful action. Thus one's mental state could deeply affect the animal economy, *as demonstrated by the effects of terror on respiration, heart rate, and the skin.* [252, emphasis added]

The early French physicians not only set up much of the science and philosophical debate (including much of what one would see during the French Revolution, for example, and the works of Voltaire and Rousseau). Psychology and psychiatry would develop over the next two hundred-plus years, but this early linkage of the faculties of cognition, perception, and bodily response are virtually indistinguishable in general terms from what neuroscientists and CNNM practitioners still perform today. Early attempts at developing technologies would be to measure psychological phenomena; the controversies attendant at this point were more within what would be recognized as EPOR – the roles of religion and state, soul and body, rather than anything that could be considered convergence as far as technology. The direction, however, was set: the need for measurement. And what could measure, if not technology?

Early Technoscience, Psychiatry, and Measurement

During the later parts of the 18th century, ideas regarding freedom from religion and from the sovereign came to a head in several parts of the globe, including British North America, but very notably during the French revolution. Much of the earliest parts of psychiatric history date back to the utter epistemic, spiritual, and physical separation seen between church and state during this period. This trend was, at least in the early years, fitful, sporadic, and frequently reversed, but the changes became evidently manifest with the adaptation of the field of medicine to encompass mental processes.[8] (Makari)

Of the technologies discussed in this essay, virtually all of them can be traced back directly to an ancestor in the nineteenth century. Some of them hail from even earlier parts of history, but the most distant ancestor that can be directly linked in an unbroken line stems from the mid to late 1800s. In 1849, electrical activity on the skin could be first detected, clearing the way for galvanic skin response (more broadly termed electro-dermal activity) and other biometric and biofeedback experiments.[9] The first techniques of eye tracking, done manually, dates from the 1870s, as do the first theories and experiments involving electrical activity in the brain.

[8] It seems that at least some of the tradition of French thought in psychology and their national commitment to the creation of asylums for the adjudged insane became a continuous thread of intellectual inquiry. Most relevant for this project is its impact on Michel Foucault, covered more thoroughly in Essay Three. It can be said here, however, that his studies of madness and incarceration were not new to him and instead had a significant place in the history of French intellectual history.

[9] Even so, Makari recounts much fascination and experimentation with electricity and the human body, particularly in France, during the late 1700s. Concepts such as mesmerism and animal magnetism went through their faddish stages at that time and place.

Also in the late 1870s, theorists linked psychological states *to* electro-dermal activity, indicating that the activity of the brain and the subjective state of mind (excitement, anticipation, nervousness) can be measured on something resembling an objective scale (In the early 1900s, no less a light than Carl Jung would find electro-dermal activity to be of striking value to psychiatry as a field.) A short time later, still in the 1880s, the use of drugs to elicit different activity could also be determined; the first meter for measuring electrical activity in the brain, presaging the EEG, also began. (Swartz) Even in the 1890s, the first link between blood flow and brain function came to be known, though this theory would not see its true technological embodiment until nearly a century later in the form of magnetic resonance imaging. Another form of biometric assessment sprouted up in Argentina in 1891: the practice of fingerprinting. (Pugliese)

It was in the early parts of the 1900s that systematic work began to be undertaken in order to study areas of persuasion, which included attitudes and behaviors. This appears to be the first documented contact between areas of psychology and business. In 1908, for example, noted public racist, eugenicist, forced sterilization advocate, and Prohibition supporter (and late in life, chairman of the American Civil Liberties Union) Edward Alsworth Ross studied persuasive techniques and used the same in his heated rhetoric, while others, such as Gordon Allport, focused on elements of personality.[10] This coincides with close discussion of the use of psychology in advertising.

[10] Interestingly, one of Allport's students was Stanley Milgram, discussed somewhat in Essay Three and the principal architect of the infamous but striking "obedience to authority" experiments of the 1970s. Another of Allport's students is a co-founder of implicit association testing, which has gained considerable attention in the area of cognition and decisionmaking, and is discussed later within this essay.

Also in 1908, Edmund Huey developed more systematic methods of eye-tracking, by placing a type of contact lens over the eye of the research subject, which limited light entering the eye. (Orquin) It was undoubtedly uncomfortable, but it also represented the first linkage of machine to human for the purpose of studying this aspect of behavior. Also in the first decades of the 1900s, greater and greater attention came to rest on the EEG, at first in animal models, and then moving to human use in the 1920s. (Swartz) By that time, most of the focused use of EEG was in a clinical setting, dwelling on epilepsy and other epileptiform illnesses of the brain. Still, the linking of the ability to observe electrical activity in the brain, during periods of ordinary activity and contrasting with those of epilepsy and seizure, further opened the door for the connection between brain activity and mental states. It would be in 1947 that the first professional society for EEG was formed; this year, 1947, becomes an important year for the history of the remainder of the discussion of the technologies and the science of human decisionmaking. (Swartz)

What can be said thus far considering our quest for convergence? We have seen an early linkage in biofeedback to pre-revolutionary France. Psychology had considerable cache by the late 19th century in both Europe and the United States and might even be argued that it supplanted areas that had been previously occupied by, of course, religion, but also of philosophy. The march of these ideas is best recounted elsewhere, but to note it here is important, as it demonstrates a conceptual linkage between body and mind that provides the foundation for all of the later work which has been directed toward the sum total of human experience, including that of buying and selling. The development of technology that would measure these activities (EEG and

eye-tracking) is a remarkable construction. We have, therefore, two general and strong linkages: mind and behavior, and technology and physiology.

Science and Art in Advertising, in Which We Introduce Marketing as an Interpretative Force

Marketing instantiates much of the decisions made by those within firms seeking to sell goods and services to customers. In a strict SCOT method of analysis, we might expect convergence to occur through the interpretative force used; however, my use of convergence is more expansive than that of closure, and might be used to occupy more ground. To see this, we can travel back to the early areas of marketing and advertising to see it from its most nascent stages.

Many of the earliest examples of advertising depended almost entirely on a factual litany of a product's attributes. (Strasser) This approach, coinciding with the increasing use of magazines and wide-circulation printed media in the latter decades of the 1800s, closely mirrored the approach and tone of that of a news article. Much in line with the Victorian ethos of the day, doing anything other than that would have been unseemly; indeed, the very *presence* of advertising at all was fraught with concern and, in some cases, outright condemnation.

The type of the product being advertised may have had something to do with the early-stage handwringing. So-called "patent medicines," which were neither patented nor medicinal (and in many cases, were in fact outright toxic), were the subject of advertising which began to suffer from a greater divergence from the "just the facts" approach used in the earliest adverts. At the same time, while legislation and regulations would be

developed in an attempt to counteract some of the more egregious abuses, advertisements began to depend on a more eye-catching, aesthetic approach in order to gain attention. Examples of these early aesthetic attempts included adverts for soaps (such as the famous example Sapolio) and a "sure cure for all female weaknesses" (Lydia E. Pinkham's Vegetable Compound), both of which could be found in many periodicals starting in the 1880s. (Strasser)

In the late 19th and early 20th century, with the true burgeoning of a mass-produced market-centric economy, at least in the United States, a larger proportion of the population were exposed to advertising for different and now affordable consumer goods. Shopping for such items, sold by vendors, or purchasable in stores by many different people from different walks of life, became more and more common. Increased and efficient mass transportation across larger distances lengthened the distribution chains for many of the products as well, meaning that fewer and fewer households would depend on the bespoke, homemade, and handmade. (Strasser)

Firms, sometimes in heavy competition with each other and with cheap knock-off copies, began to find it necessary to influence consumers to make purchases bearing their particular name. Concerns regarding the quality of certain goods and confusion with manufacturers, encouraged those who developed safer and higher quality products to emphasize their "brand," and therefore reinforce the conception of that brand in the mind of the individual consumer with attributes such as safety and dependability (Strasser).

With the increasing growth of mass-produced, commoditized products, further supported with the integration of an efficient national freight transportation system, more of the young advertising agencies and their clients were able to collect early forms of

"big data" involving purchase volumes, pricing, seasonal differences, and more and more customer information.

The collected customer information would be further buttressed by early surveys and interviews. This information came to be collected and analyzed in a way that would be strikingly familiar to marketing research firms and consumer product companies today; through statistical means and hypothesis testing, an empirical bent began to surface in the methodologies used by agencies and companies alike. In 1910's *The Psychology of Advertising*, Walter Dill Scott declared: "Advertising has as its one function the influencing of human minds. Unless it does this it is useless and destructive to the firms attempting it. As it is the human mind that advertisers are dealing with, *its only scientific basis is psychology. . . .*" [Emphasis added] (2).[11] In the years following Scott's work, some firms included the use of behaviorist approaches in the 1920s and 1930s, though it would be some more time before insights from behavioral sciences came closer to the fore in helping inform marketing and advertising strategy and tactics. This initial linkage to behavioral science and its further "stacking" within the field might be thought of as evidence of convergence, piloting evidence and theory from disparate fields and re-applying and re-interpreting them for new ends.

The "psychology of advertising" is an important consideration as well in an attempt at understanding a social construction element that one might expect to find in closure. This stands as an insertion of a scientific discipline into that of commerce; if this is true, then it is logical to also fit it into the broader capture category of convergence. As

[11] Even this 1910 work was based on some earlier works published around 1900. See https://www.theatlantic.com/magazine/archive/1904/01/the-psychology-of-advertising/303465/ (archival 1904 article by Scott, based on another work he cited as *On the Psychology of Advertising*. Professor HARLOW GALE, author and publisher: Minneapolis, Minn. 1900.

mentioned above, the early 20th century is the era of first contact between the two, but the collision did not appear to be violent, nor paradigm shifting in either the ordinary or Kuhnian senses. Instead, there seemed to be a steady accumulation of evidence, but large sections of it did not find its way into mainstream marketing thought. Like an empty reservoir slowly filling from the emptying of a variety of small streams, it took time before the dam would be breached (if in fact, it every truly has).

Social science surveys solidified in great measure under the watchful eye of George Gallup in the 1930s. His survey-based approaches disclosed the reading and listening habits of many American consumers, and other agencies gradually added their own research and survey departments (Fox). One of the effects of this me-too effect was also reflected in the advertising campaigns mounted through the 1940s and 1950s, which many critics within the industry opined dissatisfaction with the lack of creativity; instead of creativity, they leveled accusations of copying, lack of originality, and suffering from a lack of boldness. Fox writes:

> Within any given agency, the ascendant researchers found little common ground with the denizens of art and copy. The former thought of advertising as a science and spoke a dense mathematical patois. The latter regarded advertising as an art, or at least a craft, that responded to one's creative muse. Given the tendencies of the date, creatives felt displaced and defensively blamed their problems on "research and other things," as Les Pearl of BBDO put it: "Merchandising men and research men are statistic-ing the creative man to death." "No one yet," said Walter Weir, "has succeeded in making an advertisement by setting in type a research report." Yet at staff meetings the marketing and research people held the floor. . . . (182)

While all of this continued to bring to the fore accusations of sameness and dullness, it also paved the way for research into what was then called "motivation" (Fox). Motivation research, or MR, came to rely, more and more, for the latest research

in behavioral sciences that looked to individual decisionmaking. Thus, the interest grew in the individual perception, the individual cues, and the idiosyncrasies and differences between people that would be viewing the advertisements because then, more so than any other time, the attraction of the gaze became *the* single largest factor in judging the appeal of an advertisement. It was the "age of the eye" (Fox, 179). The tension between the aesthetic identity of advertising as an unquantifiable and irreducible work of art and that of something that can be analyzed and fully reduced marks at least a rhetorical break between the scientific and the artistic, and the "trad" and the "neuro" that still exists today.

Below is an example of a "scientific" or at least a quantified advertisement. It was published in the 1920s according to the then-understanding of scientifically informed understanding for an appealing advertisement, relying mostly on the language of aesthetics to construct a "psychologically" appealing picture. The terms, even in the 1920s, show a strong appeal to the visual sense and the primacy of the eye. The qualitative standards shown in the interpretation also push into the area of convergence, retro-fitting aesthetic, artistic expression within psychological appeal.

The Eye and the Advertisement

II

By GEORGE FRENCH

IV.

BESIDE those more or less general considerations mentioned in the article before this, relating to the eye in reading, there are seven other principles which are very important in advertising design, and which we draw directly from general art. They are:

Proportion, the relation of dimensions.

Harmony, the relation of the units.

Balance, the relation of the positions.

Symmetry, the relation of the contours.

Tone, the relation of the masses.

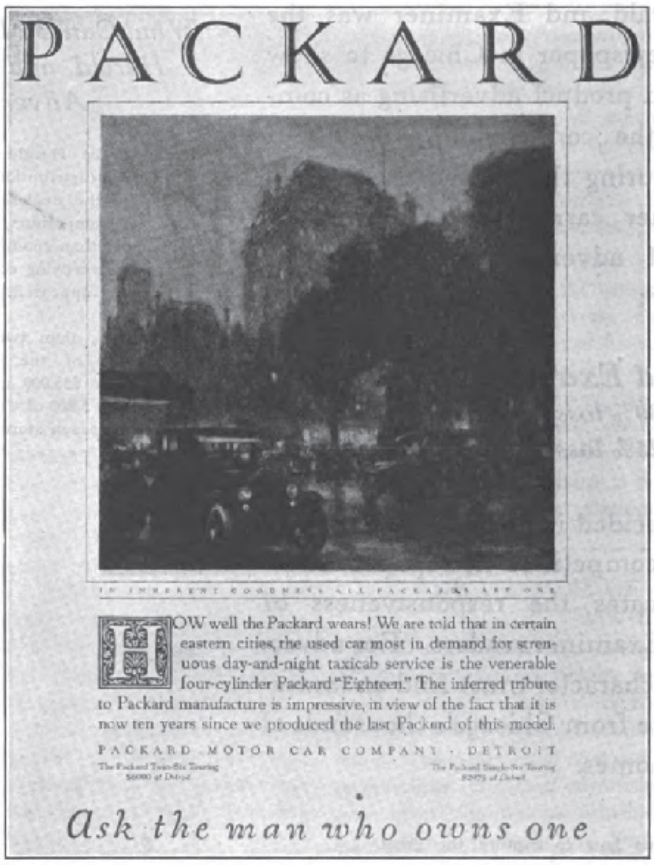
Perspective, the relation of the distances.

Color, the relation of the contrasts.

It is necessary to think well of these principles if we are to make an advertisement which is likely to appeal to the eye and get a conscious glance of attention. The normal human eye abhors forms that do not conform to these canons. It avoids them instinctively. Observance of them by the designer is not a cult. It is wisdom.

It is a curious fact, which I never have seen explained, that the eye demands that an oblong rectangle be proportioned according to this formula: 3:4.85. The axes of an oval must be according to this formula and so must the sections of a cross. No rectangle proportioned otherwise will look right; no oval, no cross. That is sufficient reason and justification for the advertising designer, and even if it were possible to cite sufficient scientific reason it would not be profitable to waste the space. The usual magazine page conforms to this proportion, and that is one reason why some publishers still adhere to the old form. The pages of the so-called "flat" form magazines and periodicals are not as well proportioned. The page of WESTERN ADVERTISING is almost exactly a split between this formula and the so-called "French" formula, which is 4:6; so that it is nearly justifiable, being on a basis of 3:4.25.

Harmony covers more than the physical character of the advertisement. It involves the relation of the physical units, and the business motive and the literary motive of the copy. Most important is the business motive, as the design and the copy may easily be harmonized with it. An advertisement of a plow should express in its looks the ruggedness and strength of a plow, by making the design and the typography strong and rugged. This is a matter of tone, rather than design.



The illustration is too dark, but otherwise this is a very good advertisement, and illustrates many of the principles laid down in this article

Harmony in the design is found by making all of the units of the advertisement harmonious. It gives the advertisement that "punch" which we all seek—drives it far into the mind of the reader. It requires that the form, art work, border, typography, etc., all harmonize in essentials—that italic type, for example, may be used with a border with a floral motive, or with a design in which curves predominate but not with a Grecian border, or any border having a rectangular design.

Harmony requires that all parts of the advertisement be placed so that the effect of the whole is as one design; that light type be used with light border and line drawings; heavy type with solid half tones and strong border, etc. It is the office of harmony to induce the reader to pleasurably neglect the design of the advertisement and drop his eyes onto the text; for, after all, the design ought not to attract attention to itself, but merely induce a sensation of comfortable agreeableness which will lead into the argument of the copy.

OVER-EMPHASIS FATAL

Many designers emphasize their work too much, so that the reader is intrigued by the fine artistic picture, and also satisfied. A too lovely design tempts lookers to expend their attention upon it, and neglect the gray masses of the text. The design is merely a lure to tempt the mind of the observer to a glance at the text. A picture in advertising may be too beautiful.

Harmony is, in advertising design, "the just adaptation of parts to each other in any system or combination of things, or in things intended to form a connected whole; such an arrangement between the different parts of a design or composition as to produce unity of effect, or an esthetically pleasing whole."

Balance shows how to place the units and to determine their weight, so that emphasis shall be where it will both make for an artistic whole and duly bring out the points of the text. By balancing the parts of the advertisement we are able to get the optical center and the center of weight at the same point—and that is very important. The optical center of the advertisement is not at the point of center by measurement—another peculiarity of the eye; it is, or should be, determined by the golden section formula, 3:4.85—that is, three inches from the top of an advertisement that is 7.85 inches deep.

Generally, balance requires that display lines and masses of text shall bal-

Mixing Art and Invoking Science in mid-century

While advertising continued in the 1930s and 1940s, often as a hodgepodge of the psychological and the aesthetic, there seemed to be forming an increased interest among marketers in information assimilation and a greater reliance on data-driven exercises and decisions. Yet this "rational" approach competed with Freudian thinking, which occupied a significant amount of psychological theory. Chrysler, for example, employed Ernest Dichter to advise on automobile styling and advertising. Dichter, a noted Freudian thinker, advised to maximize sexual cues in the marketing. (Wu) At the time, this was not considered harmless fun, even with the degree of perception of the 1950s in the US as being the heyday of public-image conservatism and wholesomeness. Ernest Dichter was, for the most part, the single largest target of Vance Packard's *The Hidden Persuaders*, often portrayed as a borderline omniscient force that was able to play on the instincts and prey on the decisions of all of us. The fact was that Dichter's theories on consumer motivation had virtually no impact in the empirical reality of the marketplace…except for the sales of Packard's book. This does, however, underscore one of the notable moral panics attendant to the field of marketing. Advertising and sales, when clothed in scientific theory, somehow appears more sinister, imposing, and irresistible. When, in fact, people learned that they did not instantly purchase an item merely by seeing an advertisement, no matter how "scientific," the bottom dropped out of the panic…if not the market. What nearly everyone seemed to realize, implicitly or explicitly, was the

importance of behavior and, more specifically, consumer behavior. What then is the best way to influence a consumer decision to purchase?

The work inside of advertising and marketing groped through its own internal debates such as Freudian influences, but the world outside of marketing in the same time frame developed far more serious and rather more influential work. In the immediate aftermath of the Second World War, some theorists were preoccupied with issues of rationality in the face of nuclear devastation; how would or could decisions be made when the death of hundreds of thousands, or even millions, could occur in an instant? Why and how do people behave rationally? Can this be counted on in times of the ratcheting upward of pressured rhetoric and the simultaneous dissolution of trust between former allies in World War Two?

The theories regarding decisionmaking with such momentous consequences would naturally find a way into the realm of economics which was, as a field, also making its own transition into being a field highly dependent on mathematics and statistics. History has many examples in this regard; the targeting of Japanese cities by the United States Air Force for maximum effect, as measured by statistics; the usage of new calculations of rational games for understanding cooperation among allies, and the interpretation of signals by enemies…all of which were presumed "rational."

The modern archetypal construct of "ideal" rationality in human decision-making was offered by von Neumann and Morgenstern's theories on utility, debuting in 1947. They offered four axioms which supply guidance for a calculation of rational decision, describing the parameters around which utility can be best defined and lend itself to the most effective decision (as measured by utility.) Following the four axioms might be

thought of as a universal pathway for maximizing utility, though this might also be thought of, in perhaps a more conservative manner, as decision tools for organizations to follow, as opposed to individuals. The four axioms include completeness, transitivity, continuity, and independence. These can be loosely understood as four parameters within which an economic game would take place, and, in the context of *Theories of Games and Economic Behavior,* are largely derived from mathematics and probability theories and are best described in those terms. In more layman's terms, completeness stands for the completeness of choices by the individual in a given decision-making realm; transitivity envisions a relationship among variables such that if two are related to each other, and a third variable enters which is related to the original two, then either of the original two must be related to the third; continuity means that there is a point at which one variable is more preferred than the other; independence means that the addition of a new variable to an existing set of choices does not impact the original selection (von Neumann 27).

The rational utility tools likely experienced a growth in recognition and expansion in scope similar to other fields, in that the interpretations and extensions by other theorists and economists went further than what had originally been advised or even anticipated by von Neumann and Morgenstern. In several areas, they cautioned the reader (presumably, other economists or game theorists) that their axioms and constructs represent "some" of the possibilities of economic thinking and they do not anticipate that the "games of strategy" can be used under all circumstances. They knew at the time of the writing that the mathematically-heavy considerations they use in the development of this theory represented a departure from the bulk of economic theory available in the 1940s, and they knew that the additions to the theory would not be a universal one: "first

let us be aware that there exists at present no universal system of economic theory and that, if one should ever be developed, it will very probably not be during our lifetime . . . there is no universal system [of economics] available at present." (2)

At the same time, however, the generation of the bases for the different types of games envisioned by von Neumann and Morgenstern do point to a significant reliance on a concept of rationality that is based largely in mathematical terms. They provide ammunition for future defenders of the rational utility theory by stating that "the arguments often heard that because of the human element, of the psychological factors, etc., or because there is –allegedly—no measurement of important factors, mathematics will find *no* application, *can all be dismissed as utterly mistaken*." (3) [emphases added]. The authors here rhetorically deploy a significant strawman argument, at least in terms of the benefit of hindsight that we will use as we retrace the history of decision theory. At the time, perhaps, some would say that mathematics would have "no" application, but later theories, including some quickly on the heels of this analysis, would not only have mathematics as *some* application, but would also be impossible to dismiss on the basis of empiricism and experience with business and policy interacting in reality.

The cornerstones of their work are notions of utility and rationality. They acknowledged that their description and conception of "utility" was likely too broad in the minds of some other scholars (16), but again they limit much of the scope of the usage of their games. They state that the measurement of utility ultimately must reside in a concrete method of comparison which provides the baseline for assessment. They go on to state that "the immediate sensation of preference – of one object or aggregate of objects as against another – provides this basis (for utility.) But this permits us *only to*

say when for one person one utility is greater than another" (16), emphasis added). The calculation of utility resides in probabilities of likelihood of imagined and real events. The issue here is one of information.

One of the most widespread criticism of Von Neumann and Morgenstern's major work consists of recognition of available information and, essentially, limits of what is *actually* knowable. This is a recurring theme that occurs again and again (and nor did it take long for this and similar critiques to find traction.) But to the extent that the many aspects of games that they've envisioned which provide models for "rational" decisionmaking, they acknowledge that "perfect information" is and would remain an assumption under circumstances. The games that have complete information are offered as possible solutions, or models for decisions that are separate from situations where "incomplete" information plagues the game-player or the decision-maker (30).

This is a conceptual limitation, self-imposed, on what constitutes utility. While there are arguments for and against their conception of utility and the aspect of complete information, it seems likely that any "artificial" set-up of a game-decision is likely to suffer from a degradation of information. Either one will be asked to comment on a situation where assumptions act as evidence, or the set of available information is intentionally scaled-down with the presupposed purpose of eliciting a certain decision. So while von Neumann and Morgenstern intentionally limited the scope of utility, they also stated "we wish to find the mathematically complete principles which define 'rational behavior' for the participants in a social economy, and to derive from them the general characteristics of that behavior." (31)

There are more than a few important concepts to unpack in that sentence. First is the other important thesis of their work, which is to determine, define, and construct a notion of what constitutes rationality. Second, they are searching for "complete" principles governing "rationality" and trying to do so in a grammar based in mathematics, a model believed to be emblematic of all which is rational. Third, the attempt seems to broaden the scope beyond games which provide models for mathematically sound decisions in a milieu of complete information to all behavior in a "social economy." While they do expand on conceptions of what is required for rationality, we can use this area as a springboard for future discussions following the framework described above: the role of technology in challenging rationality and the determination of convergence over the span of this history.

Von Neumann and Morgenstern lay out a sequence of theories that may be challenged, or at least examined, by empirical experiment. The ensuing history of rational-utility throughout economics is a history of challenging the notion of what constitutes available information and, ultimately, rationality. It was almost at the very same time that the conceptual underpinnings of rationality came under attack, along with the notion of perfect information; with the attacks has come a restive argument that questioned the value of games of "perfect information" when such events rarely, if ever, actually occur in the real world. We'll describe more of this later in the chronology, but even the idea that a firm, as opposed to a single unreliable individual human, can engage in perfectly rational behaviors which maximize utility has come under serious doubt.

In SCOT and its interpretative flexibility, we have not yet reached the stage where we might see the concrete and discrete outcomes for convergence, but we are edging

nearer to it in terms of the generation of the controversies themselves. The von Neumann and Morgenstern theories represented a departure in the sense that decision-making could be understood in a programmatic way. Theories closely following on the heels of this economic rationality would contest the ideas of assumed knowledge and rationality. It is also worth noting that this line of thought, encompassing interpretative flexibility at this stage in the history of the study of human decisionmaking, is housed within the EPOR theory of scientific enterprise, rather than socially constructed technologies. Be that as it may, the economic theories expounded by von Neumann and others almost instantly resulted in a new, albeit slowly unfolding, controversy. Controversies can lead to factors which combine, resulting in convergence – taking place over time, assimilating disparate technologies, sciences, and factors both internal and external. The change that occurs is one of the definition of the "rational."

The first significant departure from pure rationality in this context arrived in the same year, 1947, as pure rationality's debut in the form of the utility construct. Herbert Simon recognized the limitations of utility by recognizing the frailty of the human experience. Humans suffer from cognitive limitations, and limitations of knowledge in any given situation which requires a decision. Simon's term for the limitation came to be that of "bounded rationality." Humans are "rational," yes, to a point, but there are limits to what that rationality can do and what it can be. This important point, while given most attention in recent years, can be traced back more than two hundred fifty years to philosopher David Hume. He accorded second-tier status to reason, noting that it is only after impressions or feelings that humans derive reasons. (Treatise on Human Nature). Much of Hume's thought in this matter also anticipated the importance of emotions in

human decisionmaking, which are aligned with values (proposed most notably by Damasio.)

Another element of the utility theorists, maximization, came under scrutiny by Simon. Through experiments and observation, he and colleagues found that, in fact, most humans do not seek to maximize every component of one's life. Instead, in many instances, one settles for what is not perfect but is instead good enough. Simon's term for this, still used today in economics and elsewhere, is called "satisficing," a portmanteau of satisfying and maximizing. It represents a component of the reality of human behavior: that of practicality and "not letting the perfect become the enemy of the good." Simon recognized "satisficing" as guiding the majority of human decisions, in which an outcome was not maximized, but instead "good enough."

As the theories of limitation, developed by Simon and several others, came to be more and more accepted, researchers elicited greater refinement of game theory and decision theory. The scope and depth of the work done by Herbert Simon is, by any measure, astounding and has touched on several different areas that, even if related only at first in Simon's mind, have become deeply intertwined decades later. Behavior, rationality, political choice, information processing, and computer science are all fields to which he made extraordinary contributions, but the disciplinary lenses attached to each of the fields tends to mislead us into keeping them separate and *not* seeing the deep underlying connections that Simon certainly saw, and is also emulated by many now in the CNNM field.

Simon saw, and developed through his terms of satisficing and bounded rationality, what he described as a "need for improvement" in the "classical tools of

analysis." (Simon, 60) What he meant, and not one to pull punches, was that the von Neumann and Morgenstern conceptions, and those also put forward by colleagues, of what constituted rationality were "weak assumptions" (3). The construct of "perfect knowledge" in the context of the decision and strategy games set up by von Neumann and Morgenstern had little application in the real world, where Simon seemed most comfortable.

The problem came down to an epistemological one; even the "unknowns" that von Neumann had contemplated were known to be there. What seemed to occupy Simon was that the set of all knowledge was *always* larger than this. In the words of Donald Rumsfeld, there are known unknowns and unknown unknowns, and this is a simple estimation of the weakness of von Neumann and Morgenstern. Given that even the *level* of knowledge could not be accurately estimated, Simon declared us all to be "satisficers."

Richard Thaler, in *Misbehaving*, wrote of the difficulties that the field had in absorbing Simon's theories of bounded rationality. "In saying that people have bounded rationality, Simon meant that they lack the cognitive ability to solve complex problems, which is absolutely true. Yet, although he received a Nobel Prize in economics, unfortunately I think it's fair to say that he had little impact on the economics profession" (Thaler 2017 23). For Thaler (a winner of the Nobel Prize for economics in 2017), the problem comes down largely to the types of errors that are made and the types of errors that are *accepted* by the economics field. In essence, he traces it back to the same blindspots in the profession that were largely dismissed by von Neumann and Morgenstern. Thaler notes that the mainstream of the field thought that the errors were

random noise; in fact, as would be gradually realized, the errors were failures *inhering in the theories themselves.* (23, 24)

This early controversy between utility and satisficing sets up the first oppositional dynamic from which convergence might be sought. In the context of the dueling economic theories, there seems to be little technological influence in which SCOT might be considered, but, given the derivation of SCOT from the EPOR program, wherein controversy and closure might also be found as important components, the comparison seems to fit. At least two different scientific theories were offered, within quick succession, purporting to explain –or question—the phenomena of human decision behavior. This occupies a level of detail and further subtlety beyond the general psychological theories of the day, signifying our first steps into the specific history of CNNM. At the same time, it should be recognized that the von Neumann and Morgenstern theories did not fit with the general psychological theories of the day, which was largely behaviorism, for which human decisions were imponderable "black boxes" of pointless speculation. The von Neumann-Morgenstern-Simon controversy, while in itself an area of disagreement, unified in a new direction away from the behaviorism of the time.

While Simon continued to do his work, subsequently growing and taken up by others, several advancements were also occurring in the technological areas of measurement and assessment. At roughly the same time as this error-controversy began to unfold, Yarbus found initial links between eyetracking and what he termed "attention," in the sense that gaze direction and duration could give greater insight into certain

cognitive processes. Yarbus's work would heavily pave the way for adoption of eyetracking by researchers focused on consumer behavior.

In the late 1940s, EEG just found its way to sufficient popularity within the psychological and medical research world that a professional society would be formed (also in 1947). (Swartz) We are, with the pre-history of theory and the uses of technologies in well-defined and discrete areas of research, still at a point of separation between the psychological and economic thought involving human decisions and the technologies that might be used to empirically measure some of them. We are also, however, already within an area of controversy in the early stages of interpretative flexibility of scientific theories, in that multiple interpretations are being drawn. Even at the time of the writing in the earlier parts of von Neumann's and Morgenstern's work, they take time to address critiques and launch counter-proposals of interpretation. They posit new perspectives on assessment of human behavior in the form of mathematically-based axioms that may or may not reflect actual or potential human behavior and decisions.

Also in the 1950s, signals which would eventually be used for MRI would be detected in muscles. MRI as a technology truly deployable for clinical and research purposes would have to wait some years yet. In doing so, it would unfold its own saga of its contested origin. The underlying scientific seeds for what would ultimately be the largest technological nail in the coffin of rational utility would be planted at this time.

Interpretative flexibility: the scientific controversies continue to flare, developing a radiating pattern of other scholars following Herbert Simon's model. The controversy continues to center on the bounds of knowledge and the accepted nature of what it is that

the human mind can uncover. To my reading, there appears to be less of a controversy regarding what constitutes "rationality" though Simon's and related interpretations are more in line with practical expectations about what human actions actually are, and what people can muster given a limited set of knowledge. Areas such as consumer motivation could be mathematized and, for Simon, the von Neumann and Morgenstern breakthrough was itself its admission of uncertainty. (320-322) For Simon and related scholars, much of the work still came to be mathematically based, with calculations accorded to weighted measures. Unpredictability, as the true bogeyman, had yet to fully surface…at this point, it was merely ignorance.

Simon pushed concepts such as calculations of approximations and true unknowns in terms of decision-making. (386) Another contribution of Simon, however, was in that of concepts of information and particularly, information integration. Using examples of chess and computer programming, satisficing entered another realm of the "good enough" given the limitations on information that the human mind can process and integrate. Simon was, among so many other things, a prophet: "The notion of decision premise can be translated into computer terminology, and when this translation has been accomplished, the digital computer provides us with an instrument for simulating human decision processes –even very complex ones—and hence for testing empirically our explanations of those processes." (308)

For marketers, economic choices are essentially responses to marketing information (sometimes sparse information); that is, human information processing steers the decision to conduct a purchase or not. With the inclusion and pursuit of research involving these two streams of modeling –rationality and bounded rationality – the

process of human decisionmaking itself became an area of study. Rather than just leaving it to chance, and hearkening back to John Wanamaker's famous dictum that fifty cents of every advertising dollar is wasted, the fact that humans make decisions every day, including how to act in the marketplace, became a new area for research. Such an area had rules and guidance, limitations and boundaries, but it was, at the end, an *understandable* phenomenon and ubiquitous in the human experience. In terms of the technology that could be used, fMRI was still decades into the future, EEG was confined largely to study of epileptics, and eye-tracking was just beginning to make its way out of the field of optics and into the new psychological areas of attention. And yet, with this, we see more interpretations, more flexibility, and greater usage of different technologies into new areas: clear convergence.

We Want Information…Information…Information

A crucial area for the understanding of human decision is the information and inputs used to arrive at the conclusions. Be it part of the process, a beginning or ending point, or a new conception of the "stuff" of reality, information rapidly became a stock in trade, even a new language. And what best to handle information than the computer – human or machine, metaphor or actual?

Computers and electronic computation existed, in some form (ENIAC being brought on-line in 1946, the year before von Neumann and Morgenstern published expected utility theory, and the wartime British codebreaker Colossus[12]) for some time. One of Herbert Simon's many other areas of significant contribution includes that of

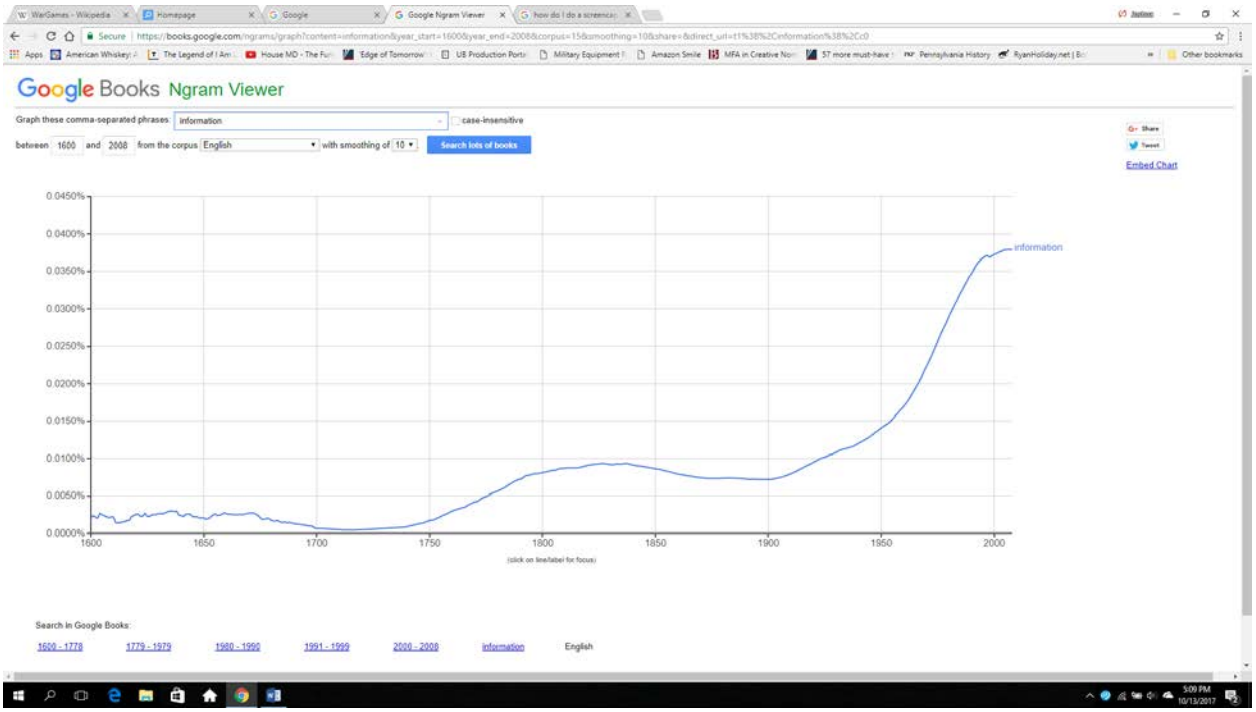
[12] Not to be confused with the sentient computer of the 1966 novel and the 1970 film *The Forbin Project* wherein the computer secured the safety of humanity by assuming control over global defense systems and blackmailing humans into compliance.

computer science, machine learning, and artificial intelligence. Simon considered all of these areas to be areas of information, knowledge, and error and his multidisciplinary work would expose, in gradual fashion, the common theoretical and epistemological threads to all of the fields. He came to realize that the common threads were all a part of the human mind; a tantalizing glimpse toward the possible unification of all knowledge (or, at the very least, a unification of an understanding of the limits of knowledge and error-generation.)

By the 1960s, however, computers began to cast a greater silhouette in various fields, and even into the public eye. In 1962, the movie *Fail-Safe* featured an erroneous code being sent by a computer to a squadron of nuclear-armed bomber aircraft. That same decade, filmmaker Stanley Kubrick translated an Arthur C. Clarke novel to the big screen, which included the disembodied voice of actor Douglas Rain supplying the implacably intelligent, neutral, and reasonable persona of HAL 9000. In short, by the 1960s, the concept of an electronic device as a computer was well-enough known to the public to be a part of popular entertainment. The thought of the risk of a small error being magnified to cause nuclear Armageddon, or that of a hyper-intelligent computer faced with a moral dilemma and opting to kill the humans as the only path to reach its super-ordinate goal was easily understood.

As a consequence, more of cognition and conceptions about thought began to take the form of what would be considered "information." The stock-in-trade of computers and those who use them, the same decade included a new-found currency in bits and bytes.

A simple Google NGram shows the development and use of the word "information":



For about a one hundred year period, spanning the early 1800s to the mid-1920s, usage of "information" in English-language texts remained relatively constant; indeed, it decreased slightly during the second half of the 1800s. By 1950, the usage of the word had grown considerably and, by 1960, the sharp upward curve of its usage was well on its way. The growth has appeared to continue since then. But the word did not simply grow in popularity; it also shifted its meaning to emphasize the more technical usage of Simon and others.

While a Google NGram could be criticized on various grounds, including its dependency on accessible scientific literature, it can be argued that the presence of the word "information" in such literature further underscores its utility and expected use

throughout many different fields, including that of cognition, conceptions of consciousness, and the processes by which humans make decisions.

In the 1960s, Norman Anderson added to the growing literature of cognitive psychology and decisionmaking by introducing information integration theory. This theory offered a new model of how decisions can be made by including the capture of different information from different sources; the task of the mind, while making a decision, is to piece together these pieces of information in order to create the best decision possible. It is, in a way, a reflected and conceptually digitized vision of both bounded rationality and expected utility.

Anderson's work consists of a seemingly even more quantified level of information than expected utility or bounded rationality. Throughout information integration theory, terms such as "cognitive algebra" spring out at the reader. Anderson's theories coalesce around the central idea of finding ways in which psychological phenomena –and ultimately psychology—can be grounded in a mathematical way. Anderson's approach differs significantly from the closed and largely linear models originally proposed by von Neumann and Morgenstern, however, in the sense that information integration is assigning a value to every possible input into a model of how a decision works. The measurement of psychology requires the measurement of all stimuli, and Anderson freely admits the complexity of the approach: "the study of integration involves many-variable stimulus fields . . . ." (5)

At the same time, Anderson includes the importance of empirical relevance for his model of measurement. "Unless the algebraic rules are shown to hold empirically, there is no measurement." The complexity of the results elicited by the approach can be

readily imagined, though the functionality of the models also appear quite high. The leveling use of computers to assist in the calculation, especially with regard to rigorous statistical methods, is readily apparent throughout his work. The models are highly rigorous, highly technical, and almost completely computational.

An example of Anderson's work is a study on the observed statesmanship of United States Presidents. (161) The comparison of the attitudes of those from which the information was elicited is subsumed into a direct comparison of the models that might be used to fit the information. This is an important example of a translation that occurs from data into an interpreted result using sophisticated models and a technological interlocutor. Even with that, however, the critically circumscribed categories that Anderson uses – for effects, for anchors, for stimuli, all represent a sequence of inputs of information that is –in an understatement—more complex and multi-factorial than previous theories.

Information integration theory added increasing complexity and dimensionality to the ways in which psychological phenomena and behavior could be measured. While the methods of measurement were improved in the period of 1960s and 1970s, a new general theory of psychology began to take hold: cognitive psychology. We need only signify its development here, as it continues its relevance today in various constituent schools, such as evolutionary psychology, a field which has contributed to the discussion in CNNM. While cognitive psychology can trace its official beginning to a symposium held in the late 1950s, the florescence of the theory truly took hold throughout the 1960s and 1970s (Solso 12).

Cognitive psychology represented a final point of firm departure from the dominant theory of psychology that had been developed by BF Skinner and other members of the Behaviorist school. For Behaviorism, any inquiry into the nature and mechanism of "thought" was hopelessly occluded and largely irrelevant. The main empirical point of the behaviorists was that one can observe stimulus and response, and therefore measure the behavior. In an interesting parallel to the one-time dominance of rational utility and bounded rationality, however, despite the firm majority of 1930s psychology rooted in behaviorism, early ideas about specific intention of an animal and "cognitive maps" sprung up at approximately the same point in time. Controversies appear to begin at the same time as the dominant paradigms, at least in psychology and psychiatry.

Cognitive psychology's central theorems argued against the skeptical behaviorist viewpoint regarding the quality of thought and consciousness. Solso et al labeled cognitive psychology – in its most recent iteration – as the "scientific study of the thinking mind." As three parts of this undertaking, attention and information gathering, information storage and processing, and problem solving and language represent the basic model for cognition. (Solso et al 2). There is a further congruence with cognitive psychology and the theories of information integration, given the great reliance of cognitive psychology on models focused on information processing. The theory also marks the departure from behaviorism (in conjunction with IIT) about the wide variation and unpredictability of human behaviors (18-19) which included things such as

communications, linguistics, and memory. Such concepts became the very fertile fields of marketing attempts.

Other points relevant to decisionmaking generally and CNNM specifically can find their roots in the theories of cognitive psychology, such as the debate between general brain activity and localized activity; the role and conception of evolutionary "modules," such as concerns regarding self-preservation, kin selection, and altruism; social intelligence; emotional signals and language. Much of what later seemed to be borne out by brain imaging, particularly fMRI, were first postulated under theories of cognitive psychology. Brain imaging and cognitive neuroscience would confirm much of the theory; Solso writes that the combination of the science with the imaging technology "has yielded a rich harvest of knowledge about perception, memory, thinking, and information processing – indeed, *all of human cognition.*" (Solso xvii, emphasis added).

Controversy is the stuff of closure and social construction, but with the ascendance of the new psychological theories, we see the instance of not just closure and construction, but also a *convergence* of new science, emerging technologies, expertise, application, and a host of other factors. Behaviorism has, as of the 1970s, largely been consigned to the dustbin of the history of psychology. No more is the mind a black box, with a pigeon's actions sufficing for that of a human; instead, new theories include and work with the complexities of the brain. New controversies emerge from this, such as the questions of society, culture, and genes, but this also opens up a greater pathway for the usage of technologies for ascertaining data about the brain and generating an understanding of cognition and psychology, including decisionmaking.

The thirty-odd years from the late 1940s to the late 1970s is an important time frame within its own distinct scope and analysis of a research program. The transition from rational utility to information integration, leading up to the early stages of prospect theory represents a change, departure, or inflection. The largest single component, however, is that the underlying theory of the human mind changed – the cognitive psychology model. The extent to which the development of cognitive psychology might have been influenced by the increasing amount of noise made by those dissatisfied with rational utility might be further investigated; irrespective of causation, there appears to be a close correlation that, under more careful study, might hew quite closely to the Kuhnian paradigm shift. With the erasure of behaviorism comes a theory that is, in almost every sense, its opposite. We see the same transpiring, albeit on a more specific level, from rational utility to prospect theory. The triggering departure represented by Simon and bounded rationality, and the recognition of the necessity of complexity of models for information processing, are both contributory elements.

With cognitive psychology as the main theory –still dominant forty years later— we see a convergence of sorts that occurred in this context. EPOR's interpretative moment has arrived in the scientific sense, at the highest level of theory and application. A similar, analogous moment arrives in the context of the decisionmaking theories. But the implications for both marketing and the involvement of technology still seems rather sparse, until the 1970s, when the parallels begin in a definitive way and from which, we

might detect some momentum. Convergence is in full swing now, a new interpretative force, developing CNNM as its own field and deploying it into a new direction.

Technologies for Observing Cognition

MRI imaging began in the early 1970s. At least two different researchers have received credit for the invention of this new way of seeing inside the body, which also resulted in the awarding of the Nobel Prize. In 1971, Lauterbur produced the first images, while a few years later, Mansfield improved the technique for better resolution. (Pillai) Still, it would be some time before this type of technology would have a significant impact on psychology and brain study. While MRI was slowly sowing its seeds of future glory, EEG continued the same trajectory it had been on for several decades and, by 1972, 1500 articles had been published in the peer-reviewed literature concerning electrodermal activity.

Another source of convergence between cognitive psychology and marketing was the focus on attention as an important aspect of cognition. In the late 1960s, Yarbus continued his fruitful line of research with eye-tracking and attention. Orquin and Loose (2013) identify Yarbus's work in the area as "seminal," in which top-down control of attention was identified by giving viewers of a photograph different sets of instructions to follow. This top-down attention mechanism is still a viable model that is used, and has become especially relevant with more recent fMRI studies that might show specific regions of the brain showing extra levels of activity or exertion in focus. At this point in

history (the late 1960s), though, it is of interest to note the congruity between the technology of eye-tracking and the cognitive state of "attention." This becomes an important convergence between the technology and the psychological theories used in ordinary circumstances.

The importance of eye-tracking in consumer behavior research must be noted. Venkatraman notes that pupil dilation and attention first came to widespread notice around 1960 (Venkatraman 2015). Daniel Kahneman spent at least a part of his earliest career phases studying this as well, around the same time that Yarbus was a leader in the field. In the early 1970s Rayner continued to refine the use of eye-tracking and cognition, and this era also marks the first application of the use of eye-tracking more directly to consumer research activities. Jay Russo and a number of colleagues first linked the concept of attention via eye-tracking to consumer preferences and decision models (circa 1977). By the late 1970s, Russo and colleagues identified a set of behavioral cues that would also receive larger theoretical reinforcement. For example, one key finding by Russo and others showed that test subjects' eyes showed greater "fixation" on their favored alternative. (Orquin and Loose) This would seem to overlap with much of the then-termed "irrationality" or cognitive boundaries wherein attention would be processed at a level beyond that of the calculating consciousness.[13]

Above, in describing technological momentum, I used the metaphor for a reservoir slowly filling with water, and pressure building at the base of the dam. The usage of the eye-tracking and the linkage to attention is an important inflection that represents the first "leak" from the medico-psychological reservoir into that of the

[13] Orquin and Loose would also add that other findings would theorize that such fixation of the eye would be a "somatic marker" of the type later so described by Damasio and colleagues.

commercial realm. An array of potential applications of a technology arrived, riding the channels of a set of scientific theories that had applications broader than a defined scientific research program. In short, decision-making and attention were behaviors that occurred outside of the psych lab. With that realization, the same tools for assessment and measurement could also be deployed outside of that lab, in any number of combinations to attain any number of ends. Attention is a universal and measurable feature of consciousness. Thus, the technology finds its way to measure (eye-tracking and attention); the society transmits the science (attention and cognition). And, over time, the two meet, thus supplying the connective element between the two.

The research performed by Russo and others is worth a special mention in the context of STS theory. With particular reference to SCOT, a new relevant social group began to use the technology when Russo and others deployed eye-tracking with a goal of identifying consumer response. In addition to this new intention, the ability to use the technology in such a manner connotes interpretative flexibility within the technology itself, another substantial component of SCOT. The eye-tracking apparatus itself would also include design flexibility, indicating that not only was the possibility for its use in other fields interpreted, but the capability inhering in its design also allows for this. As far as technological momentum, we see the added element of time taking a substantial role mediating between the path of the technology (examining the eye, which reflects human attention) and that of the social group (behavioral researchers *cum* market researchers.) Eye-tracking had existed in some form for decades prior to Russo's work, but the "alignment" of the social context and the scientific theories seem to indicate that

element of time adds a dimension to understanding the complete picture of the evolution of the usage of the technology. This also pushes us in the new direction of convergence.

Other theories building on the newer foundation of cognitive psychology also began in earnest. The 1970s saw more attention and focal interest in the linkage between biology and psychology, furthering the development of evolutionary psychology, establishing a connection between biological fitness, brain structure, and cognition. The functions and structure of the brain (cognate as well with the mind) could be analogized as efforts at fitness and survival as much as the function and structure of any other system or organ.

In the 1970s as well, the origin of the first dialogue regarding the differences between implicit and explicit memory –the two main types of human long-term memory-- would begin. The outgrowth from this would fully flower in the decades to follow, with measurement of quickly-generated impressions of humans being recorded by computers. Much of this same discussion could also be quickly related to the models of the mind which would be departures from the conception of a unified consciousness present in the brain. Instead, implicit memory would be shown to be an "autopilot" function for much of what we might already know, taking the form of what is called "procedural" memory. Implicit memory theory is also closely related to ideas of priming, another concept of great importance to be discussed later in this history.

Given the continuing developments in machine learning and computer science, information integration theory would also continue to be researched throughout this era. The work of Anderson and others in formulating the newfound complexities of information integration fit well within the modular and information-processing

approaches to studies of cognition and consciousness present in cognitive psychology. With the connection to areas of attention by Russo, and the linkage of biological processes to memory formation, retrieval, and attention, the rational-irrational dialogue had been transformed (even if, as argued by Thaler (2017), it took a far longer time to be recognized as such by the "Econs.") The combination of information integration, measuring the inputs, and information processing in cognitive psych, assured us that the process of thought *could* be understood; as a corollary, we could also understand decisions as outcomes of these manifold processes. Life for a human is not the same as a trained pigeon; a decision for a human is not merely arithmetical. BF Skinner's theoretical black box was blown open, creating a new milieu for brain and mind science and for technology to explore. Convergence yields to greater controversies, which then offer themselves up for further convergence in an ongoing cycle.

Behavioral Economics in Theory

Culminating in the late 1970s was a full-fledged departure from "classical" economics that would become generally known as "behavioral economics." Though not without critics, the new line of enquiry sprouting from the alternatives first suggested by Herbert Simon and others sought to create more complete explanations for human decision making processes. Daniel Kahneman and Amos Tversky developed the earliest experiments testing this new, provocative school of economic thought. They labeled their work "prospect theory." (2000)

Directly countering the four axioms of Expected Utility theory, prospect theory emphasized different processes that humans weight in their decisions, many of which

appeared to be informed by "irrational" emotions and worry. The theory included two major areas of human cognition to be reconciled with decisionmaking: editing and evaluation. Both of the stages would include other psychological concepts, such as cognitive biases (including the framing effect) and tics within a decisionmaking process, such as loss aversion (in which fear of encountering a loss is felt more "deeply" than receiving a gain.)

With specific regard to prospect theory, the methodology used would be much the same, at least on the surface, as what one would see when glancing quickly through the work of von Neumann and Morgenstern thirty years or more earlier. Much of the argument is heavily mathematical, with sequences of statistical steps that account for weighting of different inputs. At the same time, these statistics and calculations were tested against the results obtained predominantly by laboratory or classroom experiments, continuing the cottage industry of the strategy games first popularized by von Neumann and Morgenstern.

What prospect theory did far differently from previous models, however, was to expand the quasi-heresy of bounded rationality and explore the new possibilities that such an expansion might recognize. Kahneman wrote that he, Tversky, and related scholars did not seek out active dissension from the dominant rational utility theory, in that "we did not challenge the philosophical analysis of choices in terms of beliefs and desires that underlies utility theory, nor did we question the normative models of rational choice offered by von Neumann and Morgenstern and later by Savage." (Kahneman and Tversky 2000, 186) Kahneman noted that the model of games offered by the rational choice theorists also fit, because such games are the "fruitfly" of risk models, invoking

the famous animal model for genetics research. Despite the similarity of the models used, the statistical analysis "tightened" in some important aspects which led them to the conclusion that "the ubiquity of framing effects demonstrates that the human mind is not designed to achieve coherence." (319) This is an important further factor in considerations of the momentum aspect of these events; the hinge point of convergence occurs here in the sense of a recalibration of what it means to make a "rational" decision. The meaning of rationality in the context of decisionmaking had been on its own journey of change since von Neumann and Morgenstern, while the prospect theorists (more properly called behavioral economists) enhance and built new edifices on the limitations of pure mathematical and logical interpretations of human decisions and behavior. Inherent biases in the way decisions might be made or problems might be solved were not necessarily "irrational." After all, if it was as much a feature of human cognition as other forms of processing, only those trained in economics (Econs, as Thaler would call them (2017)) would be "rational" under such strict mathematical and logical constructs. As Thaler would also point out, it doesn't mean that such "rationality" would add up to responses that would be "right."

Some of the most relevant early findings within prospect theory was that perceptions of how to address risk in a gambling (gaming) setting depends in large part on whether –irrationally, according to rational utility thinkers – individuals perceive a likelihood of a big win on a "long shot" and tend to overinflate the magnitude of risk with an improbable loss (Kahneman and Tversky 583). Famous examples, subsequently used in nearly every text or monograph relating to decision theory and prospect theory, include ways in which a problem or dilemma might be presented, just in terms of how specific

words would be used to describe it: “lives saved” versus “lives lost” despite the underlying calculations being absolutely identical. (640) Simply by “suppressing information” in a certain calculation, a person could make a profound effect on the decision being made. These would be further developed in decades to come, especially notably by Thaler and Sunstein, who would produce and advise on specific governmental policy models which might influence behavior of the citizenry (Thaler and Sunstein).

Other parts of prospect theory would include further analysis of the “irrational” loss aversion, along with big gambles. It would point out different elements of decisions which fly in the face of the von Neumann-Morgenstern axis. People engage in antics such as “mental accounting” wherein gains and losses are factored not according to equal weight but to their emotional and temporal relevance. (Kahneman and Tversky 692) Often, painful outcomes of gambles and decisions are accorded greater weight than positive ones. Without diving too deeply into the thick though fascinating details of the findings of prospect theory, we can come away with a simple, elegant conclusion that might seem intuitive: riskiness causes emotions (sometimes, people seek risk, other times they avoid it), and these emotions factor into decisions.[14] We have come into full accord with the intuitions proposed by Simon, with models and experiments, which, while criticized, have steadily gained favor within the realm of decision theory. Over the course of decades, the Kahneman (2012) lingo would also gain credence and further influence, especially in the realm of CNNM, in particular his identification of “System 1” as a fast, intuitive, and heuristic thought process, and “ System 2” as a slower, more

[14] Richard Thaler would frequently lampoon the torchbearers of rational/expected utility hypotheses, noting that while most people can be called Humans, there are a separate form of entity called Econs which, he suggested, would prefer that Humans overcome such irrationality and try to hew more closely to the simplistic models of rational utility. Thaler, in his recent Nobel Prize acceptance speech, promised the audience that he would spend his prize money “irrationally.”

deliberative and "logical" thought process. And, as we will see in the coming decades, the technologies used to examine brain activities would also lend greater evidence to show that such brain activity does, in fact, fit more squarely within the areas postulated by the prospect theorists than by the "rationalists."

Behavioral economics would continue to grow in importance and influence over the next several decades. Subsequent sub-fields would include behavioral finance and, eventually, considerations of decisions that consumers make when considering a purchase. In a sense, behavioral economics would be translated into marketing practice, including that of "neuromarketing" or consumer neuroscience.

Importantly, however, despite the importance of information integration theory and behavioral economics, technologies used to measure behaviors or brain activity – even in consumers—did not seem to be linked to the psychological theories in any major way. Most of the prospect theory empiricism came from experiments performed by subjects in controlled settings, where the effects of decisions made would be analyzed. This would often be accompanied by the discussion by and probing of the actions of the participants in the experiments. The contributions of behavioral economics will be touched upon repeatedly as we move forward in time; it came to full blossom in conjunction with social neuroscience just after the turn of the century.

It would be worthwhile to note the advent of prospect theory and behavioral economics as its own inflection point, evidence of momentum and convergence showing both closure and interpretative flexibility. When remarking above on the move from behaviorism to cognitive psychology, marking a convergence and a departure in the general sense, the more specific scale of decision theory sees a departure and a

convergence here, or at the very least, the early stages of a convergence. It has taken some time for prospect theory to become more broadly accepted, though it has. To an extent, it as a scientific theory also had to wait for its own type of technology to help reinforce its findings. This is an incomplete convergence then in the late 1970s and into the 1980s.

Going Unconscious in the 1980s: Theory Meets Technology, Rationality Meets Emotion

Culturally, the United States in the 1980s experienced a number of important changes and results from trends that had begun in the decades precedent. First, home computers and other electronic devices became more and more common, unlocking several new markets based on technologies themselves. Home electronics was one of them, and while the "internet" as we know it today was still in the future, there were prototypes already in use for some time, with dial-up service to multiple "bulletin board systems" (BBSs), email, and on-line games. Much of these technological applications would become important in the coming years for generation of consumer data, along with more efficient ways of reaching large amounts of customers who would have familiarity with the interfaces that would be used. Robotics and related fields would also continue to advance, and EEG, as a brain technology, would first be linked to controlling units within a robot in the 1980s.

In addition to the generalized research of the usage of EEG, Weinstein et al (1984) passed an important milestone with EEG in the field of CNNM; they were the first to report the results of an EEG study performed on consumers watching advertisements. Critical reviewers met this study *en masse*, seemingly before the presenters could even

clear their throats in time to announce the results, with the initial publication of the findings in April of 1984 and then the response to critiques just a few months later (and more than a dozen pages in length). All of these arguments and rebuttals are startlingly similar to those offered in the controversies surrounding fMRI twenty years later. EEG today, by contrast, seems nearly as prosaic as survey research.

Research on human attention reached new levels in the 1980s, building on previous work mentioned above. Research efforts which had begun with linking eye fixation to the emotive state of attention became more advanced in technique and insight, and all together more thorough. Gaze direction, along with discernment of overt and covert forms of attention are, by this point, beginning to be researched; the understanding that a person might be "attending" to something without *actually* looking at it –now so obvious, it seems—would be an important area of investigation with strong ties to areas such as advertising, product placement, and design. (Orquin and Loose) This is an important counterpart to the continuing work on implicit and explicit memory formation and creates a crease in the formerly smooth surface of attention; sometimes, one is so attentive, that one doesn't want to give the appearance of attending.

With the increase in the commonality and usability of information technologies, increasing sophistication of imaging devices, continued refinement and work in areas of eye tracking and EEG, combined with the research in psychology, what we would recognize today as "neuroscience" began to form. With the ongoing findings and refinement of Kahneman, Tversky, and colleagues' prospect theory, new experiments could be designed and tested with greater observational, imaging, and measurement techniques. Thus, the theories edge closer to the transitional point of "convergence,"

though some controversy still remains. One might consider whether the debate over such knowledge is within the Kuhnian terms of "normal science" or whether a new paradigm shift is occurring; however, with the overarching elements of the central theory of cognitive psychology governing much of the discourse and thought, the Kuhnian considerations may not yet be at the height needed for a change in the underlying paradigm. (2012) This seems, for example and by analogy, less like the transition from Newtonian to relativistic physics and more akin to competing theories about the strength and measurement of gravity – an important area of research, but not one which re-writes past interpretations and makes for a completely new understanding. This Kuhnian paradigm shift seems to have occurred only once in this history, in the transition to cognitive psychology.

What of the technological changes? A watershed moment occurs close to this with regard to the development of a new technique, a new technology, and a new method of interpretation. In 1990, Ogawa published his groundbreaking findings on the usage of a new technology, fMRI (functional MRI) to measure blood flow to different parts of the brain. This stemmed largely from the BOLD, or blood-oxygen-level dependent contrast phenomenon, which showed that blood which carries oxygen possesses a different magnetic signature than blood which was oxygen-depleted. (Pillai) This finding opened a new realm of imaging which could more closely trace function by measuring the difference between the oxygen-rich and oxygen-depleted blood flowing to and from an area of the brain. While still struggling with interpretations and limitations today, the entry of fMRI technology created a new view into knowledge and understanding about brain activity and its link to behavior. Originally considered as, like so many others, a

medico-psychological technology and method that would be devoted to research and clinical use, the reservoir filled still faster with fMRI and its new technique for linking the brain and behavior. The interlinking field between behavior and marketing would no longer be restricted to areas of overt overlap, such as attention and gaze fixation. Instead, the brain's activity could be monitored throughout a spectrum of behaviors, including listening, watching, conversing, reading, and many others. Momentum at this point seems to have loosed its bounds entirely, time compressing, the communication between the technology and society growing faster and more urgent.

The link between fMRI and behavioral studies is likely the most prominent example in this history of a scientific field being solely enabled by a technological device. Without fMRI and the studies linking brain activity in certain areas in a reliable pattern, combined with assessment of the situation or images being observed, social neuroscience, as it is now called and practiced, would not exist. Social neuroscience, reliant largely on measurement technologies (including an increasing reliance on imaging technologies, once invented and in wider use) and experimental models, had its first publications dating to approximately 1988. (Cacioppo)

A number of researchers and research teams began to use fMRI imaging as a central element in psychological research. Antonio Damasio and colleagues developed the Somatic Marker Hypothesis, which linked emotions to specific patterns of brain activity detectable by fMRI. Feelings in certain parts of the body ("in the pit of my stomach") would become linked to cognition more generally, and the old understanding of a division between "rationality" and "emotion" would be substantially undercut. Theories, dating back as far back as at least that of Herbert Simon, had suggested this

with concepts such as bounded rationality, but the ability to predict and observe brain patterns associated with such emotions provided greater evidence suggesting that the ancient division (called "Descartes's error" by Damasio, resulting in a book of the same name) was a false one. The technology in this context contributes to a "convergence" in terms of the unapplied scientific inquiry, and then also begins to attend to its convergence in a more applied sense, in relation to specific understanding of human decisions.

Human decisions, social neuroscience studies would show, are not purely rational exercises in maximizing utility. Experiments on patients with brain damage localized to areas displaying affect and value (Cacioppo) were fundamentally *unable* to make a decision. Emotions, felt in different parts of the body, play important roles in determining the congruence of the situation with one's values. This finding is largely aligned with the theoretical framework of prospect theory (which fully matured in the 1990s as well, providing a further cogent supporting frame of reference for the integration of the technology *into* the scientific knowledge, which then reified back into the applications across disciplines.)

As seen above, the hypotheses of risk aversion and differential weighting of decision factors in prospect theory that bear on how people decide is a very significant departure from classical economics. (Kahneman and Tversky) Through the first formation of prospect theory and behavioral economics, much of the collision between those upstart new schools and that of "classical" economics was an argument regarding the essence of rationality. Social neuroscience has placed a finger on the balance, lending credence to the idea of the integration of emotions and logic, recognizing that the brain functions as an integrated cascade of processes. While there is an ongoing argument

regarding localization and general function within the brain, the essential finding of Damasio and others has been the important decisional role that emotions play in a process. This naturally carries over into consumer decisions as well. As will be discussed in Essay Three, the degree to which that affective state can be manipulated is an ethical concern, but the empirical linkage appears solid.

Mindful Marketing: Consumer Neuroscience, Neuromarketing, and Neurofrenzy

We noted earlier that Solso stated that much of the original conjecture developed by cognitive psychology theory in the 1960s and 1970s has been later borne out by fMRI and imaging technologies of the brain. A slew of general neuroscience studies using fMRI have come about as a part of this, and a considerable number (though still a small percentage, considering the range of studies performed) have been in the field of CNNM. At the same time, the expansion of the usage of the technologies into other fields speaks of important components in the SCOT vein: relevant social groups and interpretative flexibility. Both of these elements are clearly seen in the example of the fMRI (for reasons which undoubtedly include both its attributes and its rhetorical power) but also in that of other technologies, including eye-tracking and EEG.

Essentially, the component of relevant social groups envisions that there exist multiple groups which might use or be affected by a technology. Clearly, the easiest example is that of the original *intended* users of a technology; in the case of brain imaging, this would be researchers focused on brain activity, though other interpretations might exist when the original intended user does not engage with or ceases to use a technology. While the "seed" group is straightforward, the "spoking" depiction of other

relevant social groups, with the technology at the center and other users surrounding it in a wheel shape, might also be seen. Whether or not political or market research was ever envisioned by the early pioneers and designers of fMRI may not be known, but the theories of SCOT and technological momentum alike would suggest that this is not a radical departure.

In terms of interpretative and design flexibility, these also seem to be highly congruent to the shift in users and usage of fMRI. The linkage is one of human behavior and the commonality of brains – if the fMRI is designed and its results can be interpreted in one context of brain activity and human behavior, it is a logical progression to expect at least an attempt at moving it to a different context.

As mentioned elsewhere in this essay and within the entire project, fMRI has been the posterchild for much of the research; the converse is that it has also acted as a frequent punching bag for those skeptical of the results. Some of the most dedicated investigators of the fMRI approach have also been the clearest regarding the limitations of the technology, and the importance of drawing cautious conclusions regarding the data (Caccioppo 2005, Penrod 2018). The crucial distinction must be made between the "neurobunk" of the headline-grabbing type of Martin Lindstrom (2008) (Crockett 2015) and the "ordinary" work of finding and critically reviewing data, done in the cases which (sadly, for some) do not work the magic of generating headlines and occasioning talk show appearances.

The general importance of finding credible evidence that supports neuroscience-focused theories gave further credence to models like the Somatic Marker Hypothesis. Such studies have been key in determining not only linkage between certain types of

brain activity and emotional states, but also important clues in dealing with degenerative brain disease, traumatic injury, and the like. There is an ongoing debate regarding the relative importance of neuroscience and imaging as opposed to behavioral study (after all, the fact that emotions and thoughts reside mostly in brain activity has been known for centuries – the question of which particular region or pattern might seem to be of academic interest but with little practical effect). For the sake of the continuance of knowledge alone, however, the studies have been useful, and there have been practical effects in psychological/behavioral assessment, medicine, and understanding how brains work in the midst of everyday activity, including social activities. The social activities include ancient human behaviors involving family and kin relationships, but also considerations of more modern cultural constructs, such as decisionmaking in the market. Considerations such as this define a sense of convergence relating to the mechanisms within the brain and their affiliation with emotive states and behaviors. At the same time, the social aspect of this same arena, the influences from without, also have an effect which would seem to draw an important parallel with several disciplines (anthropology, sociology for example) contributing to the conversation in terms of understanding both micro and macro pictures of human behaviors. "Social neuroscience, therefore, has emerged to address fundamental questions about the mind and its dynamic interactions with the biological systems of the brain and body and the social world in which it resides." (Caccioppo and Berntsen 2005 xviii)

Some of the more direct evidence follows studies regarding damage to parts of the brain and observing the behavioral consequences of that damage. Phineas Gage, of the railroad spike fame, is the most famous historical case but such is modern heath care that,

when sufficient resources are devoted, a number of patients with similar injuries or conditions can be gathered together and studied under similar protocols. (H Damasio) Anderson et al (2005, in Caccioppo and Berntsen) found that lesions along certain parts of the brain suffered early in life continued to have profound behavioral impacts as adults, such as loss of inhibition or even an entirely circumscribed concern for consequences of actions. In such a study, the number of research subjects is quite small, and there is plenty of room for interpretation…but the important realization is not that many interpretations of such behavior patterns are possible (or even plausible) but that at least *some* of them seem to be understood.

Other studies identify specific brain regions that appear to be associated with specific behaviors. Moll, et al (2005, Caccioppo and Berntsen) isolated portions of the brain associated with emotionally-linked moral and nonmoral judgments. A study which departed from the fMRI pathway and instead used MEG helped to better understand the different stages by which facial recognition is processed by the brain (a technology with a link to another technology, in the form of biometrics. (Liu, et al 2005, Cacioppo and Berntsen.))

The reason for the importance of these studies, and one with a direct linkage to the concerns governing market research that rely specifically on behavioral measures, surveys, interviews, and the like, is a lack of clarity and reliability of self-reported "reasons" as to why one might engage in a behavior. Given the theories about which cognitive psychology and evolutionary psychology have described the nature of not only "consciousness" but in more earthly terms of competing modules and systems within the brain, it is not difficult to understand why we may not be able to give answers to such

questions. Our answers may, in fact, be completely confabulated by a different module or mechanism that might be seeking to make sense of our own actions in the world. Caccioppo and Berntsen explain: "In fact, people are not particularly good at knowing the causes of their feelings or behavior (…). They believe they know that opposites attract, just as assuredly as they know that its logical opposite is also true (i.e., birds of a feather flock together.) People overestimate their strengths and underestimate their faults." (2)

These lines of reasoning make for easy connections to the world of CNNM. Indeed, in Essay Two, at least some of the presenters made special note of the fact that technological methods might be more reliable to measure customer response than "trad" methods (although still others stated that the best outcomes use both methods in concert.) The basic takeaway, however, is that the technology is being used to "get at" the truth, because the previous methods have been thought to be unreliable; one of the figures used to bolster that latter argument refers to the large number of product failures over the past several decades, including humiliating examples that have made national headlines, such as the debut of New Coke (concocted by survey and focus group) or the Ford Edsel. This "getting at" the truth is the action to attain convergence and convergence, in the marketing sense, would be a mechanism by which product or advertising disasters might be avoided.

This is an important inflection point in the application of interpretative flexibility and technological momentum, particularly where the two meet in the area of convergence. It would seem that what this has been leading to has been realized – a confirmed and validated technological process that shows itself to be congruent across the fields of neurology and psychology. In that same line, the neurological signals

scanned by the technology are validly congruent with the behavioral aspects that are observed or otherwise recorded. In addition, we see a "jump" across fields of expertise or disciplines in the contexts of both the technology and the science – into the applied combined field of CNNM. This spells out the importance once again of "time" and its incorporation into technological momentum.

There is a crucial distinction to be made in reviewing the course taken by the technologies and sciences on their way to the inflection point found to occur in the late 1990s and early 2000s. Why wouldn't, for example, Russo's use of eye-tracking for consumer attention or Weinstein's usage of the EEG in advertising research (along with the interesting embattlement that took place as a result of that, touched off seemingly before the ink was even dry on the initial findings they reported in 1984) be such an inflection point? They could very well be; a more detailed review of the totality of literature might indicate such. At this level of analysis, though, the evidence presented by both would indicate that they are signposts showing the function of the theories of SCOT and technological momentum.

The survey approach I've taken within this essay likely does not disclose the full shading of every step of the development of the technologies or the sciences. The controversy associated with the Weinstein results in 1984 is an indication of the same discontented zeitgeist shadowing the epistemology of the techniques today. And yet, the march of the use of fMRI, from medicine to marketing, seems one that inheres simultaneously in the science and the technology.

With the growth of the usage of fMRI to understand brain patterns and their links to particular behaviors, it has become a natural extension to understand brain patterns

during sensory intake of marketing information, be it an interaction with a product or an advertisement. Neural patterns attendant to behaviors due to organic brain disease (such as tumors or degeneration), to mental illness (such as psychopathy or schizophrenia), to learning (such as memory storage, language acquisition, and decision-making), to emotional responses linked to behavior and perception (imagery of love, war, flowers) all point to the direction of better understanding how and why people behave and think the way they do. The growth of applications of this technology appears ready to be viewed with the theory of technological momentum in the stricter sense; (Hughes 1994) when the EPOR-situated scientific controversies, and the different technological artifacts are situated well within the social and cultural settings, with the display of differing interpretative efforts seen and known, we see interpretative flexibility in its full form.

One of the most congruent areas of CNNM, decisionmaking, neurology, and psychology is the growing recognition of the importance of non-conscious processes within the brain. Identified early in the history of psychology and measurement, especially in terms of non-voluntary accidents or illnesses (Phineas Gage, for example, or epileptics), there has long been a recognition that "autonomic" processes are present. The extent to which this recognition grew to behavioral exemplars that could be measured (pulse, galvanic skin response) is still expanding; the usage of technologies that study brain activity that have no overt behavioral response is still in its infancy. The unconscious, non-conscious, or semi-conscious processes have all gained in recognition as to their crucialness in a vast array of behaviors and thoughts.

In the late 1990s, Banaji and Greenwald, building on social psychology and neuroscience, developed the implicit association test. By 1998, the first article describing

this process was published, linking the findings of implicit memory research to a test which purported to show the content of a subject's implicit memory. The theory tested was largely based on the assertion that the fastest reactions, driven by implicit memory, would show the deepest motivations and biases of the research subject.

The assertions regarding the IAT application uncovered some disturbing insights when it came to identity. For example, Banaji reported that under certain circumstances, Caucasians "preferred" to see images of other Caucasians, as opposed to non-Caucasian faces; even more striking, these findings seemed to hold when tested on infants only several months old. The discussion rapidly became to what extent such racial (or other) stereotyping Is, in fact, an ineluctable component of the functioning of the mind. Other findings, some amusing and some less so, included the implicit reactions of a gay rights activist whose measurements indicated "subconscious" distrust of gay signals. (Greenwald)

While the work on implicit reactions and memory developed, Bargh and colleagues further developed their work in unconscious stimuli and priming. (Greenwald) This element of social psychology extended the assumption that many, if not all parts, of the mind's information processing capabilities (or modules, in the parlance of evolutionary psychology) occurred beyond the realms of conscious awareness. The basic mechanisms behind this are almost always hidden from us, operating in the background. Automaticity, as an example, and memory retrieval, as another, all occur to some extent beyond our conscious, willful exertions. Some extreme examples include simple functions –as in pulling your hand away from a hot stove, an action processed largely in areas of the spinal cord – and even more complex functions, such as driving and swerving

to evade a surprise, such as a leaping deer or an obstacle in the road. These are instances we look back on, often with a type of wonderment at the speed of our own reactions and almost always the sentiment reported is something like, "It just happened automatically. Didn't even think about it." The modularity model of the mind comes into the conversation as another example underscoring the importance and interconnectedness of the general (Kuhnian) theory, combined with the closure of both EPOR and SCOT.

The unconscious processing patterns of Bargh (2002) and others are similar to this, except that the theory pushes it beyond what we would recognize, even in retrospect, as automatic. We make decisions based on memories retrieved and past experiences *without* a conscious awareness of the fact that a memory had been retrieved. Mentioned earlier in this essay was that the root of such things stemmed from early theories within cognitive psychology and the recognition that the information-processing element is the sine qua non of consciousness itself. What Bargh and colleagues would study would become some of the more famous examples within social psychology, closely akin to what Greenwald and Banaji would uncover with their IAT. Bargh, for example, used tests which contained language "cues" that would make test-takers become inundated with imagery of the elderly, with questions focused on retirement, Florida, diseases of aging, and so on. The results of the study were that test-takers leaving the room after having taken the test with the "priming" words walked at a gait that was significantly slower than controls. (Greenwald)

The IAT is one test which would gain recognition for peering into the subconscious, but certainly the brain imaging technologies claimed some degree of knowledge as well. However, there is also an increasing recognition of the advancement

of biometric measures, which led to the publication of a set of factors that sought to standardize the probity and consistency of the measures in the late 1990s. (Greenwald) The technologies of, for example, skin conductance, had become sensitive and specific enough to be to track differences and could offer greater insight into the actual biological signs and systems that were taking place in the body while information was being processed, and while attention would be devoted. Such measures would still necessarily be at a fairly gross level of detail, but still reinforced the link between the unconscious and reasons to study it.

Caccioppo sought to clarify the distinction and the link between social neuroscience and social psychology. By focusing on the neuroscience aspect, he states that the biological mechanisms are the focus of the neuroscience. While he underscores this, the collisions and problems with social psychology are avoided. At the same time, Caccioppo stresses that *without the development* of specific implements of technology, the neuroscience would have been unattainable. To the extent that we see the importance of convergence in the contributing theories of EPOR and interpretative flexibility, the use of the technology is the precise mechanism of convergence for the science itself.

During the turn of the last century, we see the science and technology finally fully combining and converging over time within the field of CNNM. Some internecine competition between psychological theories (though, at least insofar as the evidence shown from the content analysis in Essay Two, the behavioral economic/prospect theory paradigm is supremely dominant) exists, and to a large extent, the technologies are seen as, while competing, at least pulling in the same general direction of aiding and assisting in market research.

Just the Day Before Yesterday: CNNM

In the 2000s, one could finally witness the unification of the technology and mind models into a discernable field of neuromarketing. While this is largely covered in the literature review in the introduction, it should be noted that the field itself has both roots that stretch back decades (in some cases, a century or more) and that it feels the epistemic criticism of its parent fields. Some critiques included the use of fMRI on a dead salmon (Bennett), mentioned above, while even greater criticism was leveled from within the field of neuro-imaging itself, concerned about the commercialization of a clinical and medical research technology.

For example, Kahneman (2012) issued a sharp criticism on the lack of replicability and validity of many priming studies. To the extent that Bargh's research program depended largely on a reputation formed by public acclamation of his studies, it represented (and still represents) a major challenge to the field of social psychology. The famous example of Bargh's was that study participants, after working through a word exercise that evoked associations with the aged and infirm (including words like "cane," "wheelchair," and "Florida"), test takers were, on the average, slower and less ambulatory leaving the testing room. However, attempts to replicate these results have met with what might be most politely called "complications" in that they've been unable to attain it. In all, it has been shown that more than 100 studies were not replicable. This has thrown concerns about the validity of social psychology, or at least the unconscious/priming/automaticity area, into a significant turmoil. Concurrently with this,

we can imagine that the "convergence" to which social psychology might have been driving is not as clear as what it might have been.

Into the controversy comes where we are now. All of the developments of the theories of decision and the technologies of scanning are but prologue to CNNM – it has only been in the past fifteen years or so that it has been recognized as a separate subfield, complete with scorn attendant to other problems in the larger field of neuroimaging and behavioral sciences, with the added bonus of being used for commercial ends, thus ensuring an even greater level of opprobrium for its perception as being mercenary.

With the introduction of the term "neuromarketing" (claimed to have been bestowed in 2002 by Ale Smits), we arrive at the current day, with the current controversies and current linkages between scientific theory and technological evidence that is recounted in this essay and elsewhere in Essays Two and Three. Robust forms of the insights provided by CNNM are frequently used in other contexts (and sometimes, by other names, perhaps signaling a cross-disciplinary congruence to concepts inhering in but not exclusive to CNNM). Thaler and Sunstein, for example, argue for the adoption of "choice architecture" when it comes to design of social programs. (Nudge) These use the same basic principles that marketing specialists use when it comes to projects such as labeling and even shelf design and product presentation.

The literature review and introduction familiarizes us with a substantial body of literature, most of which has been published in the past decade, and which demarcates the field of CNNM, drawn on the past research and the newest techniques and scientific findings in (uneasily) allied fields. Books such as *Buyology* by Lindstrom, *Neuromarketing: Understanding the Buy Button in Your Customer's Brain* by Renvoise

and Morin, and AK Pradeep's *The Buying Brain* have all heralded the field and yet, at the same time, helped create the most problematic perceptions of it. Not the least of the critical approaches have been from within the field itself.

And yet, studying the related literature, from 2002 until today (and, more even more probably, from 2007 until today) we see a field that has fully intertwined the science and the technology into a new applied field. Convergence seems close indeed, given our interpretations of both the science and the technology (with the added complication of its application in the realm of CNNM) That is, unless an epistemic catastrophe occurs in which the entire underpinning of either the technology or the science would be brought into question, such as the current question of some of the research in social psychology. However, we can also look to SCOT and technological momentum to act as different analytical lenses which may resolve more details in our picture of the field.

In a special issue of the *Journal of Marketing Research* of 2015, the editors devoted an entire issue to the state of knowledge within CNNM. The growth of papers and research in the area may have been one factor, but such growth in attention came about as a concern relating to public perception of marketing (as recounted in the Introduction, when, for example, Martin Lindstrom declares that you have romantic feelings for your iPhone, or even when noted neuroscientists write that they can identify the agreeable and non-agreeable aspects of Presidential candidates by scanning the brains of prospective voters.)[15] Even still, however, Plassmann and Venkatraman in the same issue noted that the bulk of the neuroscience research in marketing has been published in

[15] Undoubtedly, brain scanning for such clues would have been largely irrelevant in the Presidential election of 2016 given that the United States had never seen a contest among two polarizing people so hated, feared, and loathed by so many.

neuroscience oriented journals, rather than marketing journals. They also pose the question that is present in several areas in this dissertation, in that the practice of neuroscience *in* marketing might shed more light on neuroscience than it does on marketing itself (427).

The introduction essay covers much of the literature in its basic survey of the current state of CNNM, so it need not be repeated here. Instead, the recency of the special issue contributes highlights which fit well into this history of the entanglement of science and technology in human decisionmaking. I will focus more on the latter for purposes of this historical essay.

At this point as well, we are focused not on psychology broadly, or decisionmaking generally, but most specifically on the technologies and scientific theories which illustrate particular consumer behaviors and decisions. We are, as it were, at the narrowest point of the funnel, and so the questions that Plassmann and Venkatraman ask are specific to the marketing questions about which the science and technology might be best suited:

- Identification of mechanisms which contribute to decisions and behaviors (such as self-control.)
- Closer study of the unconscious and implicit processes which lead to biases in decision-making and preferences.
- Whether a process is psychological or physical.
- Recognizing individual differences between brains and ways of measuring possible heterogeneity
- Greater accuracy in predictions about behavior and decisions

Indeed, as will be seen in Essay Two, the Kahneman factors of System 1 and System 2 currently hold great weight and cache with the neuromarketing parts of CNNM. At the same time, such a theory might not hold under greater empirical insight shown in brain imaging.[16] (Plassmann et al 2015 429). The ongoing scientific controversy will continue – this is the process of knowledge discovery and is an important part of not only the construct here, but of development of knowledge more generally.

In examining the factors Plassmann proposes above as well, we see areas for greater knowledge and insight. One might indeed hesitate to use terms of SCOT or EPOR such as "closure" and look instead to multifactorial analyses driven by diverse forces combining into a field. Even with the explosion of insight into the "Decade of the Brain" from the 1990s and the ongoing prioritization of brain research by the US NIH under the Obama administration (Penrod 2018), we are at the very, very beginning of knowledge about the brain. The competing notions of convergence under the more general circumstances should be recognized; in one sense, yes, the flexibility of the achievement of the technology in answering scientific questions has reached a point of acceptance. To reframe this achievement in any broader sense, however, is to dramatically underestimate the pure unknown with regard to the operation of the human brain and, by extension, the intricacies of the mind.

Plassmann has repeatedly and consistently illustrated scientific questions to which technologies might be applied. Venkatraman and colleagues, in a separate piece within the same journal issue, discusses the technologies used currently in CNNM. He

[16] And, in balance, Kahneman never describes the System 1-2 distinction in physiological terms but instead are intended as psychological shorthand descriptions used to note that human decisionmaking is often intuitive and heuristic rather than measured and arithemetic.

concludes that study favoring fMRI for the measurement under study (reactions to advertising) but the usage of the different technologies still stands out as a way of showing the progress of the past seven decades, up to and including the content analysis in Essay Two (the discourses for which occurred within an overlapping time frame as the Plassmann et al and Venkatraman et al articles).

Venkatraman recounts some of the history of the "neurophysiological methods" used in advertising research, dating back to the 1980s. He pinpoints the different constructs used historically in advertising research (attention, affect, memory, desirability)[17] and also focuses the question on whether all of the investigations have actually mattered to advertising…i.e., has the research resulted in improvements? Venkatraman's questions closely mirror the areas pursued by the researchers covered in the content analysis of Essay Two, particularly in terms of memory formation and affective state. And, as seen above, the importance of attention and its role in decisions still factors in.

Focusing on advertising in this regard also allows the study to proceed, unmolested, by considerations of purchase behavior (either actual or intended), product design, and other questions. But the linearity of the approach used discloses relative results of different technologies; my work in this Essay retraces the histories of the different technologies, so it isn't necessary to recapitulate Venkatraman's here. Instead, it is noteworthy to point out that the researchers interlace the different aspects of the advertising-psychology construct, such as attention, with the technologies that show

[17] According to Venkatraman, this construct –used in his 2015 study—dates back to 1925, close to the very beginning of the history recounted in this essay.

probity in testing those aspects of the construct. (Venkatraman, et al Table 1). I have simplified their findings here:

TECHNOLOGIES[18]	AD-PSYCH CONSTRUCT STATES
Implicit Association	Affect, memory
Eye-tracking	Attention, affect
Biometrics	Attention, affect
EEG	Attention, affect
fMRI	Attention, affect, memory, desirability

In conjunction with the technologies, the researchers also included an assessment of "traditional" methods, which also helped to account for all four of the construct states.

While fMRI would be favored, at least in the context of advertising assessment by this team of researchers, Boksem and Smidts (2015) note that use of the EEG is often favored due to the economics of the technologies themselves. We also see this as a theme mentioned in the discourse analysis in Essay Two. Also of note in comparing the technologies is the overlap among technologies and among technologies and traditional methods. The use of orthogonal methods to double-check findings and to fill in the gaps between specific technologies is an important recognition of the scientific controversies and the technological limitations. Again, in Essay Two, we see this play out in practical terms, when studies are done in-store, for example, or the costs of a large-sample fMRI study is just too high.[19] In their comprehensive 2013 review article, Orquin and Loose would show that a significant portion of the published findings of consumer decisions and eye-tracking has occurred through the 2000s. (Orquin) This too is ratified by the

[18] Each of the technologies had different sub-methods which were often related to different constructs. For example, pupil dilation is a part of eye-tracking but it measures affect, and fMRI scans of particular portions of the brain would yield insight into memory while other scans on different areas would show arousal, etc.

[19] Leaving aside, as always, ongoing considerations and controversies involving the concerns of the technologies. Plassmann also outlined several, including the every-present caution regarding reverse inference, particularly in the case of brain activity imaging and measurement.

discourse analysis, where eye-tracking was one of the major methods used for the research reported throughout the five years of the conference studied.

A similar parallel exists with regard to biometrics. Simple physiological measurements, with technological antecedents reaching back to the 1800s or even earlier, they include pulse, blood pressure, respiratory rate, and galvanic skin response.[20] For purposes of decisionmaking and customer attention, such basic measurements can be used to answer questions regarding emotional states and measurements such as overt and covert attention. Other biometrics exist which create substantial political and social issues (facial recognition and fingerprinting, for example, as discussed by Pugliese), but they may not yet be truly attached to questions of customer decisionmaking. However, facial movement and tracking in the form of microexpressions, when performed by trained human observers, may have the capacity for also examining affect and attention. (Ekman)

Momentum and convergence; time moves on and events and knowledge change shape. If one accepts the basic premise of the utility of physiological and brain-measurement methods (even while changing), one can see the same utility in applying the technology in the case of CNNM. If one accepts the basic (though changing) psychological theories regarding decisionmaking and information processing, one can see application of them to decisions and information processing by *consumers.* The interpretation is, as always, where the rubber meets the road and is at least as responsible for the value and probity of CNNM as a field as the technologies and the science.

[20] More sophisticated measurements, such as pupil dilation, may also be considered biometric in nature, though I've included such a measurement under eyetracking.

Convergence and CNNM: Some Preliminary Conclusions

We have traced the development of psychological and decision theory with behavioral and brain measurement technologies over the past seventy years. As a part of that, I have deployed the ideas of SCOT and technological momentum to help frame this narrative, and asked whether convergence has occurred in the sense that the science and technology have been successfully "converged." These theories allow us to examine the adaptiveness and temporal qualities of the changes in both the scientific theories and the technological approaches and apparatuses of marketing. We have seen that, for decades, the two were largely unconnected and then, after some early attempts in the 1970s and 1980s, there arrived a tipping point wherein the two became nearly synonymous in the context of CNNM.

During this history, several transitions occurred. Each one of them is important to mark in the course of time as specific instances where inflections were felt, each demarcating a part of a new interpretational framework and a new usage.

First, there is the transition of the technologies from clinical and medical research to commercial usage. This transition is but one thread, especially today, when the prospect (and criticized concept) of neuro-everything is seemingly underfoot. The broadening of applications of the technologies into CNNM marks a transition that is not welcomed by all parties, even by those who practice *both* marketing and neuroscience. Nonetheless, the transition has occurred; CNNM might be just one example of a broader social transition to expectations regarding explorations of the human brain and behavior, but it is a transition of technology just the same. Technological momentum allows us to examine this history through a capable analytical framework.

While this has occurred, the expertise has still remained expertise. This will be explored more in Essays Two and Three, but while the broadening of technological application has exceeded the original areas of clinical and medical research, the need for experts to interpret the findings has not.[21] This concentrates a greater amount of power in those trained (or who purport to be trained) over those who are not. The controversies about this have offered a mechanism of self-correction, to such an extent that the most concentrated of the specialists, such as those within CNNM, have actively attempted to tamp down the hype and the overclaims. The next few years will be interesting to watch; in the meantime, this dynamic is also shown in the discourse within Essay Two. Interestingly, however, much of the public opprobrium launched against marketing (such as in the case of the Vance Packard work and the more recent usage of fMRI) seems to be when marketing is either couched in scientific terms, or presented rhetorically with science in such a way so as to make it seem omniscient and omnipotent.

Second, there has been a transition in decision theory itself. In one sense, it can be seen and thought of as a natural evolutionary process by which science grows, self-corrects, and re-asserts. One can witness this throughout the evolution from early psychology and experiments in the late 19th and early 20th centuries, through behaviorism, up to and including cognitive and evolutionary psychology. The transition most germane to our analysis, however, is that of the definition of what constitutes *the rational*. Even while von Neumann and Morgenstern battered away at the behaviorist school in the late 1940s and 1950s, paving the way for cognitive psychology, the

[21] Marketing and consumer neuroscience are not the only areas in which the technology has been interjected in the hopes of rendering greater insight. Brain activity technology is being deployed in the political and religious spheres as well, just as a couple of examples. Cynical observers might also claim that neither of these fields is too far removed from marketing at their core.

definitions of rationality hardly remained unchanged – rational was thought, irrational was emotion.

This began to change almost immediately, as we've seen, with Simon. But the boundaries of "rationality" themselves began to change with the questions of how the mind works, and why it works. What is, for example, rationality except to have the instinct to jump back from a surprise, a snake-shaped stick on the sidewalk? It is a reaction driven by fear, but for millions of years, nothing could be more rational but to do exactly that. The tools of the mind, examined by psychologists and behavioral economists, have begun to redefine the rational in way to include emotions and recognition that value comes not purely in numerical or monetary forms. The new interpretation, the signifying and unifying feature of the new theory, is that emotions and thought are *both* rational.

Third, there has been a transition to a grand unification of technology, at least in the sense of CNNM. This will be explored more fully in Essay Two (and picked apart a bit in Essay Three), but the usage of behavioral measurements and brain scanning has developed into a coherent, self-reinforcing discipline within the space of CNNM. This is not an easy alliance. Clearly there are strengths and weaknesses to different technological platforms, and each have their own set of acolytes and evangelists. But it is not unusual to see technologies being used together, particularly when undertaken as a practical exercise in marketing, where eye-tracking might be combined with EEG and observation, or fMRI results might be correlated to foot traffic, or something similar.

Some further practical and theoretical considerations should be mentioned, in terms of what these findings and analysis might mean to CNNM as a field, and to STS-

oriented, interdisciplinary research of the field. First, practically speaking, it seems to follow that the appearance of a specific technology (fMRI) instantiated a higher degree of usage of other technologies which, while having different capabilities and attributes, helped to underscore the link between the unconscious and decisionmaking, and numerous ideas relating to conscious processes. It may follow that the development of the next generation of imaging or measurement technologies could produce other effects which would further reify these findings. Second, the usage of CNNM as a reflective tool peering upward into the larger pictures of the meaning of consciousness and the function of mind and its linkage to behavior seems a valid enterprise. At the same time, this normalization of what have been, from time to time, controversial techniques also point in the direction of ongoing cycles of convergence and controversy, along with that of momentum.

In terms of the theoretical discussion, it is the theories of SCOT and technological momentum that deserve some consideration for their ability to sharpen areas of historical focus in this essay. Of course, the most obvious weakness attendant to this is that this work represents an *historical* and descriptive look, rather than, say, a predictive and possibly normative approach. In compiling this information and deploying SCOT and technological momentum as lenses through which the events can be viewed, I was struck by the retrospective applicability of their descriptive attributes while also being well aware of the post hoc nature of the inquiry. However, it might well be through an emerging network and technology, with accompanying social and political issues, that might point the way toward a conservative predictive analytical framework. Just as technological momentum incorporated an additional element to established theories, and

SCOT combined several features which were also included in other disciplines (including economics, design, and scientific epistemology), it may be that a combination of SCOT and technological momentum can be developed so as to understand the underlying principles and trends in an area such as CNNM. It seems that the occasional upwelling of concern about marketing when "cloaked" in science represents a socio-economic-political inflection point that deserves further study (and is touched on later in this work as a whole.) Future research and refinement is needed here.

A differently-targeted ANT analysis than what is present in Essay Two might reveal more about competitions and trends among the technological applications, but the point here is not that different researchers have pet technologies, but instead it is the emerging (though not fully solidified) consensus that buying behavior and decisions can be investigated through application of scientific theory and technological methods. The extent and consequences of this are explored more fully in Essays 2 and 3.

SCOT and interpretative flexibility is but one way to examine these trends, transitions, and inflection points. It serves as a partial explanatory framework in describing harmonies and disharmonies alike in the context of the science and technology of CNNM. At the outset, I noted the scientific controversy of CNNM and its epistemic concerns, but with the examination herein regarding the technological spread (different artifacts have crossed usage from multiple other fields), differences in interpretation and usage (interpretation of the meanings and outcomes of the technology in CNNM), and finally the catalyzing moment of technology and science (the instantiation of social neuroscience and the concrete path to application to CNNM), we are closer to seeing a

clearer picture of an established field comporting with both SCOT and TM and their combined factors in the form of convergence.

With this survey of history in decision models and technology, we next turn to Essay Two for a picture of the discourse regarding the science and technology in CNNM over the past five years, how expertise is conveyed, and how expert groups might be formed. After that, Essay Three will help to address one of the ongoing criticisms of the SCOT approach, in that it does not address ethical or consequential issues of the development of a technology. (Winner)

Essay Two:

A Modified Actor-Network Theory Approach for Expertise Formation in Neuromarketing Conference Participants

Introduction

In this chapter, I follow the formation of a network within consumer neuroscience application and research in order to answer the question: "How is expertise in neuromarketing—a field that crosses the normally separate domains of science and business—constructed?" Using actor-network theory (ANT) as a helpful framework, what I explore here draws on the overarching intent of ANT, as articulated by Bruno Latour, while also drawing more tactically on approaches used by Michel Callon (1986, 1999)

ANT is a form of sociological analysis that attempts to describe a connected "network" of people and things. Generally, ANT does not take "the social" as an explanatory factor unto itself (Latour 2007) and instead relies on detailed description that enables other scholars to understand the movements and configurations of a network. Such an analysis, if performed according to the guidance given by Latour, does not contain outright political judgments about a group, nor does it attempt to manifest any type of explanatory action. Instead, it is a descriptive approach that allows a clearer picture of a multitude of connections, particularly in the STS realm wherein the connections between humans and forms of technoscience are of particular interest. ANT has also been useful in this broad context in studies of innovation and emerging technologies and methods; given this, it is well-suited for offering a descriptive structure

of an unfolding area of social connection and technoscience, both of which are present in consumer neuroscience-neuromarketing (CNNM). The disparate areas of inquiry related to marketing, with significant sociological and social science underpinnings, and its connection to these new technologies, can create valuable inquiries bridging STS and marketing scholarship.

One goal of its usage in a context such as marketing and management is to methodologically determine if the ANT approach, as modified, can be useful for assessing an applied and academically mixed field such as CNNM. If it can be useful, then we can also begin to see the shape and form of the network associated with it, particularly in determining the relationship of different technologies to the different network participants. How does the technoscience help inform expertise?

Theorizing in CNNM in Actor-Network Theory

ANT helps us understand group formation by tracing associations and ascertaining connections between things and humans (Latour 107). Within the usage of ANT, actors and actants do not just include human beings but also group representatives, artifacts, technologies, and different forms of knowledge enrolled in the formation of a network. The network is also forever changing; a network without change is not an explanatory path in the context of ANT. "If the social remains stable and is used to explain a state of affairs, it is not ANT." (Latour 181)

Another set of factors also supports the usage of ANT in this analysis. Callon noted that ANT functions without a set hierarchy of actors and forms a network by tying together different elements within society. (Callon 1986) Any portion of any network (in the form of an actor) can also be considered as a network itself. In this way, the tracing of associations with an approach based in ANT is a recursive approach. Unpacking this recursive process, I identify four discourses, each a sub-network producing its own power effect, which in combination form the unique construct of CNNM expertise as power/knowledge. In addition, the analysis uncovers further implications for group formation and persuasion along the edges of the categories.

Further considerations also exist for the applicability of ANT in this context. ANT has been deployed as a methodology for the study of innovation in several different contexts, such as the development of a (failed) public transportation system and electric vehicles (Latour 2002, Callon 1986). It has been deployed as well in laboratory-study settings, a well-known area of STS that has closely examined the functional relationships between researchers in a laboratory (Latour 1987). It is a flexible analytical tool to understand networks in a variety of contexts, which makes it valuable to many different contexts, including that of business. In following that ethos of flexibility, I have changed some of the categories and considerations of "classic" ANT, which represent departures from the original French terminology. The reasons for these changes are based in the nature of the network being developed and in the data provided, all of which are explained more fully below. Briefly, I have expanded "problematization" into a two-step process and have used the term "technological engagement" rather than *interessement.*

In following the actors and actants, I study the interrelation of the participants within a group as mediated through four discourses: marketing expertise/credibility, neuroscience expertise/credibility, technology as witness, and the credibility of neuromarketing. These four categories and my analysis stem from a content analysis of videotaped presentations made at the Neuromarketing Science and Business Association (NMSBA) world conferences, held in Amsterdam (2012), Sao Paolo (2013), Dubai (2016), and London (2017). The NMSBA is an organization devoted to collecting the latest thinking and most prominent figures in the field of neuromarketing and consumer neuroscience. The organization considers itself "[t]he association for everyone with a professional interest in neuromarketing." (NMSBA website). In addition to the presentations at the conferences, I also attended a virtual course sponsored by the MOOC Coursera on Neuromarketing. The central instructor for the course was Thomas Ramsoy of the University of Copenhagen; the part of the course that was analyzed for this review consisted of seven interviews conducted by Ramsoy.

The Discourses

The four discourses identified in this material establish claims to expertise in different ways:

- *Marketing expertise/credibility* followed the terminology and language used by conference participants to demonstrate their familiarity with current issues or the classic teachings of marketing. Actors could either explicitly mention their

expertise in the form of academic background, vocational experience, or other reference point, but could also use specific terms which would facilitate the audience's recognition of expertise and credibility. Thus, terms such as "branding" or "pricing" or "design" can be considered indicative of the speaker's signaling of credibility and belonging within the arena.

- *Neuroscience expertise/credibility* followed uses of specific scientific theories, terms, and arguments to demonstrate working knowledge of historical and current psychological theories, arguments regarding brain anatomy and function, and related topics. Some terms related to psychological theories and brain anatomy included mentions of "System 1 and System 2," "hippocampus," "long-term memory," and so on. The usage of terms by the actors within this context would signal the particular type of marketing sub-discipline fitting within the call of the conference. Thus, the set of all marketing interests includes this subset wherein neuroscience credibility defines the field in which the group forms.

With the determination of the language used in the two areas of establishment of credentials, we see how the actors enroll words to form the network. By issuing such a signal, the speaker allows the audience to know of their relative place within the network. Undoubtedly, the speaker's construction of their network began prior to actual exposure at the conference, thus accounting for the invitation to speak and the conference participation. At the same time, the words help to define the boundaries within the

domain, and thus the edges of the network. This helps define the boundaries of the evidence and also more securely grounds the network in that same evidence.

- *Technology as witness* is the category I used to understand the role of different techniques and equipment in the group. The technologies and their evolution are themselves actors, as are the human beings acting in concert with them. The use of the technology establishes a pragmatic and practical signal by which many members of the group could show their experiences in the usage of them, and the technology could demonstrate utility and results back to the human observers, thus demonstrating its own importance to the formation of the network and the changes that arise. The content analysis traces the deployment of specific technologies and rates their importance, as judged through an assessment of the approximate number of times it is mentioned and the emphasis with which the mention occurs. Every type of technology that is used has been traced into the network formation, and some take on a distinctly more prominent role than others.
- The fourth category of discourse is that of *neuromarketing credibility*. While the previous categories of marketing and neuroscience are well-established areas of expertise, neuromarketing is an emerging field whose credibility is still uncertain. This is a reflexive category which shows both the actors' participation in the field and, by dint of their participation and assessment, the credibility of the field itself. Specific judgments may be entered into in this category, at either the outset of a presentation or in the conclusion, or in remarks seeded throughout

the discussion. This category acts, in a sense, as an outcome of the combination of the two types of expertise and the transformative effect of the technology. Within this category and the participants' judgments regarding its credibility sometimes come signals regarding controversies and ethics of the practice.

Methods

The total content analysis consisted of a review of 70 unabridged videotaped presentations or interviews, available for download on the NMSBA website or from the Coursera Neuromarketing course page. Presentations and interviews varied in length from approximately twenty minutes to one hour in length. On a handful of occasions, the named presenter enlisted the aid of a co-presenter, or videotaped testimonials embedded in the presentation. Subjects over the years varied widely but spanned technical how-to presentations to more philosophical discussions regarding the state of the industry and included some discussion relating to ethics.

The review involved several steps. After locating and gaining access to the dataset by becoming a member of the NMSBA, I downloaded all of the presentations onto two external hard drives due to space limitations and desire for redundancy. I then viewed and made general notes on each of the presentations and to get a sense of the discourse involved, and to create the categories enumerated above. Following this, I began a systematic qualitative review by watching each video two more times in order to make notes and deconstruct the presentations for content categories. In all, with approximately 25 hours of videotaped lectures, I spent approximately 175 hours

watching, notating, coding, and cataloging the content. I did the initial note-taking and analysis in long hand, then re-typed and set the data in basic tabular format, which took another 30 hours.

The multi-year approach provided by consecutive workshops and the MOOC course allows us to track different measures and changes over time. We can, therefore, see that the network does in fact change in both subtle and gross manner and can assess how expertise has been formed along with the group. The relationship between the categories of discourse is also an important one, and instead of being parallel indicators or identical categories of signal, we see a transformational character to the discourse and the effect that different discourses have on the others.

In fact, the four categories of discourse and the presentations tend to show a sequential relationship in the following manner:

Marketing credibility established → neuroscience credibility established → Technology is deployed → Results are interpreted → Field gains or loses credibility

The nature and quality of expertise that is demonstrably formed in the context of this analysis relies largely upon the perceived economic need for marketing performance. This approach does not rule out the possibility that a person trained in neuroscience or some facet of it cannot later absorb marketing knowledge and deploy the combination of the two in some form. The basic level of the knowledge, as encapsulated in neuromarketing, however, appears to be the desire to seek competitive economic advantage in the marketplace, through knowing the archetypal customer better.

ANT and Consumer Neuroscience

This essay will largely follow and expand upon the structure first demonstrated by Callon (1986) in his analysis of scallops and fishing in St. Brieuc Bay, France. In that classic essay (then called the sociology of translation, and later ANT), Callon sought to "outline an approach to the study of power," particularly in the sense of how science and technology structured relationships (1986).

Callon discussed his introductory principles of agnosticism, symmetry, and free association; the same principles would apply to the study of the group in this context. Callon set up a network which included three main researchers (unnamed) who sought to advance their research program on scallops, the population of which were suffering from overfishing in various areas around France. At the same time, Callon included the scallops themselves within the network, along with the fishermen harvesting the scallops. A further actor in the network was the larger community of researchers in the scientific community, perhaps devoid of specific knowledge relating to scallops but still with interest in the area. These tenets will be discussed throughout the essay, but my naming of actors to include researchers, the market research community, the consumer, and the technological methods all have clear analogs to the Callon approach.

One critical difference between what Callon did in that work and what this essay studies is that this essay is not studying power among disparate articulated groups, as in the case of scallops, fishermen, and researchers; instead, this essay's analysis will focus on the formation of expertise (possibly considered as a form of power relationship)

within the closed confines of a specific and demarcated group contributing to a conference series. As in Callon's case, the CNNM actors support their claims to expertise by enrolling other actors & actants (fMRI scans, psychological theories, older marketing technologies, prestigious institutions), but the cooperation or resistance of those other actants will not be discussed here. Another important distinction between this analysis and that contained in Callon is the breadth and depth of the scientifically oriented participants. While the scallop example included the roles of fishermen and, indeed, of the scallops themselves, the scientific researchers were few in number. The researchers in the discourse analysis in this work are more in number and represent a wider variation in disciplines and fields. To that extent, they also draw on a much broader history and milieu of fields which have contributed to their individual expertise. This means that the analysis here contains a separate set of qualities which must be accounted for in a different manner than "ordinary" or "classical" ANT. These areas of distinction will be noted in further detail below, in different areas of the data which are presented.

Callon and Latour have both commented on the importance of controversies in the formation of a network. The resolution of a network in order to better understand a scientific controversy is an important feature of ANT, and it clearly applies in the context of the areas under study. The field of consumer neuroscience most certainly has an accompanying set of controversies for resolution both within the instant network and across the broader communities and other networks which may be affected. Broadly speaking, the controversies fall in two major areas: ethics and efficacy. There is a relationship between them in a variety of circumstances, which include the obvious concerns of privacy, autonomy, and the possible generation of coercive knowledge.

More occluded controversies, linked more clearly to the skeptical end of the spectrum of epistemology, include the concerns regarding the gullibility of business organizations being tempted by modern-day neuro-snake oil. The ANT analysis contained within this work will partially shed some light on these issues by demonstrating the ways in which the discourse has constructed an expert group with a unique form of applied knowledge. In Essay Three, I will examine some of the ethical questions raised by consumer neuroscience. Some of the epistemological puzzles regarding brain imaging have been previously covered by myself (Penrod 2018) and many others.

In establishing the actor-network, Callon sought to use three main researchers focused on scallops, and then included in the network scallops, fishermen, and the larger body of scientific researchers that show interest in the central researchers' work. The scallops are included as an important actor and Callon argues that they were "persuaded" to participate in the undertaking by the same broad strokes as the fishermen were themselves persuaded. Non-human actors would become a cornerstone of ANT, including the famous *Aramis*, the failed mass-transport train system in Paris. (Latour 2002)

In defining the actor-network within this essay, the technologies and techniques for imaging are included as actors. As a parallel to this, what also must be included are consumers both as an end result (something to be acted upon) and the consumers who acted as research subjects within the studies that many of the conference participants performed. The specifics of these consumers are almost universally unknown, except that they were the foundation for the extraction of the information contained in studies, described as data, and extrapolated into further hypotheses. In Latour's terms, which we

will revisit when the occasion allows, the people were more "easily transported" via their conversion to text and tables.

For Callon, the scallops were the faceless, nameless masses that stood in for teeming Nature. Individually undefinable from each other, the scallops acted *en masse* within the framework Callon proposed as a single Actor. In much the same way, neuromarketing experts expect to extrapolate from the small sample of humanity that has been tested by brain imaging technology, and hope that the same humanity (though different individuals perhaps, but not necessarily nor importantly) will be affected *by the technologies used on the first set of humanity*. Scallops in Japan equated with application of hope and technology to scallops in France; humans testifying via application of technologies become humans testified *to* with the transformations elicited by technology. In sum, neuromarketing and consumer neuroscience represents a putatively more accurate and internal "voice" of a spectrum of consumers and potential consumers.

Callon's fishermen became another actor within the network. This too is a class of actor that largely goes unrecognized in terms of individual contribution, at least until the point of representation and effectiveness of that representation is in question. The scallop fishermen are the partners of the researchers and of the scallops, along with being the putative beneficiaries of research agendas of the primary actors. Similarly for this essay, the "outer world," that is, the community of market researchers external to the conference participants, are the larger putative beneficiaries of the work done by the conference participants and by the work and learning discussed by them and their colleagues in the consumer neuroscience world. The larger external world of

beneficiaries may also not be cognizant of the contributions made by the network within the conference but includes the broad disciplines of advertising and sales.

The specific biologists with interests and expertise in scallops were the actors who created the obligatory passage point for the rest of the actors in the network. The conference participants over the course of the years of the meetings are visible participants within the broader array of persons interested in market research, from the most vaguely interested hobbyists at one extreme, to the seasoned professionals and academics in the midst of all forms of market research, to the narrowing point of those with special interests in the behavioral sciences, to the most specific set of those interested in use of brain imaging to understand consumer behaviors. Of that most specific set, the conference participants have been selected, either by self or by recognition from peers, to participate in the conference.

A critical difference between the "key" group of researchers within Callon's analysis and the conference participants in this essay, is the extension of the analysis to a reflexive goal. The conference participants seek to show knowledge and to demonstrate expertise and, in so doing, push along the unfolding boundary of what they believe to be a new theory of interaction between biology, psychology, and technology. The transformative and catalytic element that technology represents is a departure from the scallop case; in that instance, Callon reported prosaic use of technologies that were well-established, with a well-understood biological basis of marine life. The technologies here, by contrast, are emerging, along with the neuroscience and behavioral science theories of people, which in turn inform theories regarding purchase and consumer behavior. The unfolding of the network through expertise concomitantly represents an

expansion of technological and scientific knowledge into fields which, by comparison to the scallops and fishing methods, are only partially understood.[22]

Thus, in establishing the actor-network, our actors are: consumers, the studied and the audience alike; the broad market research community; the conference participants; and the various technologies used to unite the network. The discussions and discourse that give texture and depth to the network centered on elements of expertise, technological methods, scientific credibility, and marketing credibility. The analysis of this network further gained temporal depth by observing its activities and curation over the course of several years at successive conferences; in so doing, one can assess relative merits of not only the technology and credibility, but also the general tides of discussion within the field, such as concerns about perception, ethics, and other controversies. In this, we can determine a measurement of success of the ANT process, in that knowledge is certified and produced and social grouping has occurred, through the manifestation of these trends and seeing the creation of expertise.

The Parameters of the Network

The first basic analysis was to track the frequency of the individuals who participated in the conferences and the interviews in order to understand how many were first-time presenters and how many were seasoned. This is a step within the ANT approach that allows us to understand the size and shape of the network involved. With

[22] Even within Callon's analysis, there were very large gaps in the knowledge of the actors in the network; one of the primary reasons why the researchers were ultimately unsuccessful in their bid to better understand the scallops and sustainable fishing methods. The paucity of knowledge relating to the human mind and behavior is orders of magnitude greater than this.

the limitations of the dataset understood at the beginning, we can see that the network will have a set of enumerated participants in the workshop, largely taken from the set of all participants in the field, both academic and industry, around the world.

There were 57 total speakers in the combined five opportunities for speaking or participating in the conferences or MOOC. Out of these 57, 46 had a single appearance. Nine (9) speakers had two appearances. One speaker appeared on three occasions and one speaker appeared on four occasions. The data set shows that the vast majority of speakers over this time frame were one-time speakers, with 81% of them occupying that category. For the two-time category, 16% of the data set are represented, with 1.7% each for three and four. No speakers appeared in all five opportunities.

A second analysis included a rough idea of speakers who are involved in academic research and those who are practitioners (labeled as industry). This helps us see at least a part of the institutional relationships among the participants in the network; it is, at best, a partial glimpse because of the fluidity of associations and the fact that some participants may occupy more than one category. Indeed, another category includes those who are or who have been involved in both. Some data fuzziness comes up in this analysis, as current or past academic affiliations are not entirely clear, and some of the presentations had multiple presenters, not all of whom made affiliations clear. Subsequent Google searches were used to clarify when possible, but there is a degree of imperfection with it. In addition, a handful of speakers were neither academic nor industry, but instead participated as a member of another organization, such as the Advertising Research Foundation or as NMSBA. To the extent that I was able to determine the affiliation, I included such speakers in the count with “industry” rather than

academia. I also included another category for speakers which made note of their authorship (at or by the time of the year of the conference) of a published book on the topic of neuromarketing or consumer neuroscience.

Table: Relative Academia and Industry Contribution

Year	N	Acad	Indust	Combined Now	Combined Past	Book Authorship [23]
2012	9[24]	1	4	3	2	1
2013	6	1	2	2	1	2
2015	7	2	3	1	1	1
2016	~26	1	22	2	1	2
2017	~22[25]	4	16	1	1	1
TOTALS	**70**	**9**	**47**	**9**	**6**	**7**

The totals included the multi-year participants, and those individuals would also be included in each year's data. The reason for the "~" sign for the "n" in years 2016-2017 were that it was sometimes unclear as to where the affiliations lay, particularly with a previously unannounced speaker who participated with the main speaker listed on the program.

The data show, however, some large demographic contrasts. The five years of data show a very large predisposition toward practitioners in the data set. To the extent that the two "combination" categories also include academia, the industry-heavy data still constitute the vast majority of participants. Strikingly, even in the "combined past"

[23] With regard to book authorship, I attempted to discern book authorship and publication *at the time of the conference.* In some instances, a book had apparently not yet been published at the time of an initial conference appearance, but had by the time of a later conference.

[24] At least two of the videotaped presentations for 2012 had either a two-part presentation or had more than one speaker, who may or may not have been in a specific category *at the time of the conference.*

[25] The numbers for 2016 and 2017 are approximated, as a handful of the speakers on the program invited another presenter to the stage to comment or to give a different part of the presentation. There were 20 total presentations given in 2017, but not all of the presentations only had a single presenter.

category, each of the participants *left* academia to pursue their careers in industry. Not a single participant, that I was able to discern, has left industry to become a full-time academic. The "academy" category refers, however, only to participants who mentioned or who were clearly engaged in full-time academic research careers, so this might undercount those with academic ties.

Some preliminary conclusions can be drawn about these actors and the general scope of group formation. One is that while some percentage of speakers are repeat speakers, and many are likely to know each other, a span of five years is a relatively short time in which repeated patterns may not yet occur. Certainly, there seems to be an opportunity for "early adopters" for work in the area, in which multiple appearances occur at the beginning and such individuals have a disproportionate role in the organization.[26]

This introductory portion of the analysis allows us to see an emergent network, with a large number of new participants active in this forum. At the same time, we can identify a handful of speakers who, after this same comparatively short period of time, are well-networked within the system. We can identify in this limited context a significant difference between the inputs of the academy and industry into the network, though the causes are, at this point, not readily apparent. It is still too early, with a small overall population, to tell if there are any distinguishing demographic trends though there are other analyses, below, that do show some indication as to general trends in subject

[26] "Early" is a somewhat contested term here. The field of neuromarketing in its entirety, dates back to at least 2002 (with the coining by Ale Smits of the term "neuromarketing") though others argue that it is actually older than that. Examples of Weinstein's early 1980s EEG experiments on subjects watching television commercials might be mentioned though, for some, the principles of neuromarketing are congruent with early principles of the inclusion of psychology in the field of economics (Sutherland), resulting in the field of *behavioral economics.*

matter covered by the various participants which, if continuing, may show a gradual shift in the type of actor that has sufficient expertise in the areas which occasion the greatest interest.

Several weaknesses in this analysis surfaced. Complete speaker data are available for the 2016 and 2017 NMSBA meetings and for the Coursera interviews. For 2012 and 2013, more speakers might have been present but were not represented among the archived videos; indeed, several of the speakers in 2017 noted how many times they had attended the previous conferences (though perhaps not always in a speaking role.) The weaknesses here, however, would apply to any dataset in which the participants have been limited by external factors, such as the confines of a conference. To understand the formation of expertise within the group, the use of or lack of repeat speakers is an important measure, perhaps more incisive than what would uncover given a set of all participants.

This overview gives us a rough idea about the most evident human actors within the network. As Callon noted, the reality of ANT is that any particular actor is themselves a network, which we can readily picture given each speaker's own professional circle, institutions, and technologies which helped bring them into the network we're currently following. As we approach the next stages of network building with ANT, we will see the important actor roles of the technologies, the broader market research community and, especially, the consumer. All of these actors will become the "allies" in the formation of the network.

Problematization and Indispensability

Following Callon's framework, the step of problematization within ANT is that of "becoming indispensable." We must determine the actors and define identities so that we can determine the "obligatory passage point," or OPP. Callon determined the actors and identities in the form of fishermen, scientific colleagues, and the scallops themselves, with the team of researchers specifically devoted to the French scallop problem themselves being the determiners of the OPP. The OPP, in turn, was the question of how scallops become anchored into an environment; along with this is a *recognition* by the actors of their alliance with each other.

The actors and identities in this subset of consumer neuroscience are the conference participants, consumers, technological methods, and the larger body of market researchers. Some different factors exist in this discourse analysis already, however. The network within the conferences already exists independently of the element of persuasion that would be present within the network developed by Callon. In short, in this circumstance, expertise is vetting and validating other expertise for the purpose of group membership (and group expansion.) The goal within the neuromarketing expert group is not for some recruitment effort to pursue a different set of goals; the vast majority of those participating in the network already agree upon the large-scale goal of probative value of the field. However, at some point the recognition of the expertise coalesces into the more concrete formation of a group, which then is the important point of formation of an "alliance" in the same way that the fishermen, researchers, and scallops were formed into an alliance. The best representatives of that expertise can then represent the group as a whole, in the broader networks of marketing and commerce. In summary, with specific

regard to classic concerns of STS, what's at stake in the formation of expertise in this group is field legitimacy and boundaries, which topics are of greatest concern and of highest status for addressing, and who best represents the field in terms of authority. All of this comes within the greater context of those practicing in the field who are largely in agreement on the field's overall legitimacy.

Callon's model used "problematization" as a way of describing the transition point. Given the realities of this network, however, the indispensability aspect is really a two-step process of, first, enhancing and reinforcing the credibility of the contested field and, second, individual participants in the network vying for recognition of their expertise in the network. The second step would also occur against the background of a mixed and heterogeneous application of scientific knowledge and technological/artifact uses.

The credibility of the field, as the first step, acts as a kind of "pre-problematization" step policed by the conference organizers in terms of the suitability of presentation and the credentials of the speakers. This then creates the environment for the network in the second of two phases, that the initial "vetting" by the program committee is justified by the demonstration of content of the speaker. Each speaker, already through the gate of membership in the contested field, can then focus his or her efforts on demonstrating how a specific use of technology or scientific knowledge can assist in that measure of field credibility.

This a significant and unique departure from the Callon model and is a novel re-interpretation of the area of problematization in this network. This different application also has an impact in terms of what constitutes a credible basis for authority. Given the fact that the speakers have been selected by a committee in setting up the conferences, the

process of demonstrating some level of expertise and reaching a baseline of recognition within the field has likely already occurred. Indeed, the conference website provides the following points:

> Our program committee spends hundreds of hours crafting the agenda and selecting speakers to ensure high value, quality content and absolutely no sales pitches from the stage. We make certain each session has applicable takeaways with a strong scientific foundation…Unlike a typical conference, attendees are part of a innovative (sic) community of avid readers and learners. Attendees are smart, innovative and all there for the same purpose — to improve themselves and the effectiveness of their marketing and market research." (Website)

The introduction of the program committee, at least as defined by the language in this paragraph, spells out the ground rules which constitute their vision for a successful conference. First, the assurance that the program committee takes their roles seriously, with high-level criteria that include an emphasis on testable and dialogue-spurring *content* (i.e., "absolutely no sales pitches") which helps audience members and dissuades speakers from attempting new business development from the stage while also invoking the rhetorical advantage of the perceived disinterestedness and objectivity of science. This seems to be an attempt at fostering community and diluting any competitive notion, at least in the formal sense. Further bolstering this as a knowledge-sharing enterprise is the assurance that the audience will come away with a new level of knowledge grounded in what is labeled to be a secure form of discourse: "a strong *scientific* foundation." (Emphasis added). Next, the reader receives a message of differentiation ("unlike a typical conference") which also happens to be a classical marketing teaching to show customer value, and then in-group membership "a part of a[n] innovative community."

Finally, there is the call to action in terms of taking the learnings from the conference and instituting them in other places, institutions, and organizations. The network's influence, if not the network itself, might therefore benefit through such further expansion.

Beyond this general beginning, specifications for the submission of a presentation grows more exact. The most recent call for papers for the organization and conference states the following requirements:

- A short bio of the presenter and organization
- Keyword set: choose a few words that clearly describe the main idea of your work
- Preferred presentation title
- Summary / content outline of max of 75 words and a detailed description
- Short background on the scientific validity of the idea
- What the audience can learn
- Short motivation why the topic is new, exciting and needs to be included on the NMWF agenda

The program committee also restricts (or defines) the acceptability of topics that would be considered for inclusion in the conference. It should be noted that this does not appear to be the single parameter of suitability but instead gives a generalized shape as to what topics would be congruent with the pre-determined theme of the conference. The possibilities of topics for an upcoming conference (theme: enticing consumers with neuroscience) includes:

- The role of consumer emotions in marketing
- Conscious and subconscious emotions and the effect on communication
- Neuromarketing as the key to the Asian consumer
- Better understanding of audiences in the rapidly changing media landscape
- Predicting advertising success
- Successful product launches with the help of neuro methodologies

- The power of understanding habitual buying
- New behavioral patterns in shopping and/or media usage
- Brand love: brand building in the modern era
- Innovation either at the hardware/software/analysis level or at the industry level

At the time of the review, the Program Committee for the conference consisted of six individuals, ranging from a variety of industries (and included one academic). All had a listed position or interest in marketing and consumer neuroscience. The Committee appears to rotate to different individuals from year to year.

Criteria listed for selection of topics include:

- Quality of Submission: All proposals must have clear objectives and a detailed description of the proposed content. Priority will be given to proposals where speakers and presentation titles are fully identified, where original data or novel work will be presented and where broad debate will be encouraged.
- News Value: Proposals focusing on "hot" topics in neuromarketing, behavioral economics and consumer neuroscience have a preference.
- Proof of Presentation Skills: The program committee will do everything they can to check the presentation skills of the proposed presenter. If the presenter has spoken at the Neuromarketing World Forum, or Shopper Brain Conference Series, survey results will be shared with the program committee. If you have videos of yourself presenting, or references from other conferences, it is highly appreciated if you can share them with us for review.

We can see, therefore, that the ability to perform as an expert has several dimensions and can be considered a somewhat fluid assessment, ranging from year to year:

- An accepted speaker can show presentation skills and, if she appeared in a prior conference, that year's audience assessment provides information for selection to the committee.
- The speaker's proposal will need to clearly communicate the intention and goal of the presentation, which would include favorable assessments for those whose proposed topics are congruent with that of the program committee.

- Submission of biographies, previous speaking experience, and primacy of one's own research and research agenda weigh significantly in the assessment process.

In a sense, the bar for the *next* year is at least partially met, for some speakers, with previous successes in the *current* year.

The establishment of the consumer neuroscience area as a *field* seems to be such that there is greater dependence upon the burgeoning research agendas of the speakers. In contrast with other ANT analyses, including the electric vehicle, the scallop, and public transportation in France in the saga of the *Aramis,* the field might be considered more tenuous, more contested, and less well-established than fields such as electrical engineering or marine biology. In other words, the legitimacy of such research agendas is not under the same amount of skeptical questioning as that of consumer neuroscience. An important difference, therefore, with the stage of problematization in this immediate discussion is that the emergence of a field is more heavily linked to some other measure of credibility and expertise. A more established field, perhaps one with a long history of conferences, externalizes an OPP through a unification of diverse actors, such as in the case of Latour's *Aramis* or Callon's scallop fishing. The legitimacy of an inquiry becomes specific in the context of a question which may contribute to the general knowledge of a field, but is not necessarily linked to the *existence* of the field.

Already our ANT analysis in this case has disclosed the primacy of another set of actors that is *not present* upon the surface of the network; the rotating cast of individuals that inhabit the roles of the program committee for the conferences.[27] This, therefore, is

[27] Also notable in this case would be the specific individual of Thomas Ramsoy, who appeared to be the lone decisionmaker with regard to the inclusion of materials in the Coursera MOOC sessions.

the first step of the two-prong approach that represents the departure from classic problematization as it is generally understood within ANT.

The second prong, establishment of expert credibility within the network, is the next aspect of the analysis, and is brought into further resolution through looking at the data below. The participants describe their uses of technologies and largely explain their findings through the accepted science (and justifying the work in the sense that the program committee promulgated). The present analysis, therefore, does not include those who do not present themselves with sufficient expertise (or, frankly, interest in participation) and are therefore not directly included in the network, though their presence should be noted throughout the operation of a commercial enterprise and beyond. To some extent, some background of such an "extended network" is given in Essay One, which examined the history of the technologies and psychological theories used to describe human decisionmaking.

Of course, the criteria used is not "expertise" as judged by the committee, but also relevance and fit of the specific topic; therefore, passage through the pre-problematization after one year does not guarantee that this would occur in a subsequent or, indeed, any year. To the extent that the network possesses temporal depth, it may be sufficient that the credibility and expertise has been established by a specific researcher; the extent to which this occurs outside of the evidence contained in the discourse is unknown (i.e., audience ratings of a given speaker).

Problematization is in this analysis a fluid and ongoing process, rather than a procedural step that can be "checked off." While this is a different approach to ANT, it offers a re-affirmation of the Latour dictum that transformation must occur within a

network for the network to truly exist. Perhaps an analysis using data other than conference participation could reflect a different network, but in the context present in this essay, where the vast majority of evidenced actors are willing to participate in a field so as to give testimony regarding its –and their own—credibility, the two-step problematization fits.

Beyond the role of the program committee in securing speakers and setting forth the agenda, the definition of identities of the remaining actors remains to us within the step of problematization.

The conference speakers are fixed in their identities by the program committee and are described in greater detail above. Other actors include the consumers, subsumed within the research of the conference participants as research subjects and research outcomes. Consumers are not physically present within the confines of the conference but are omnipresent in many other ways, such as the object of experiments and the means of performing experiments (in conjunction with technologies.) The network radiates both inward and outward and this point, connecting those "in the room" with those who are not. The consumers become the objects of marketing expertise, to be demonstrated through the speakers in efforts to attain personal and professional credibility among their peers.

Secondly, the technological methods are identified and linked to different results and different contexts by each speaker. The analysis of the methods is discussed in greater detail during the interessement section, below, because the level of "alliedness" within the structure of the network is one of a catalyst within the discourse and, to an extent, pre-figures the relationships with some of the other actors, such as the consumers. The

role of the technological methods within the problematization step is clearly one of indispensability to the emerging field, however; the use of the technology itself is what separates much of this field from the rest of the enterprise of marketing in the past.

Many of the technologies began as medical or psychological measurement and assessment devices (see Essay One), and some have fairly long histories within the medical community. Eye-tracking dates back to the 19th century and EEG measurements have been used and studied for many decades. The translation of this technology from the uses as medical assessment into a utility for commercial deployment is a remarkable effect of the network. As has been noted, ANT *is* the sociology of *translation.* For Latour, the instability of the network speaks of change and is the network; the translation of the technology ensures this occurs.

Another actor within this network is the larger community of market researchers. This field within the discipline of marketing is generally tasked with understanding the market, the environment, the consumer, and other factors related to a firm's commercial actions. Market research involves more than just the areas of consumer neuroscience or the members of that sub-community; it also includes many different types of data gathering and analysis, behavioral understanding and tools, "ordinary" (or "traditional") forms of market research, and others. The tools and methods of consumer neuroscience can be seen with a lens of some ambivalence by these actors, viewing the emerging field with hope, trepidation, enthusiasm, and skepticism.

Some of the conference and interview participants note this ambivalence, and some also possess it themselves. The ambivalence most often seemed to arise in the context of the discussions regarding the credibility of the field and concerns about both

the ethical aspects and the perceptions related to the ethics of the field. Turning to the empirical data derived from the discourses, we can see the network here enmeshed in a broader public sphere, contrasting belief and ethics, epistemology and efficacy. The evidenced actors within this discourse report, indirectly but emphatically, on belonging, that they are deserving of having the mantle of special expertise conferred on them. The "special" nature of the expertise is shown first by having conversational ability in "marketese," an important component given that marketing and marketers as a profession and group of practitioners have been historically regarded with a degree of disdain. The ability to demonstrate not just competence, but belonging, thus becomes important. The second element, which creates the special aspect of the expertise, is the familiarity (albeit with a wide spectrum) with neuroscience terminology, findings, and main points of theory. This element shows that the expert can, through his or her discourse, show membership in the subset-field that is "neuromarketing" or "consumer neuroscience," and thus also give credence and credibility to it.[28]

Two portions of the content analysis have immediate bearing on this stage of the ANT construction: marketing engagement and field credibility. Marketing engagement tends to be a basic assessment of the membership of the speaker within the field of marketing, while the second has a focus on the narrower specialty of consumer neuroscience. Both demonstrate familiarity with the many concepts and controversies

[28] It should be noted as well that there are participants in the discourse analysis that both explicitly and implicitly disavow "expertise" in at least one of the two elements. Some of this is self-effacing to a degree, but the conference organizers also brought in, on occasion, expertise from someone in a field that was, to some extent, distal from the main areas of neuro- and marketing. One speaker, for example, from a major consumer products company, disavowed knowledge regarding neuromarketing and instead focused on television commercials he found interesting. Another, an analytics expert from an internet company, seemed clearly more comfortable in discussing cognitive load than large-scale marketing concepts.

within the field and sub-field, and also signal to other attendees that a requisite level of knowledge can be shown.

Marketing Engagement

The clear sine qua non at the conferences and within the MOOC interviews was the intent of the participant to engage in a discussion involving commerce. At the heart of all the presentations was the pre-supposition that the behavior or brain pattern under study involved, at some level, a purchase. The purchase might be immediate or far into the future, and a presentation might be intensely focused on a specific area of the brain which exhibited activity, but the reason behind the studies, the presentation, and the discussion was invariably this specific act of a purchase. If it were something else, the conference or dialogue would have a different focus: theology, law, or purely neuroscience.

Thus, the usage of marketing terms on the part of the speaker signals an important entrée in the membership of the group. In addition, it introduces the substance of the themes of the various presentations in such a way so as to allow the observer to understand the areas of greatest importance in the marketing discipline and, more specifically, the intersection of neuroscience and marketing. Both marketing and neuroscience occupy broader fields than what would be covered in even a comprehensive conference agenda. The narrower circumscribed area offers a rich convergence revealing important information about the state of technology, the state of science, and the state of the practice of marketing.

The analysis I've undertaken to better understand the state of this sub-field of marketing is similar to vocabulary analysis performed in the sections involving the rough frequency and perceived intensity of words and phrases. The changes, if any, are then tracked over time and compared longitudinally over the five-year span of the materials. As before, the terms and phrases which received the greatest combination of intensity (frequency and emphasis) are listed toward the top of each year, trailing off to more isolated usage of different concepts and terms.

The probative value of the content in this category is significant and can likely be extrapolated to numerous hypotheses regarding the interests of the actors in the network. Branding, for example, is a concept which is likely the highest intensity term used over the set of data and connotes many things, including value, market share, competitive power, aesthetic preference, and others. Some of the lesser-intensity terms that are used in isolation can also be considered as part and parcel of a larger discussion involving brand. Other terms that are used have strictly historical relevance and were used in the context of the presentation to mark a departure from a previous state (such as the usage of a "rational-man" model.) To the extent that terms would be used in an economic or finance sense, I also included them as they are impactful upon marketing practice.

Another type of words used included signaling membership in a particular sub-discipline of marketing, such as market research. Methodologically-related words which included the use of things such as "focus groups" and "surveys" are also listed; at the same time, it's important to understand the use of a particular term that, whether the speaker would strike a conciliatory note or sound a critique, signaled a significant demarcation: "traditional." The context in which this term was used was that of

"traditional marketing techniques" and would include usage of social science methods, such as ethnography and surveys. This represents a fascinating nexus involving a current controversy within the field.

Other terms which I included as signals for marketing expertise have other use as signaling expertise or credibility in neuroscience or in the field of neuromarketing. Terms such as "emotions" or "attention" are terms of art used in conjunction with specific neuroscientific findings but are also associated with the marketing exercise of consumer choice and purchasing behavior. Such overlap is, I believe, unavoidable and likely not to skew the analysis or the data in a meaningful way.

One might also consider the possibility of a linkage between EEG or eye tracking, and the many facets of branding which creates a valuable nexus between the marketing concept and the technology used. This, taken together with the dominant usage of certain neuroscience constructs, is at the heart of the formation of knowledge within the field. This knowledge is the area of knowledge which contains the greatest amount of *action* which an actant or organization might take; in short, it can be seen as the practical implication and environment in which the knowledge would work to measurable effect.

Marketing Concepts, Emphasis, and Intensity: 2012-2017

2012	2013	2015	2016	2017
Emotions	Branding	Engagement	Branding	Branding
Branding	Unreliable reporting	Branding	Emotions	Emotions
Attention	Motivation	Intuition	Persuasion	Semiotics
Choice	Implicit	Emotions	Priming	Advertising
Product Placement	Emotion	Memory	Point of Sale	Motivation
Engagement	Perception	Traditional	Pricing	Validation
Pain	Traditional methods	Ethnography, surveys, interviews	Choice	Social Science/Traditional
	Persuasion	Rational	Printing/Signage	Visual, Media, Reward, Segments, Aesthetics, Engagement, Taste, Placement, Memory, Distraction, Resources, Pricing, Demand
	Purchasing	Attention	Associations	
	Direct marketing		Intuition, Influence, Design, Anchors, Packaging, Data, Advertising, Segments, Profit	

Many familiar caveats apply to this analysis, such as the difference in the number of presentations over the course of a given setting. A larger number of presentations were given in 2016 and 2017, which could have created an effect wherein some of the concepts were overemphasized in later years, or under-represented in earlier years. While this seems to be a valid concern, it is likely that the same response would apply – that the very consistency of the most frequently-mentioned terms over the time period would appear to lend considerable weight to their importance. This is especially notable

in the emphasis, both quantitatively and qualitatively, placed on branding. Such usage also connotes a signal showing expertise in marketing.

Other than the ongoing primacy of branding and consumer emotional engagement, there seem to be few discernable patterns above the noise. One later increase in the use of the term "semiotics" might indicate a greater trend toward universal symbols and signs, along with the visual saliency of packaging and signage. This might also be significantly related to branding which, in turn, is strongly linked to areas of design, appearance, and even packaging.

Participants at the conference clearly favored the areas of branding and emotional involvement on the part of the consumer. The emotional affiliation between consumer and brand is a highly desirable target for most marketers (at least, those working within organizations and markets that favor branded products or services.) The area of brand engagement and, indeed, brand favoring by consumers, represents the ultimate nexus between the product and its brand, exhibition of emotion by consumers, understanding the emotion in a scientifically credible way, targeting of the processes generating the emotions by technology, and the subsequent marketing strategy decisions informed by all of the inputs.

Field Credibility: Interpreted attributes, signals of belief, and silence on belief

This analysis made use of another category of recordation in the data; that of professed expertise and opinion on the field of neuromarketing. Included for purposes of this discussion are references to consumer neuroscience; although a couple of the

presenters expressed hesitation or dislike of the term “neuromarketing,” they nonetheless seemed to adhere to the concept and, more to the point, actively participated in a congress in which the world “neuromarketing” was prominent in the title, as it is with the organization supporting it.

As one might expect, several subjective assessments and judgment calls had to be made in the context of interpreting the remarks that the speakers and interview participants made. The initial step was to determine whether the speaker, in fact, made references to the credibility of the field. This led to an initial bifurcation of each conference, by year, into the number of speakers who “signaled” an opinion on the veracity, credibility, or morality of the subject of neuromarketing, and those who were “non-signalers.”

In the context of credibility, I included opinions on the ethics and perceptions about the industry and practice from the external world, because some of the critiques regarding neuromarketing is based on concepts of “overclaiming” and credibility. Where specific quotes were, I thought, especially telling, I included them.

By contrast, one conclusion that one might reasonably draw is that if a speaker *did not include* any signals regarding the credibility of the industry or any related practice, their course was that no controversy was involved and their participation in the conference was proof enough of the veracity of their subject and probative value of the general practice of neuromarketing. There were a handful of isolated cases where such a non-signaling speaker would make a comparison that questioned the credibility of isolated epistemic inquiries or questions of relevance (such as in comparing the “real world” to that of the laboratory.) In such a case, there was the pointing out of differences

in environmental conditions in which a study might occur, but not a direct an opinion on the credibility of the field in general. Had a speaker carried an argument through to the idea that lab findings have no environmental relevance for neuromarketing, I would have included that.

In the collected data, I made note of recurrent tropes, words, or themes throughout the discussion. From year to year, comparisons regarding the breakdown of signaling and non-signaling presentations can be made, along with the frequency of repeated words or phrases. I also included the interview subjects from the Cousera interview, as these participants, while smaller in number, had a more diverse professional and scholarly background, which yielded terms that were not otherwise discussed in the NMSBA conferences.

In the context of the discussion of positive or negative valence, I construed both categories broadly. Positive valence I interpreted to mean possible areas where neuromarketing offered a clearly superior path over other forms of market research or discovered or enhanced an area of knowledge. I also construed the negative valence area broadly but noted that oftentimes negative comments arose as a response to an argument that a speaker was reciting or anticipating. This tended to be bent so as to be an apology to a critic not present (or at least not vocal) in the audience. On the whole, however, the phrases used in the negative valence were more prevalent and more prominent. Much of the discussed positive valence phrases and words would occur in other categories in the content analysis matrix, such as areas of settled science or mutually understood marketing concepts (such as the value of a brand or that a certain part of the brain was associated with a certain affective state.)

2012: Interpreted attitudes, signaling and non-signaling, positive or negative valence

Signaling	Positive Valence	Negative Valence	Non-signaling
5	"Here to stay"	*Ethics*	3
	Translation	Term "neuromarketing has baggage"	
	Practicality	"Academics are skeptical"	
		"Buy button"	
		Skeptics	

The small set available for 2012 offers some limited information. The biggest repeated part of the discussion wherein negative valence occurred was in the context of a deliberate mention of the ethics of the field. Also of interest is the notion that there is a split between academics reviewing the work of consumer neuroscience, as opposed to the practitioner. Also, the term "buy button" was mentioned in 2012, recalling the Martin Lindstrom metaphor that created some degree of concern about the practice of neuromarketing in general, from the consumer protection standpoint.

2013: **Interpreted attitudes, signaling and non-signaling, positive or negative valence**

Signaling	Positive Valence	Negative Valence	Non-signaling
3	Global interest	*Ethics*	3
	"Not magic"	Competition	
		"Buy button"	
		Data of success needed	

Once again, confronted with a small data set, we see again ethics being the strongest negative valence across an evenly divided population of signaling and not. There is another mention of the "buy button." While positive mentions included a growing global interest in a neuromarketing practice based in science and "not magic," another mention noted that the field was in critical need of significant data showing its success.

2015: **Interpreted attitudes, signaling and non-signaling, positive or negative valence**

Signaling	Positive Valence	Negative Valence	Non-signaling
4	Consumer protection	*Transparency*	3
		Flaws	"hype cycle"
		"Snake oil not eliminated yet"	Laboratory vs environment
		Labs are artificial	
		Term "neuromarketing" is bad	
		"Buy button is nonsense"	
		Overpromising/hype	

The "buy button" earns scorn again in this set of interviews, though transparency has overtaken "ethics" as the most mentioned concern. One element that sets these interviews apart from the earlier years in the non-signaling discussion that was not related to the credibility or membership in the field, but instead of note because the "hype cycle" triggered a wave of interest in the field (though the speaker was not talking about hype in a negative or positive valence, but instead remarking upon it as an historical trigger point.

2016: Interpreted attitudes, signaling and non-signaling, positive or negative valence

Signaling	Positive Valence	Negative Valence	Non-signaling
8	Persuasion rather than influence	NM has its own branding problem	15
	Traditional research is useless	"Neuroscience of everything"	"Understanding"
	Not revolutionary but natural	Replication issues	
	Outcry subsiding	Independent review	
	Neurodesign	Lab vs env	
	Used to be like parapsychology	Political uses	
		"Brain buttons"	

The presentations in 2016 seems to offer a significant shift in the tenor of the presentations that were given, in that nearly twice as many presentations were of the non-signaling type than of the signaling type. Interestingly, the positive and negative valence of the signaling presentations resulted in more even numbers, to the point where some *de novo* positive valence terms were used, such as the declaration that traditional market research is useless compared to neuroscience-based methods, and that the "outcry" regarding neuromarketing is on the wane. Still, in terms of negativity, the "button" term arises once again, along with the standard epistemic claim relating to publication and replication of results. One speaker raised the specter of use of the technologies for political uses, while another was more critical regarding the dichotomy between laboratory use of technologies and in-field technologies.

2017: Interpreted attitudes, signaling and non-signaling, positive or negative valence

Signaling	Positive Valence	Negative Valence	Non-signaling
9	Don't believe GRIT report	Trust in NM	11
	"Going great"	GRIT report	
	Helping people understand neuroscience	Big data is better	
	Be honest about challenges	Black box	
	How we talk about NM	Skeptical of neuroimaging	
	Corporate social responsibility	Ecological validity	
	Interpretive	fMRI gets attention because it's colorful	
	How to avoid "products of irredeemable shittiness"	Junk science/fear	
	"Non-crap" products	Bad press	

The speakers for 2017 showed, once again, a more even split between non-signaling and signaling presentations. One expresses skepticism regarding some techniques given the findings of a report on market research (called the GRIT report) while another disbelieves the same findings and declares that everything is "going great." Self-proclaimed skeptics regarding the usage of neuroimaging also picked up on a strong historical critique of the validity of fMRI in that its rhetorical value is higher than its probative scientific value, given the design of its software and the fact that its elicited results are "colorful." Still others dredged up the older concerns regarding the fear of manipulation, and concern about the viability of the field in the face of bad press that it has brought on itself.

My conclusions after reviewing these data is that there seems, indeed, to be a continuing controversy about the credibility of neuromarketing. This strain on credibility of course includes the perceptions regarding the field from the outside, which seems to be

an existential worry, while another set of perceptions are internal wherein most of the group members are convinced of value, but are more concerned with the way the field is presented to the outside world. Part and parcel of that presentation is a sense of decorum and the rhetorical nature of claims made and then broadcast to the general public. In essence, there are controversies which include both content and communication.

The concept of the recognition of the alliance for the two-element problematization becomes especially notable in the context of this research, primarily because of the urgency presumably felt by the participants considering the credibility of their field. The quality which is the "emerging" part of the field militates toward a strong "fixing" of an alliance, which would seem to go beyond the mere "recognition" of the same. The selection of the participants within the conference itself would go far to ensuring the alliance of the speakers within the conference, though not necessarily that of the other actors in the network.

The enlistment of the technology, the consumer, and the broader market research community into an alliance would necessitate the conception of a different goal beyond that of expertise of the individual speaker. It would instead rely upon the effectiveness of the field of consumer neuroscience itself. Efficacy in terms of the consumer would mean that products enmeshed with consumer neuroscience (in design, in recognition via advertising, for example) are more popular or more appreciated; efficacy in terms of the technologies used would mean that specific technologies would be more preferred for some reason, such as affordability mixed with efficacy.

Further alliance-finding can be done in a general sense with regard to the use of technology as a tool for the translation of medico-anatomical knowledge into marketing

insight. There likely exists other controversies about the *best* technologies for each purpose that could be envisioned (such as supporters of EEG as opposed to those of fMRI.) The technology discussion is included in greater detail below, but it is important to note the more active role of technological methods *as actor* in the case of consumer neuroscience than it was within Callon's examples in the scallop-fishing saga. In consumer neuroscience, technologies are deployed in ways that were not largely within the scope of envisioned use at the time of their innovation and push the boundaries of their capabilities and knowledge, whereas the technologies within the Callon piece are rather prosaic and much simpler (such as towlines.)

It is when the technological methods are coupled with the neuroscience insight and the marketing shibboleths that an alliance specific to the field of consumer neuroscience is actually formed. The obligatory passage point, in "classic" ANT, is something that needs to be passaged *to*, and, in the context within of two-stage problematization, furthermore, represents an ongoing iterative cycle rather than a single chokepoint that determines expertise, network direction, and alliances. The group at the conferences, even over the course of the years, is a coalition of the willing to affirm expertise within the field and therefore harden it, at least in some ways, from critique. Technologies are *all* mobilized in this sense, creating the barrier which stops entities from defining the network participants as non-experts.

Interessement: Locking Up Allies or Claiming Technology?

Problematization has identified the actors within the network and fashioned them into some type of loosely-recognized alliance. Interessement, in the Callon model, takes these allies and ensures that they stay within their roles *as* allies. The stage of interessement is the stage by which entities impose or stabilize the identities of the other actors within the network.

In discussing the assessment of expertise, as noted above, the very fact of a conference participant being involved in the conference at all is the product of a decision and decision-making authority prior to the participant demonstrating their place in the network. While this was discussed as the obligatory passage point, and a further argument made supporting the notion that the OPP is best recognized as a two-step problematization and is a process as much as it is a location, we see that same process unfolding into this stage as well.

The interessement in the current context is a demonstration of expertise via a demonstration of belonging to the group. The demonstration can be further shown through the deployment of several areas of the discourse via the content analysis. The fixation of the roles within the interessement stage means that the coronation of expertise be firmly attached to the presenter. However, the data collected and subject to analysis do not necessarily disclose the same method of interessement that might be commonly found in other analyses, wherein competing methods of technology or science might be dismissed. This might typically be done in an effort to stop network actors from straying into other networks. If that is to be found in the context of CNNM, it's done as more of a blanket statement noting "inadequacy" of behavioral or observational methods.

The majority of the human actors in this discourse, however, tend to favor a blend of behavioral and CNNM methods. Indeed, some of the technologies used might be seen more as an extension of behavioral observation (galvanic skin response, eye tracking) than what would merely be seen as brain imaging technology. The *interessement* for preservation of the network actually becomes instead an effort at *technological engagement*, to be used both as a distinguishing characteristic which further epitomizes an approach unique to CNNM but also to recognize its capacity to *create a bridge* across and into other networks.

The one thing that truly does demarcate CNNM from other approaches is the use of a technology that measures a biological function of the body, be it brain activity or voluntary or involuntary behaviors. That technology might be the latest generation fMRI machines, or it might be a technology with a considerable history of usage in different settings, such as biometrics or EEG. Otherwise, the approach would be more akin to what is found through observational analysis and experiments limited to observation and self-reporting.

Within the discourse itself, I sought to include the broad notions of discussions of technological artifacts in the speaking topics. The probative value of this analysis is to estimate the emphasis on different technologies by speakers over time, while the strategic importance is in noting that deployment in favor of expertise. It serves a further purpose of fixing the role of the technologies and techniques as actors within the network as well, performing the corollary deed of fixing the technologies…as a whole. The degree to which certain technologies are favored over others is a further point for discussion. As noted above, the general purpose of the technology within the debate is to set consumer

neuroscience apart from other forms of market research; in this way, we watch the creation of a unique network which distinguishes it from other networks, but also as it creates connections. Usage of the technology and describing the usage by a member of the network also further affirms expertise.

In reviewing the content data, I made note of the technologies that were mentioned and estimated the relative weight of importance placed on the technology by the speaker, in addition to noting the approximate number of times a given technology was mentioned.

There are several limitations in this analysis. Without a particular word frequency count as in exact transcripts, I could not separate by pure frequency the amount of mentions of a particular technology and had to estimate. Some of the lines between the types of technology are not easy to discern; facial coding and facial recognition are an example of this wherein I combined the estimates. Biometrics is an example of a "catch-all" category that included things such as galvanic skin response, temperature, heart rate, and so on, all of which seek to discern bodily behavioral responses in conjunction with affective states. Some other instances may not be of sufficient granularity – for example, all technologies that studied eye motor movements I've combined, but this may not be the best approach. Certain technologies resolve level of eye focus depth, while others track gaze duration. Depending on the activity or product being evaluated, a different choice may be made.

In the following assessment, I've logged interest and intensity of mention by year. I have excluded the 2015 Coursera interview data and focused only on the discussions within the NMSBA conferences. The table data are arranged horizontally, to show the

progression of the year. The ranking order used is that the top tier of technology is the one that is mentioned the most often or with the greatest energy (admittedly a subjective assessment.) Descending from there is the frequency and diminishing energy used to describe the technology. In the final category, the lowermost rows, where different technologies are grouped together, the artifacts had been mentioned only once or were portrayed as a part of a group, such that it was difficult to discern any meaningful distinction in frequency or energy.

Table of Technology Enthusiasm, by Year in Rank Order

2012	2013	2016	2017
EEG	EEG	EEG	EEG
Eye-tracking	Eye-tracking	Eye-tracking	Eye-tracking
Biometric	fMRI	Implicit	Biometrics
fMRI	Implicit association	Biometrics	fMRI
Hormone levels, SST, Virtual Reality, Voice analysis	Biometrics	AI	Facial
	Facial coding, interactive computer	fMRI	Implicit
		In-store tracking	Shelf studies
		Apps, virtual reality, augmented reality, search data, hormones, colors, websites, SST, big data	Music, hormones, A/B testing, VR, simulators, GPS, Google search data

Some conclusions that can be drawn from this assessment are that EEG and eye-tracking have occupied the top tiers of discussed usage during this time. This is a consistent finding from year to year, as is biometric measurement. The technology that seems to be the most noted by third parties such as the media, fMRI, has floated in the upper third of mentions but, contrary to what might be popular supposition, is not the

dominant technology that has been used in the field, at least as reported in this venue over this period of time. The use of implicit associations appears to be on the ascendant. Some technologies, such as measurement of hormones, have been present throughout the entire time but present only at a very low level. The use of music or color discernment as a technology for assessment of brain activity are, to date, one-off uses.

It is likely that there is a significant economic and efficiency component to the selection and continued "favoriting" of certain technologies. Several speakers pointed to the ascendancy of implicit testing, with its comparative low cost and ability to mesh with other data analysis tools (such as big data Google search information, app software, and easy-to-use hardware such as PCs and mobile phones). Several speakers also pointed out the utility of combinations of different techniques and correlating data findings across different platforms; many extended this suggestion to include the use of traditional social-science marketing research methods with the neuroscience tools in order to better validate results (and each methodology against the other.) What remains the same is the expert-deployment of the technology to lock the network down and make it more resistant to assault, both in terms of the expertise shown and in the arguments regarding the robustness of the data revealed.

Several limitations should be drawn out. One, the number of presentations between the years is not constant. Years 2012 and 2013 are more similar to each other, as are years 2016 and 2017, than they are across the entire data set. The smaller amount of presentations from the earlier years may disguise critical information about the usage of other technologies in that time. Given the whole set over time, however, with occasional mentions of "singleton" technology types, the selection of technologies and

their interpretations seem highly consistent. A further limitation is the lumping of categories. Some might argue that, for example, biometric measurement in the form of galvanic skin response, should not be counted with the same frequency or intensity as that of pulse rate and body temperature. Similar distinctions exist within the types of technologies employed for electrical activity in the brain, or morphological changes in the eye. Facial recognition and coding also packs together several important ideas regarding the expression of emotions and not only the brain activity involved, but social cues. A more detailed analysis might, at some point, be useful to improve tracing each technological actant in the network.

All of the limitations aside, however, the presentation content, to the extent that findings were presented, is highly evocative of Kuhn's suggestions of normal science, or puzzle-solving, comfortably within a paradigm. (Kuhn) Results given in the open sessions were not, as far as I could tell, met with derision or astonishment but instead seemed to be accepted as an incremental increase in the overall body of knowledge of the field. With this unremarkable interplay between the techniques, technologies, and researchers, the field looks to be relatively stable in terms of scientific and technological paradigms. But, with Latour's caution, a static network is not a network; what is not static in this area is the development of solid knowledge regarding the field of consumer neuroscience, coupled with the linkage between expertise and the deployment of the technologies.

What are the technology actors doing to the network that is being traced? The associations with the greatest solidity are the use of EEG and eye-tracking. Other human actors will equip themselves with other technologies, such as fMRI, though the

associations among the majority of the human actors are fewer. Similarly, not every human actor deployed the same technologies to the same degree, meaning that the associations between EEG and humans are not necessarily all-encompassing. The role of the technologies as a whole within the construction of the network itself is the area of consideration and focus, given that the technologies provide the means to create new knowledge or to give the appearance that new knowledge is being created. Sometimes, technology works to reify existing marketing approaches or what appears to be understood as an element of behavioral science. At other times, it works to uncover new insights or to disprove prior assumptions. Whatever the case may be and whichever technology is selected, it acts within the network to create knowledge and, in so doing, accelerates or boosts the credibility of the human actors.

In aligning many of the other factors, one can see that it is the technology that creates the difference between "ordinary" marketing or "ongoing" neuroscience. The deployment of technology is what materializes the marketing theory and scientific research into an actionable set of data and creates the actual neuromarketing enterprise.

Under many circumstances and throughout history (see Essay One) marketers have called upon behavioral theory to advance techniques of marketing through understanding human behavior. Since the 1970s, if not slightly earlier, the field of behavioral economics sought to show differences between the ordinary models of mainstream economic theory and that of what actually occurs in the sphere of exchange. The use of technologies to measure brain activity and the direct linkage between that activity and decisionmaking is a departure from the statistical risk and psychological models used by Thaler, Kahneman, and many others. With the use of measurement of

brain activity, somewhat localized and known to be housed in mostly discrete and definable areas or processes of the brain, behavior (studying the phenotype) became only the sidelight to the neurology (studying the root, precursors, and causes of behavior.)

If such a conference were to be shown without the use of technological implements to "get to" brain activity, it would be little different than any behavioral economics discussion wherein theories would be examined along with behavior. Instead, the technology forces a new element into the network which alters its contours. To the extent that the efficacy of technologies are known, understood, and agreed upon, the technology creates a new type of evidence and thus a new form of knowledge that would have otherwise been unavailable to the market researcher.

Historically, the market researchers would have been focused on social science methods of knowledge generation, such as surveys, ethnographies, focus groups, interviews, and other measurements. Some of these techniques were also not without controversy when first introduced, but today's social science research in marketing has been labeled as "traditional," in contrast to the "neuro."

Without diving into the complexity of the efficacy of the technology and the active dispute that many have with regard to the accuracy and probity of the data elicited by brain scans (at least to answer questions about commercial behavior), most of the human actors within the network agree on its utility. *All* of the actors agree that there remain points of discussion even if some are not fully convinced of the same.

Enrollment: Defining and coordinating roles

Callon explains the enrollment stage as being one of transforming the question at the heart of the interessement stage into an affirmative answer. This means that actors and actants are now "playing" their role within the network, with both the researchers and the examples of technologies working to further the interest of the field. Several questions still remain. The largest, given the data and this part of the analysis, is whether the group, as assembled, problematized, engaged, and enrolled, can convince other networks that this group does, in fact, possess expertise that is relevant to other networks, and that such expertise has value that adds legitimate knowledge to the field.

The roles for definition and coordination must, therefore, be clearly understood. The way in which the roles are defined in the context for the conferences is one of demonstration of expertise. While expertise is reviewed by other groups of actors (the program committee in its capacity as gatekeeper), the other audience attendees are also enablers of the definition of the roles. The demonstration of a commitment to the field of marketing and familiarity with the undertakings of related neuroscience research both ally to show membership. With the enrollment of all of the actors in the network through the mutual demonstration of expertise, by participating within the discourses, the expertise is further cultivated beyond the original stage of the OPP process – the selection of the speaker by the program committee. Demonstration of marketing engagement, familiarity with neuroscience, and facility with technological methods combine, at some level, to confer recognition of true expertise.

Thus, enrollment represents another adjustment from the four neat stages articulated by Callon into the recognition that, at least in the formation of some networks, the stages are iterative and cumulative, rather than sequential. Just as there is blurring

between the social, the natural, and the technological, there is a blurring between what constitutes enrollment as opposed to interessement or, indeed, even the definition of what constitutes the network. Among many observations that might be made about this, an important one to bear in mind is the importance of change to a network, once again bringing to the front of mind the Latour dictum that without a change, there is no network. This network, with its multi-stage fluidity, seems to be *only* change.

The evidence from the content analysis follows in turn, beginning with the discourse that shows marketing engagement, field credibility (discussed in problematization, above) then neuroscientific credibility (below), all coupled with technological methodologies that are employed. Neuroscientific credibility comes as the last of the stages which, along with technological engagement, would show a departure from "traditional" marketing research. The discourse involved with neuroscience provides a linkage to the multiple fields of psychology, psychiatry, and general brain research that gives CNNM, at the very least, a rhetorical advantage in some circles. To the extent that it does provide greater insight into consumer decisionmaking and information processing, the neuroscience provides a scientifically credible basis for marketing action. Thus, the ability to demonstrate conversance within the field is to be able to "represent" the field in a way that both distinguishes it from other forms of marketing research and to be able to discuss CNNM in other settings.

Neuroscientific Engagement

Demonstration of neuroscientific expertise is a category which shows that a conference participant or interviewee attempts to demonstrate credible neuroscience knowledge. This can take a number of different forms, such as the use of technical lingo or jargon; the theme of a presentation which would be, for example, brain-anatomy concentrated; outright discussion of one's own expertise during the introductory portion of a presentation or interview; usage of a litany of scientific papers or other scholars' names to show familiarity with scientific literature or the professional network, and others.

Interestingly, this was also a category which elicited a noticeable proportion of speakers who went to some lengths to distance themselves from the field. Such a speaker would make an outright declaration of non-expertise, such as "I'm not a scientist" or "I know nothing about neuroscience." On at least one notable occasion, one of the claimants in this vein proceeded to touch on several notable articles in the field, thus demonstrating possible false-modesty, an unawareness of what was happening, or even an intentional misdirection or manipulation of audience members (thus showing possible neuromarketing prowess).

Neuroscience expertise would be, under ordinary consideration, possibly the most difficult type of expertise to attain in the area. There is, however, upon reviewing the presentations, a significant gradation of what can be considered expertise in a formal way and an informal way. The level of the speaker, the type of presentation, and the expectations associated with it all combine to create a non-traditional type of perceived expertise which is a significant departure from a traditional model of Ph.D. research-scientist showing repeated scatterplots. Non-technical speakers who showed familiarity

with the literature and could readily demonstrate applicability vis-à-vis business questions showed significant expertise. The expertise found, therefore, is also one of a *combined* nature that includes the many different types of knowledge on offer.

My analysis for this area of knowledge and network formation did not seem to offer up a path for strict congruence with marketing expertise. While tracing the concepts and changes from year to year is important –and I therefore kept it—the categories and methods of blocking out specific parts of this expertise were somewhat different. In this analysis of engagement and intensity, I focused on the uses/mentions of theories/constructs, scholars/practitioners referenced or cited, declaimed experience, and lingo usage. For the mentions of theories and constructs, I used a qualitative categorical approach with some degree of subjectivity (intensity) and objectivity (frequency). For scholars and practitioners, I have an approximate listing of names mentioned during the various discussions. For both categories of mentions of theories and scholars, frequency and intensity are listed in a general sense, ranging from very high (represented at the top of the chart and in italics) to more modest mentions. Minor or single mentions are at the bottom of the list. In the category of neuroscientific expertise, I relied on self-reported (or anti-mentions) to determine this, focusing on academic credentials which would indicate scientific or technical training, such as a medical or research background. For the latter years, such as 2016, where many participants appeared to have such a background, I italicized the most frequently mentioned. For earlier years, only a handful registered such expertise. I also included a category for "lingo" which I took to be a signal or demonstration of expertise. For this category, I sought again to register intensity. Not every speaker invoked lingo, but for those who did, I included an anonymized scale from

0 to 4 for each speaker who invoked technical, anatomical, or behavioral terms that I viewed to be within the rubric of neuroscience or a closely allied field. The numbers for the lingo column then are a description of intensity for when lingo is used, but not a strict count of *how many times* it was used.

What follows is a number of tables which progress year by year for the analysis, which seems to be a cleaner and simpler approach when considering the categories entailed and the degree to which the more subjective data create greater fuzziness.

2012 Neuroscience Concepts, Expertise, and Engagement

Theories/Constructs	**Scholars and Peers**	**Expertise**	**Lingo**
System 1 & 2	McClure	Professor	1
Frontal lobe asymmetry	Lachman	Academic	2
Gestalt	Damasio	Medical Doctor	1
Evolutionary Psychology	Le Doux		0
Behaviorism	NS Textbook		1
Triune	Berns		
	Moore		

Interpreting the neuroscience expertise signals in 2012, one takes away a few conclusions. First, in 2012, the repeated mentions and emphasis on system 1 and 2[29] – the Kahneman construct—is already apparent. This is likely to be the most strikingly repeated trope throughout this line of discourse, on the heels of Kahneman's receipt of the Nobel Prize and in the immediate after effect of his bestselling book, *Thinking Fast and Slow* (2011). Lingo was fairly minimal, despite the expertise signaled by professional

[29] Kahneman's term of System 1 and System 2 is a popularization and shorthand for his identification of two systems in the brain; one is intuitive and fast, while the other is slower and more methodical. Many of the participants in the conferences have seized on this construct as an efficient way of talking about consumer behavior and decisionmaking.

and educational backgrounds. Standard high-profile consumer neuroscience academics and thinkers were also mentioned, such as McClure, Berns, Moore, and Damasio.

2013 Neuroscience Concepts, Expertise, and Engagement

Theories/Constructs	Scholars and Peers	Expertise	Lingo
Rational man	Pavlov	Academic	1
System 1 & 2	Nass		1
Subconscious	Cialdini		2
Neuropyramid	Milgram		1
Limbic system	Ariely		0
Frontal asymmetry			0
Free Will			

Presentations from 2013 were a bit different from what one would see in 2012. There was no overt and repeated emphasis on any one construct, but again these results might be a bit dampened given the relatively small number of the presenters. The presenters as well were fairly low on the lingo scale; overt discussions about one's own expertise was very thin indeed, with little to no mention of it, at least in the video segment.

2015 Neuroscience Concepts, Expertise, and Engagement

Theories/Constructs	Scholars and Peers	Expertise	Lingo
Conscious/nonconscious	Regan	Ph.D	1
Emotion		MD	0
Senses			2
Psychophysics			2
Rationality			4
			0

The data set available for 2015 has a different discussion tenor than what was seen earlier. These data came from videorecorded interviews, which comprises a different cadence and focus than a presentation to an audience. The interviewer –in this case, Thomas Ramsoy, took an active role in shaping the discussion by teasing out things such as expertise, and addressing technical questions to technically experienced interview subjects. The span of the interviews covered a wider scope of topics as well, including legal frameworks. One of the speakers struck fairly high on the lingo scale, and at least two of the subjects were also possessed of advanced degrees in a field related to consumer neuroscience.

2016 Neuroscience Concepts, Expertise, and Engagement

Theories/Constructs	**Scholars and Peers**	**Expertise**	**Lingo**
System 1 & 2	***Kahneman***	***Non-expertise***	2
Heuristics	*Cialdini*	Psychologist	0
Senses, Emotion, Memory	*Ariely*	Neuroscientist	2
Behaviorism	Alter	Brain scientist	1
Behavioral econ	Damasio	Cognitive scientist	0
Adaptive	Lerner	PhD	1
Rewards	McInnis	MD	3
Big data	Steidl		1
Processing information	Bargh		1
Cognition	Miller		0
Hormones	Fogg		1
			1
			0
			1
			2
			3
			1
			2
			2

The 2016 review of neuroscience expertise is a more robust dataset than previous examples, with more than twenty speakers available for analysis. In this set, we see a very high degree of emphasis placed on the system 1/2 construct, with concomitant emphasis and enthusiasm for Kahneman. At the same time, other constructs were favored with several mentions, including the usage of heuristics (which is similar to early research pioneered by Kahneman and Tversky), and emotions. As far as other scholarly mentions, Ariely and Cialdini were mentioned prominently and often, and once again Damasio makes an appearance. This is also the first year where two of the participants recognized each other as working together: McInnis and Steidl. This year's data also contained a high number of tertiary-degreed experts, but, more strikingly, there was a significant emphasis declared by several speakers on the *lack* of neuroscience expertise. Lingo usage, by contrast, was mostly moderate; this year was more technical than in previous years, but none of the speakers were overwhelmingly technical in the neuroscientific details.

2017 Neuroscience Concepts, Expertise, and Engagement

Theories/Constructs	**Scholars and Peers**	**Expertise**	**Lingo**
System 1 & 2	*Kahneman*	*No Neuroscience*	1
Emotion	Stipp	*Ph.D.*	1
Memories	Garcia	*Ph.D./Prof*	0
Hormones	Moses	MBA	1
Default-mode	Wager	MD	4
Valence	Plassmann	Academic	2
Behavior	Shiv	"Degree"	1
Neurophysiology	Gneezy		2
Senses	Salk		1
	Boksem		0
	Kuhn (2016)		0
	Ohm		2
	Rubash		1
	Gallant		0
	Damasio		3
	Taleb		1

	Cialdini		
	McGurk		
	Loewenstein		
	Simon		
	Ogilvy		

For the 2017 data, there is again a strong preference for citing the Kahneman system 1 and 2 construct, along with Kahneman himself. Other speakers had some passing mentions, including one who was participating in the conference (Plassmann.) Damasio and Cialdini were both mentioned again, who, along with Ariely, seem to be the cadre of scholars most referenced during the presentations, behind the ubiquitous Kahneman. Discussions regarding the brain science of emotions again came in at a high level, and constructs involving hormones also had an increase in mention during the 2017 presentations. There also seemed to be an increase in academics, though, as pointed out above, the balance is still greatly in favor of the industry count, particularly when considering former and current academics who also participate in the industry.

The strongest trends within this category are undoubtedly the primacy of Kahneman and the System 1-2 construct. Much of the other constructs cited are also frequently mentioned as subsidiaries of the System 1-2 construct; other constructs, such as the frontal lobe asymmetry discussion, disappeared during the later years reviewed (once again with the caveated limitation of possible beta-errors in the review of topics.)

There appears to be an increase at the end of the data set in the raw numbers of academic contributors, though one year cannot be called a pattern. Future results may further enlighten as to the constituency and potential academic impact on the speakers at these engagements.

The striking component of the entire data set would seem to be the unabashed willingness to distance oneself from expertise regarding neuroscience. Those speakers trained in the field also tended to simply mention their background without elaboration, or to just proceed to their more technical talks without much prelude. It seemed to be only within the realm of declaration of neuroscience expertise that any speaker did this. While certainly not everyone claimed to be a marketing or branding expert, none sought to actively distance themselves from the field.

It would appear that the main point of signaling group membership, and therefore contributing to group formation, is that of demonstrable marketing expertise. As noted above, the action *of* marketing appears to be the sine qua non of the entire field. The relative contribution of neuroscience can vary within the context of marketing, making the ability or need to claim expertise in neuroscience less important than that of marketing. That being said, neuroscience would clearly also need to be present in some form in the majority of the presentations made by group members, as a necessary condition for showing that the set of marketing *and* neuroscience is different from the set of all marketing concepts.

The negotiation taking place within the enrollment phase is largely that between the human actors, showing facility with the technologies, demonstrating neuroscientific knowledge, and membership within the marketing and consumer neuroscience groups. All of them are combined within enrollment to show the expertise of the members of the group but also, on a different scale, the connection between the natural world and social world. The interpretation of the data (which is really the interpretation of the consumer) is the transition between the two worlds and, ultimately, combines them. This is one of

the major points of the ANT analysis, in demonstrating such connections. It is also ultimately a connection of epistemic importance.

Mobilization

The heart of the step of mobilization is that of determining who is representative of the larger classes of actors both within and outside of the network under study. The further implicit question is whether that representation is being done with the assent of the represented, or will there be rebellion?

Within the context of the conferences and the MOOC interviews, it might be said at some broad level of generalization, that each human actor is seeking to represent those participating in the field of consumer neuroscience. The same human actor might also be seeking to represent all conference attendees, members within their particular sub-discipline (such as those who favor a particular technique), or even their company or institution. Even the actors who professed skepticism with regard to the enterprise of consumer neuroscience could be considered to be representing their set of skeptical tokens, the inevitable balancing element to the enterprise undertaken in an effort to show some degree of rigor.

The representativeness of these different categories would necessarily differ from actor to actor, intention to intention, not all of which may be readily apparent or even reasonably inferenced from a content analysis. There is, however, a representativeness common to all of the conference participants, including the technology: that of the consumer.

The researchers, combined with the technological methods, represent consumers both as study subject and as endpoint. This is one consideration, enwrapped into the aspects of mobilization that encounter controversy.

If, as it is said within ANT, "people are converted into tables and papers, easily transported," (Latour 2007) controversy may be easy to find, even if just in an epistemological sense. Consumers are the data represented by the studies, the hypotheses, the examples, and market share. The ability for the conference participants to effectively represent them is judged, in large part, by product popularity, market share, and commercial success. Should the representatives fail in their task to represent the consumer – if, for example, the conversion into data is inaccurate—the representation fails and this can be seen by product failure, loss of market share, and shrinking commercial success.

The representation, however, is somewhat more complicated than a linear relationship. Very few of the conference participants would be solely responsible for a product success or a product failure. Many factors contribute to either outcome, and the role of the neuromarketer in the midst of it may have been quite minor. The relationship, then, is one that is likely to be underdetermined. To the extent that a product may be developed with a clear linkage to behavioral sciences, technology, and such generated insights, then the tracing could be clear.

One might also imagine a scenario in which success of a CNNM researcher could convince a client to pay for the services based not on demonstrable results, or even a testable theory, but instead on the basis of good salesmanship and perhaps nervousness on the part of the client. Such a case might well be within the contemplation of the Code

of Ethics of the Neuromarketing Science and Business Association regarding the problems of "overclaiming." If such a sequence of events would occur in which that scenario would be the only measure of success, then the ethical integrity of the entire field would be in doubt. This is discussed to some extent in Essay Three.

At any rate, the underdetermined relationship between consumer neuroscience insight and the fate of a specific product is one controversy, though this isn't necessarily always the case. Other controversies exist despite the possibility of distal (or no) impacts represented by behavioral science insights purported to be a part of a product; controversy can be amplified if it is claimed that such scientific insights and technological methods are used with great success. These controversies center on the ethical status of consumer neuroscience; the usage of the technologies to gain insight into consumer preferences and thereby gain market share or more general commercial success.

The mobilization elements contained in the circle of controversy also illustrates subtlety within the network. The ethical debate, as examined over the sequence of years and then by different actors over that span of time, is one that has been re-shaped by the participants in the network, though the degree to which that re-formation has been reflected in the world outside of the network must be more thoroughly investigated separately. The prevailing notion within the discussion, to the extent it was discussed at all, was that the ethical debate pertaining to autonomy and privacy had largely calmed with the recognition that the technologies involved were not capable of vitiating any norms associated with them. In Essay Three, I discuss the ethical aspects in greater detail.

Still, persisting within some years of the conference, there would be a degree of skepticism associated with some of the findings. In certain cases, this would be during a presentation regarding a given case or technological-scientific insight and the speaker would illustrate the limitations of a study. In other cases, a speaker would affirm that their invitation had been for the purpose of being a "token" skeptic.

The step of mobilization represents a return to where we began, with the definition of the network. At a certain level, it asks of the ever-changing, ever-modifying network, what comes next? Given the parameters of the analysis within this essay, the larger question of what next is one of social context and credibility; this will, to some extent, be covered in Essay Three and is implicit in the histories of the technology and psychological models discussed in Essay One. For now, we can see that the network is a network of a new field, with new techniques still under serious strain in terms of credibility and discussions regarding value. Where it goes next are the answers to the larger questions: laws, policies, and further refinement of the field. The actors who catapulted themselves to expertise within the context of the conference participation are the same ones that will have to answer this question going forward.

Limitations

The study performed was a very general one, done first to assess the expertise and group formation from a limited set of applied CNNM researchers. The second aspect of interest within the study was the feasibility of an adapted ANT approach to describe the

data set and to assemble a network in an innovative area of technoscience. As such, the first cut does have some limitations that should be noted.

First, the categories and coding systems used were subjective. I assessed them alone and while I had multiple systems and occasions of review, it was only my eyes that watched and my ears that listened. Another observer might have found other areas of presentations that had a different point of relevance; another observer might also have selected different categories or a different arrangement of the data.

Second, the generalizability of the groups examined must be placed into careful context. It should not be interpreted that the entire field of CNNM is represented by the sample seen in the context for this chapter; other aspects of research were not fully covered and the rather interesting anomaly of a large number of fMRI studies might be explained through such a selection or availability bias alone.

Third, and related to generalizability, are the criteria used for the selection of the speakers for participation in the conferences. The NMSBA, like any organization, has its own strategic goals and mission, and the constituency of the audience and speakers at its conferences would hew to such an agenda. This is not necessarily nefarious or even suspect; it just stands as a note that selection decisions had to be made according to criteria set by those charged with the responsibility of having an attractive conference.

My assessment of some of the usage of terminology (lingo) and favored technologies by the speakers was also largely qualitative. For purposes of manageability of the data and to get a "rough cut" of the dimensions and parameters of the network, I assessed term usage through categories of high, middle, and lower usage of terms. It is not a pure frequency count, although I also tried to ameliorate this by gauging the

enthusiasm that a presenter might have portrayed in his or her usage or assessment of specific technologies (or if they delivered a particular critique of a given method). This might be biased by the selections made by the conference committee in the expertise of invitees and their areas of research; for example, given the economic limitations presented still by widespread use of fMRI, and given that most of the presenters over the years were working "in the field" and not in a laboratory, more portable technologies likely had a greater frequency in terms of their presentation.

Another limitation is in the use of ANT and the modifications I made to the theory, informed by the content itself. ANT might be critiqued in the sense that it is a "flat" type of analysis that, self-admittedly, does not attempt to make causative judgements on the movements of actors, actants, or the network as a whole. It is largely a descriptive device that allows us to see relationships and the formation of networks; one might critique the approach on the basis of its non-attempt at explanatory and causative power. For the limited purposes and scope in this essay, however, it should be acceptable as a first descriptive approach.

Some of these concerns can be addressed through further "cuts" and analysis of the data set, and I have outlined a few potential new directions below. Similarly, the data set and the ANT approach might be further built out with the addition of more content and more detailed tools of analysis (for frequency word-usage, for example.)

Conclusions and Next Steps

As mentioned at the outset, Michel Callon articulated a number of touchpoints for consideration when conducting an ANT analysis. These touchpoints included

generalized agnosticism, symmetry, and free association. In short, agnosticism stands for equal treatment of all interests, including participants in the network, while symmetry means that all of the actors are subject to the same categories of knowledge. Free association means that no route of action taken by the actors was foreclosed by the analysis. Following these steps, one can determine what, if any, displacements occurred within the network and are therefore "translated." This provides its own symmetry, as ANT can also be called the "sociology of translation." At the same time, translation is a process and a mechanism by which the natural world and the social interact and take on a new form.

In terms of the analysis presented in this essay, all interests have been treated equally as actors in the network. All have left their mark on the discourses contained within the framework; the analysis did not favor human or technological participants. Instead, they each provided a discourse through interaction with each other.

Symmetry was also strictly observed. Each of the categories detailed within the content analysis provided input into the network and the actors. The degree of action taken by each actor was left to that actor, and any limitation was self-imposed, such as in the examples where an actor declared his or her non-expertise with regard to neuroscience or neuromarketing. Similarly, the technologies were limited by the parameters of their nature and use and provided input to the network in the categories in which they were placed.

The actors were also left free to associate. Concrete examples of obvious interaction were limited to the context of formal presentations, but one can readily observe the associations in terms of the language used and the shapes of the contributions

to the discourse. A further critical combination-association was between the human actors and the technologies, with a further combination being that between marketing and neuroscience. The blurring of the lines when it came to understanding the role of, for example, emotion in the decisionmaking or product selection process became a singular concept of a consumer decision, neither clearly marketing nor clearly brain science but an action placed in the specific context and time that resulted in a unique outcome: a selection or non-selection of a product.

The extent to which translation has occurred can be measured by the displacements. The participation of the human actors in the conference generally enhanced expertise, after the original "boost" provided by the speakers' selection by the program committee. The most salient aspect is the kinetic nature of the process.

To the extent that the goal of observing a translation is, as Callon noted, to see the process by which social and natural worlds take form, the analysis of the conferences performs exactly this feat. The categories of discourse blend the social and the natural in a way that illustrates a new field of inquiry, blending commerce and science, the brain and the purchase. In so doing, we witness the deployment of technology in conjunction with an agreed discourse in vocabulary in the marketing world, with the addition of scientific concepts and theories believed to best describe the functioning of the brain. The categories used to conceptualize a network in this essay do represent departures from "classic" ANT; the usage of a two-step problematization instead of obligatory passage points and technological engagement as opposed to *interessement* may not satisfy purists. However, the new categories more accurately describe and represent phenomena of group

formation in a context of business, especially regarding the mix of technology and science that is not always present in other contexts.

We have also witnessed the utility of actor-network theory in observing these patterns of discourse, the certification of knowledge, and the formation of an expert group. The features of this analysis also underscore the fluidity of the different steps in the analysis. Rather than providing ordinal points upon which a specimen can be stretched and pinned down, they represent curves in a moving stream of information in an active network that is constantly changing. I hypothesize here that this phenomenon is due to the unfolding and emerging nature of the field, where the parameters of discourse are not as fully understood as in a more mature area of inquiry.

The active controversies within the field, while encompassed mostly within the area of mobilization, also give definition to the network and underscore the character of much of the discourse. This colors much of the vocabulary within the field –among experts—and, quite importantly, the relationship that is the representation of the consumer by the combination of the technology and expert. The consistent concern regarding the ethics of the practice has changed shape and form over the span of years and is also delineated by the analysis. This is covered more fully in Essay Three.

As far as next steps for this specific set of research, the content analysis provided covers a general sense of the group formation for this series of meetings. There are potentially more detailed analyses that still might be conducted on this dataset. A case-based approach might be used for specific presentations that the ANT has shown to be closely connected. A more detailed, frequency-based approach on the lingo and other terms of art could yield some further interesting results; as mentioned above, my

assessment on the usage of specific terms was largely qualitative and somewhat subjective (dependent, for example, on a given speaker's enthusiasm). For an even more empirical approach, the actors in this network might be surveyed for follow-up or interviewed to determine if any of their findings or discussion points might have changed since delivering their conference talk. We might also see the evolution of the usage of the technologies even further when the actors are followed longitudinally, along with the results of their work (if recorded and available.)

From an STS standpoint, we see that the ANT approach might be somewhat modified when grounded in a new and, until now, unused and undescribed source of data. From a marketing and management perspective, we might see new connections among the actors in this limited network; it might also trigger some new understandings and possibility for further investigations in truly understanding the expanse of the network in the applied marketing and academic research areas.

Essay Three:

The Foucault Point: Reading Blood, Sweat, and Tears for Ethics, Knowledge, and Power

Throughout the many discussions and arguments pertaining to consumer neuroscience and the ability of technology –real and imagined—to provide privileged information about consumers and, indeed, perhaps all of us, the most worrisome concern relates to identity and control (or autonomy). Such ethical concerns and analyses are particularly triggered in conceptions of potential impingement of deeply-held values such as autonomy and privacy. The broadest worst-case scenario leads to dystopian visions of a mass of consumer consumption, a population bent only on maniacally purchasing products advertised with themes most congruent to brain patterns…or changing those brain patterns to be most congruent with purchasing products.

These hypothetical concerns have real policy implications. Partially in reaction to these perceived fears, France has recently amended its bioethics code to preclude the use of neuroimaging technologies for commercial purposes. (Cerf 2017) Instead, the usage of such technologies is restricted to medical and scientific research purposes. Legal codes, lawsuits, institution of private sets of standards, contractual agreements between parties, regulations, and policy documents all represent instantiation of society's responses to concerns regarding norms and ethical breaches of conduct within the body politic.

In this essay, I discuss some ethical implications of consumer neuroscience/neuromarketing (CNNM). I begin with a brief recapitulation of ethical

thought, beginning with overall ethical considerations, followed by a discussion of bioethics. Winnowing down the broad overviews of ethical schools, I then continue to discuss more specific ethical considerations, following bioethics with a summary of neuroethics, which is then followed by the special considerations of neuromarketing. This "funnel" type of approach is necessary, in order to properly situate the current ethical dialogue involving the human brain. I focus my ethical analysis on issues of consumer privacy and control, and utilize a new approach to the ethical constructs involved: namely, that of biopolitics and informed by Michel Foucault. I discuss several different aspects of consumer vulnerability, followed by the differential aspects of the technologies involved.

I use two major components of Foucault and modify them to help illustrate some of the specific considerations of CNNM. The first is his concept of "discipline." First explored in his work on prisons and the mentally ill and the ways in which the state sought (and continues to seek) to control them, the usage of "discipline" has expanded, especially in the STS realm, to include ways in which science and technology have acted to "discipline" knowledge and information. By finding ways to categorize information (including people) and by installing knowledge infrastructure which controls the methods by which knowledge is produced, processed, and stored, science and technology creates a special and pervasive disciplining exercise. This becomes readily apparent in considerations of brain activity imaging and behavioral measurement systems and methods. The second concept drawn from Foucault is the power-knowledge continuum, which he described largely in the context of state control over the individual; the more knowledge the state has in such a case, the greater the degree of control that can be

exerted over the individual. I've modified this and narrowed it to the application of the technoscientific methods which require greater and greater training to operate and to understand and interpret the results. We see this especially in the ascension of the ladder of expertise in Essay Two, but it also comes into play with the complexity of the devices used.

The usage of the Foucauldian framework is novel in the context of CNNM, neuroethics, and the technologies involved. The aspect of the actual *ability* of the technology to do what it purports to do is one dimension, while another dimension – largely unaddressed until now—is the set of ethical considerations which would apply *even if* the technologies fall largely short of either their intended goals or the fears placed on them. The linkage supplied by Foucault, that of knowledge and power, is an important dimension when considering the weight, force, or coercive powers applied by the technologies. The lingering Foucauldian-Benthamian allegory of the "Panopticon" also seems eerily appropriate for the metaphor of the all-seeing eye, and the gaze which purports to read minds more accurately than the minds themselves.

Starting Point: Considerations of Ethics

Gordon Marino writes: "Although there may be considerable overlap, ethics is neither law nor custom. Whatever else it may be, ethics is the study of oughts and of relationships; that is, of how we *ought* to relate to ourselves, *ought* to relate to others, and as of late, how we *ought* to relate to the earth." (Marino xiii) Specifically with regard to brain imaging, but also biometric and behavioral measurement techniques, ethics become

a sequence of questions about the body and the embodied mind. For example, questions could involve control and autonomy, not only of physical action resulting from a decision, but also of the privacy of the information used to *make* a decision. Determining the "oughts" and the relationships attendant to the implications of the technology and the body is the only way to address the worrisome concerns.

The function of marketing in general has been an area of contention for many critics for decades. Some of the critique is based in mainstream Marxist criticism of the operation of markets of exchange, while other critique has been more focused on particular tactics that have been used by market actors. (Kotler and Armstrong) More generalized critique wonders if the functioning of the market – the act of a purchase itself, at least for products not strictly necessary to survival—is itself a needless waste and a useless demonstration of the over-cosseted Western culture. "The consumer marketplace encourages us to live by a utilitarian calculus, to satisfy our desires and lose sight of the moral stakes involved in everyday decisions." (Brooks xiii) Some critiques of marketing assume an imbalance in power between the marketer and the consumer, and perhaps even if the power itself is quite minor, the question focusing on the implications of the technology used to increase an imbalance still should be addressed. The imbalance, such as it is, has been recognized for a very long time with such presuppositions also including tactics discussed by sales professionals, advertisers, and even behavioral economics. The receiver of the message is cognate with the target for manipulation.

The more specific critiques about consumer neuroscience, or neuromarketing, preys more directly upon the concerns of a consumer being unable to help oneself in the

face of this onslaught. While some would support the ordinary function of a market, even, possibly with the "hard sell," some type of conceptual Rubicon gets crossed when it comes to the interpretation of data derived from studies on brain activity. "This far, no further" becomes the rallying cry for those who would profile you for the type of car you can afford, but simultaneously would refuse to interpret a brain image that might also illustrate preferences that can't be brought out in language.

The question therefore becomes: what makes brain images different? What is different about consumer neuroscience? What is it about neuromarketing that changes the flavor from "traditional" marketing? There must be something separating the two in terms of ethical concerns if, in fact, there is a different ethical calculus for neuromarketing than for marketing more generally.

The essay will begin with a review of the content analysis of Essay Two to determine what, if any, ethical cues were discussed by the conference and interview participants. Following this is a situational section outlining the debate in terms of the fields of bioethics and neuroethics, and then moving into the specific concerns with neuromarketing. During this discussion, the essay will examine the "normal" business ethics guidance, along with the Professional Code of Ethics used by neuromarketers. We will then review these cases, both easy and hard, through the lens of the work of Foucault, focusing on the ethics of the use of technologies that began in another domain (medicine or psychology) and moved into use in the commercial realm. After examining whether the use of Foucault's thinking with regard to the power-knowledge relationship can help illustrate ethical issues, I will attempt to draw several conclusions and follow

with a brief consideration of consumer neuroscience/neuromarketing (CNNM) in ethical schools and in the philosophy of technology.

Content Analysis: What do the Experts Say About Their Ethics?

Part of the discourse isolated in Essay Two included opinions and discussions about the credibility, efficacy, and ethics of neuromarketing. While there were a few brain-imaging skeptics in the set of presentations reviewed, none of them uttered any expression of concern regarding the potential ethical ramifications of CNNM. The simplest explanation for this was that such questions would fall outside of the scope of their presentation and, given the generally more strict review of a skeptic's talk given the requirements of the program committee (see Essay Two), the ethical concern of the use of any technology would be confined to medical ethics.

Several of the speakers in the conferences mentioned concerns regarding the ethics of CNNM, but the context was mostly in the sense of a fear of misinterpretation by the media or by the public; the discourse emphasized the worry about the sustainability of the field, given some of the events that took place in France. Whether precluded by force of law or by voluntary convention, the main concern seemed to be one of scandal rather than of the substantive ethics involved in the actions in the field of CNNM.[30]

[30] It should also be noted that, to my knowledge, those presenting at the NMSBA conferences were not *specifically* asked to address ethical issues, though the credibility of the field is an aspect of much of their analyses. The ethical discussion that did come up was probably largely shaped by the questions that were asked of the presenters, the limited scope and time allowed for different presentations, and the interests of the program committee in ensuring that the conference programs hewed closely to the intended theme of the meeting, which would help to ensure attendees got what they paid for.

During the Neuromarketing Science and Business Association (NMSBA) conferences, the words used within the discourse for describing the stance of the field included positive things, such as that the practice is "here to stay." In this respect, the view was that the practice was "not magic" but was instead based in science and the efforts at translation into marketing action were cautious and prudent. Oftentimes, it appeared that the use of the technologies would also contribute to a more hearty marketplace with better products and a better understanding of the "true" needs of the customer. The trend has been to describe CNNM in terms of better persuasion, rather than control, and that the new ways of looking at brain activity or subconscious behavioral cues can be used either in conjunction with or, in some cases, is better than "traditional" marketing and market research methods.

On the downside, the participants remarked repeatedly that the term *neuromarketing* still has "baggage." Other terminology, such as "brain button" or "buy button" (Morin) were thought to be derogatory to both the customer and to the practice of CNNM (Essay Two), and an oversimplification for which the revisions of the NMSBA Code of Ethics was necessary. Some others noted a continued problem with the validity and reproducibility of findings, along with extrapolating the results in a way meaningful for marketing a product. Other terms include the concern that the field remains a "black box" which may leave itself open for exploitation. The credibility of the field, both through actively seeking to take advantage of the unwitting, or through the lack of robustness, is still at stake.

Ethical concerns did pop up in the Coursera MOOC interviews, and were a special part of the discussion with at least one of the experts in that set – a European law

professor tasked with interpreting the proper functioning of a market in non-exploitative paths. (Coursera MOOC) He readily agreed that this was a paternalistic view and appeared to be skeptical not just of the concept of CNNM, but of the functioning of the market exchange more generally. If anything, the use of CNNM appeared to represent a threat to consumer interests which appeared to invite state or superstate (in the form of the European Union) action.

With the exception of the MOOC law professor, who seemed to have a fundamental distrust of market mechanisms, the other participants in the discourse analysis seemed to take as a given the essential function of the marketing exercise. The ones who expressed an ethical concern specific to the operation of CNNM linked the concern to one of potential embarrassment about a lack of credibility, or the concern about being seen as participating in an unsavory course of activity.

For example, some participants took umbrage at the use of the word "neuromarketing" which seems to connote a perception of the "slick" and manipulative marketer. Much in the same vein, the concern deepened with regard to overclaiming and the huckster, with a participant noting that while the "snakeoil" has gone down, it still seems to be present. Others focused on consistent issues across the field of neuro-anything, with epistemological skepticism regarding some of the experiments, the contrast between the lab and the environment, and others. Ways of remedying these concerns included efforts at improving transparency, with the open publication of experiments and actual results. What is notable in all of this is an apparent silence about or no recognition of the unique features of technology which might change the ethical calculus into something that goes beyond credibility and into the realm of control.

With this as a backdrop for the information gathered from conferences with the specific internal concerns voiced regarding CNNM, this essay will now survey the evolution from bioethics to neuroethics, and then on to CNNM's specific ethical issues.

Bioethics to Neuroethics

Bioethics as a field separate from "ethics" first began to shape its own direction in the 1970s, specifically addressing questions of patient autonomy. (EdX course https://bioethicsarchive.georgetown.edu/phlx101-02/course.html#units/patient-autonomy/historical-overview) Much of this was shaped in concert with the development and use of the Helsinki Declaration, although the "pre-history" of the field dated back to responses to Nazi medical experiments, reactions against eugenics, and increasing concerns about participant consent in research. From the concerns involving patient autonomy, other areas of ethical interest, specifically within the medical and human biology realm, continued and included topics such as abortion, euthanasia, and human augmentation. These represented more fundamental and specific questions that required the input not just of philosophy, but also of science, law, and anthropology.

As we follow the narrowing ethical funnel from general ethics to bioethics, we next come upon the more specific field of neuroethics. Martha Farah writes that the further specificity of neuroethics as stemming from bioethics becomes necessary because "new ethical issues are arising as neuroscience gives us unprecedented ways to understand the human mind and to predict, influence, and even control it." (Farah, 2) These areas, like so many others attendant to the discussion, does have branches out into

areas within the rubrics of different disciplines, but the most straightforward definition seems to be supplied by Jesper Ryberg: “the study of ethical issues arising from what we can do to the brain and what we know about it.” (Ryberg 1, 2017). Similarly, Adina Roskies supplies us with the similar and cyclical concern of what ethics tells us to do *with* the brain and what studies of the brain tells us about ethics and, more particularly, our ethical intuitions. This gets at a very hot-button topic of entertaining the idea that ethical behavior could be a part of our evolution as a species. (Roskies 2002)

Neuroethics encompasses many of the crossover points of science fiction and bioethics, even delving into questions about what it means to be a human and, possibly, at what point a person would cease to be one (either through cessation of vital function or, more speculatively, the ability to augment the mind or to even upload to the mind into a computer). Neil Levy discusses areas of influence, impact, and augmentation as enhancement to the brain/mind and noting some of the tug-of-war between what constitutes treatment, as opposed to what constitutes an augmentation or enhancement. (Levy, 2007) What is, after all, a “normal” starting point? Many of these highlight specific clinical and medical interventions and decision-trees from which the ground may rapidly slip from beneath our feet. A move to “cure” a disabled child dissolves into an argument to “normalize” them, and then the full panoply of designer babies pops up into our thought space. We’ll return in more detail to the specific questions of normalization below, but we should also see the specific concern for neuroethics in the commercial practice of neuroscience; persuasion moves from presentation of evidence and well-constructed arguments to direct effect into certain areas insulated from other conscious and non-conscious processes that modulate volition.

Jespers and others combined for a recent special edition of *Res Publica*, with a series of articles highlighting the specific ethical issues attendant to what we know and what we can do to the brain. At the basic level, with regard to study and research, Jespers notes that neuroethics is virtually indistinguishable in concerns already expressed in bioethics. This is also a recurring trope when, considered below, other thinkers take a look at ethics in neuromarketing, bringing to the fore concerns about research subject welfare, informed consent, and so on.

The issues that many believe are more profound, precisely *because* the brain/mind is at the seat of them, are the areas of autonomy and privacy. These two areas are foundational to what constitutes personhood, individuality, free will, and all of the related values that many societies hold sacrosanct. After all, if a technological method can detect unspoken thoughts (vitiating privacy) and can then manipulate subsequent action (vitiating autonomy), concerns regarding cognitive and physical liberty are especially warranted.

Privacy and autonomy stand as preeminent concerns in many considerations of an ethical basis for bio- and neuroethics. Both are the central pillars of ethical codes in international legal documents such as the Helsinki Declaration (Helsinki 1964), which provides guidelines to protect human research subjects from exploitation. Autonomy in today's conception can be thought of as a condition under which a person's "desires, actions, or character . . . originate, in some way, from [a] motivational set." (Taylor 1) Within this framework is a more complex set of considerations, which include concepts regarding hierarchies of desire, biological triggers, and other assorted affective conditions. Within these concepts, one can understand an ordinary research procedure

occurring under which notions of privacy and autonomy are, at the very least, understood and any vitiation thereof might be cured with consent.

However, there is a separate family of ethical considerations in neuroethics and neuromarketing ethics, which is that of the incidental finding. One of the ethical puzzles involved is the capability of certain technologies, employed during a brain imaging study for commercial purposes, to discover other health-related information about the research subject. An example of a well-understood case would be that of organic damage to a subject, such as a small brain tumor detectable only by functional magnetic resonance imaging. Certainly such an example is not an "easy" situation for anyone involved, but at the very least, the stakes are quite clear. At some point, it is likely that the person being scanned will have to be informed of, say, a potential tumor. What if the result is inconclusive and the subject needs further testing (an especial likelihood)? What if the subject has no insurance that can cover the screening and medical procedure? What if the finding is erroneous?

Throughout much of this scholarship, at least as presented in the special issue of *Res Publica*, there seems to be an active and very real assumption about the efficacy of the technologies to exert force on privacy and autonomy. For the most part, it seems to be taken as a given that the technologies are available now which create such ethical concerns or, at the very least, they will become available in a very short timeframe, perhaps in a couple of years.

Much of the discussion seems to hinge upon concern in a criminal case in India where a murder conviction based in large part on interpretation of fMRI evidence was upheld. In short, experts concluded that an fMRI scan of a murder suspect conclusively

proved that the suspect had "experiential knowledge" of a crime scene that she could only have possessed had she seen it firsthand. Widely criticized, this is a case –both legal and scientific—that can be factually and significantly distinguished from others where an actual physical structure or change causes behavioral issues or lapses in judgment (such as that of a tumor impinging on ordinary brain function.) The case of "experiential knowledge," however disregarded, is still important as it seems to be the vanguard element of the incursion of brain imaging into areas of public policy and social institutions, such as the court system.[31] Despite the epistemological issues with the technology, the case fits well into the paradigm of the triumph of the brain image as being the decisive factor in "proving truth."

Neuromarketing ethics

Even with the field of neuroethics being comparatively young, a new discourse is emerging from it with a particular focus on the commercial aspects of brain-first considerations. That is, the role of ethics in neuromarketing or consumer neuroscience is beginning to be thought of as an individually identifiable strain of ethical inquiry which would include neuroethics (which by dint of its nature includes bioethics), business ethics, and some other rather "big picture" ethical and even phenomenological issues, such as the ideas of autonomy, control, and free will. It may well be that focusing on

[31] Different jurisdictions and countries have different requirements for evidentiary probity and the acceptability of certain technologies for eliciting evidence. Such scans have not yet been admitted on a widespread basis. However, the case of being able to show medical evidence of organic damage is an important component in many aspects of criminal defense, such as diminished capacity or insanity.

purchasing behavior and brain activity while participating in the market could offer extraordinary new insight into brain activity and human action.

A recent publication, *Ethics in Neuromarketing* (2017), serves as a jumping off-point for understanding the lay of the land. This collection of essays lays out a foundation consisting of distinctions around and among ethical considerations, many of which are useful within this work. The most primary of these distinctions, as the ethical focus of this essay lies in questions of power and autonomy, is the difference between *research subject protections* and *consumer influence.* The latter occupies the bulk of our attention here, though insight into the generation of data (through research subjects) is also quite important.

Most of the same discussion stems from the concerns illustrated above, in the discussion of the field of neuroethics as a whole: that of privacy and autonomy of the customer. One critical distinction made by many of the theorists specifically examining neuromarketing as opposed to those within the broader neuroethical field, is a greater focus on the *actual* and *present* efficacy of the technologies used to elicit the information.

The concept of *overclaiming* is a crucial one in the literature of neuromarketing ethics and is a cornerstone not only of the discussion involving ethics but also of the nascent ethical code developed by NMSBA. Overclaiming is also directly and causally linked to the efficacy of the technologies and the interpretation of their results by experts. Overclaiming can be simply defined as the claim of a purveyor of CNNM services that cannot be substantiated in the current understanding of the science, nor is within the capabilities of the technologies currently available. The NMSBA code's initial clauses

forbid the use of exaggeration of results (Article 1) and the exploitation of another's "ignorance of neuroscience" (Article 2).[32]

Of course, technologies' efficacies and any resultant claims, over-exuberant or not, do differ. The ability of fMRI scans to capture the hearts and minds of onlookers and researchers is due, in some part, to the charismatic way in which its programming presents the image; critics even within the NMSBA conference noted that the way it creates pictures is at least partially responsible for its popularity and for the way it has captured the attention of journalists and critics. The charisma makes for the belief in efficacy and furtherance of the overclaiming seen, off and on, by writers such as Martin Lindstrom. By way of comparison, data tables generated by something such as implicit testing might be more securely linked to specific brain processes and behaviors, but have more conservative claims and none of the colorful charisma (except that this might be a problem of presentation, rather than something necessarily inherent in the data display.)

The overarching *business ethic* concern is a pragmatic construct of legal restrictions and ethical norms. Actions and things such as defrauding the customer, false advertising, and false claims would all fall under this generous category. (De George) This would also include CNNM concepts such as *overclaiming.* To a greater or lesser extent, the ethical concern can be a concern about "being caught" or involved in scandal, though there is also a fundamental ethical construct involving fair dealing. In addition, the NMSBA Code also includes concern about the credibility of the field in the face of such shady dealing, expressly forbidding anything that could harm the reputation of the field (Article 1). Thus, an overclaim *can* result in scandal and should be avoided, but it also *is* a misconstrual of the truth about the efficacy of a technique or the results elicited

[32] See Code of Ethics in Appendix A

by the application of technology. Throughout the history of commerce and exchange, a basic element of trust in the veracity of claims made by the parties to a deal must exist. This also supplies the foundational aspect of "business ethics," which is not easily conceptualized as a direct descendent of one of the major strains of historical ethical thought. It is instead a field of applied ethics which draws on all ethical fields, and fields outside of ethical thought, such as economics and law. (Stanford Encyclopedia of Philosophy) Some of these points will arise again, particularly in regard to thinking through issues of "rightness" and "wrongness" in terms of autonomy and privacy. The transactional nature of business could tend to defer such judgments on legal and economic infrastructure and standards, from which little further insight might be gained. Instead, confining the business ethic inquiry of concern regarding fraud, given the basic assumption that trust and relationship-building is a central concern for the ongoing and uninterrupted nature of commerce, will suffice for now, and the questions will turn to sources outside of business ethics when the issues necessarily go beyond business-peer relationships.

Addressing the concept of gullibility directly, the ethical inquiry is predicated on a basic assumption that continued commerce is a desirable activity by the culture or society in which a transaction occurs. Francis Fukuyama in *Trust* (1995) made several points about the relative openness of societies and innovative developments as relationships built on trust between contracting parties. Trust between parties helps speed transactions, allows greater numbers of deals, and generally creates a larger network of commerce which itself enables greater efficiencies.

Any attack on the nature of honest and fair dealing between parties in a society that ordinarily has a high degree of trust therefore derogates the entire system. Legal penalties can be imposed for such behavior but, at a minimum, there is a penalty paid in terms of greater caution and prudence which may also slow commerce. Terribly long legal agreements, an order of magnitude more onerous and difficult than the ones attendant to normal arrangements, become the norm. Parties may be reluctant to continue in any further arrangements, laboring under the greater weight of concerns regarding dishonesty, bad faith, and fraud.

Why, then, could an organization suffer from such gullibility? Such a concern may not apply equally to all sectors and types of industries, to be sure. However, to the extent that new product development is rapidly rewarded (either by the consumer market or by the investment market), or the product life cycles are accelerated, or anything that tends to move a sector into an economic state of "hypercompetition," risk calculations might arrive at different conclusions. Decisionmakers may not be convinced about the efficacy of brain imaging, for example, but might be motivated out of fear that there *is something to it*, and, more to the point, might be further motivated by the fact that a competitor has found what that something is. If such an event occurs, in the context of a competitor successfully gaining market share through neural imaging (or thought to do so), punishment would therefore come in two forms as well: one in the market, where the competitor sought and received an advantage through its use, and two, in the investment realm, where members of governance bodies and shareholders might inquire as to how *their* company lost out on this important new direction/insight/product.

These circumstances align decision incentives in such a way so as to bend likelihoods in favor of using brain imaging, if for no other reason but to show it was done. At the other end of the spectrum, a sense of desperation among organizational leaders could also be trending in the "try anything to get ahead" realm, which would also prime them for manipulation by unscrupulous neuromarketing firms. This is precisely the area that seems to be of greatest interest to the NMSBA and some of the membership, in an attempt to drive the hucksterism out of the practice. To a degree, this is still the "fear of embarrassment" but it also seems to be a logical extension of ordinary business ethics practice.

Beyond the concerns regarding "gullibility" in the context of a business-to-business transaction, there remains the more dystopian concern regarding manipulation of the population into making a purchase against their will or, at the very least, against their interest. Indeed, accusations of the latter can find their antecedent for decades, into the earliest portions of the 1900s, when the federal government passed a spate of initial consumer protection legislation (such as the first Pure Food and Drug Act (FDA)) and a number of books came out alleging the perfidy of consumerism and the bleak moral outlook of advertisers (Fox, Strasser).

The relationship between concerns of autonomy and privacy in the context of an ordinary consumer purchase exist on a continuum from fully aware research subjects, put through a process with legal protection including informed consent, through to action "in the field," wherein unwitting consumers or would-be consumers could be subject to manipulation or some degree of a loss of autonomy. Such categorization becomes less clear when, from a practical standpoint, one recognizes that we are all consumers, out in

the world, participating in an ongoing experiment called "the market." The extent to which any result based on a viable neuro-centered marketing strategy is different from another persuasive or memorable advertising campaign based on survey data is not easily measured, especially in ethical terms. Instead, these different considerations adumbrate a complex mosaic of interwoven circumstances and methods which represent some potential areas of ethical friction, which the Foucauldian analysis would seek to illuminate.

As mentioned in the introduction to this Essay, is there something *different* about the use of this form of technoscience that changes the ethical calculus? Consider these scenarios:

- A research subject, under informed consent, allows his or her mental privacy to be lessened and, in so doing, contributes to a body of research which would allow an organization to influence the autonomy of a purchasing customer with inveiglement.
- An organization, following a purchasing customer or customers without consent or knowledge, carefully watches (including possibly with technological augmentation of observation) behavioral cues and conducts data analysis so as to create products or advertising which influence the autonomy of a purchasing customer.
- A research subject, under informed consent for a certain type of study, is unknowingly subjected to other data gathering which may allow an organization

to influence the subject's future autonomy, or to influence the autonomy of a different person.

- An individual, or group of persons, without informed consent or knowledge, are purchasing customers who have been influenced to make a purchase decision or influenced in a measurable way *toward* a decision through the intervention of means developed through brain scanning or behavioral measurement technologies.

Akin to the last example, we must observe that we are all subject to and purveyors of influence in our own networks of human relationships and groups. Marketers are one example of offering persuasion, but persuasion is a dialogue among many different groups, including parents, children, organizational, religious and political leaders, and many others. They all seek the *same* outcome: a favorable decision or predisposition to decide favorably on behalf of the person seeking influence. The only difference in the case of CNNM is the supposed intercession of technology, and the interpretive expertise with the technology, leveling judgment and counsel. In the first three examples, violations of ordinary research ethics can be found, and there seem to be no separate details or considerations which would warrant treatment any different for these conventions or ethical violations because of their use in CNNM.

The active case for ethical consideration, then, is that of specific effects that use of a technology has on a consumer who does *not* have knowledge of manipulation. Most consumers must have some type of expectation of manipulation or persuasive tactics when encountering a purchase decision encompassing everything from the purchase of a

can of peas to that of a car or home. Socially and culturally, the reality of this is understood well and also stands as much of the reason behind consumer-protection legislation, and requirements for disclosures of information (nutritional value, interest rates on loans, expressly forbidden uses of objects), among many other policy measures and market controls. Even still, however, market economies tend to function best when consumers have ranges of choice and the possibility for persuasion and negotiation.

Concerns or areas specific to *consumer* protections in CNNM exist, outside of both the business-to-business and research subject contexts, but they seem to be more poorly defined. Like those that wrestle with the broader field of neuroethics, there is a touchpoint with reality or possibility that presents a boundary beyond which is speculation and unsupported paranoia. The NMSBA Code of Ethics contains some verbiage which *could* be construed as possibly working for broad consumer protection, but the most specific elements are reserved for research-subject treatment.

For example, the NMSBA Code requires transparency, consent, privacy (of research participants), and other related rules. At the same time, it requires that researchers be "honest" about the capabilities of their technologies to *clients*, and to not overclaim. The less specific areas –the ones which require some more legalistic gymnastics to interpret a protection of consumers into the language – relies on the need for integrity and credibility of the field as a whole. These are far less specific than the actual areas of the Code especially addressing research participants and, indeed, it could be readily argued that the Code contains no explicit requirement or duty for consumer-purchaser protection at all.

Other areas of consumer protection and measures taken to prevent unethical activity when techniques are applied are even less well-defined. Ducu (2017) attempts to do so, naming the possibility of manipulative market practices or "stealth marketing" as problematic; under these examples, a consumer would be so influenced so as to be coerced into making a purchase, and only the presence of the technique or technology would have created the conditions under which the coercion would have been possible. Ducu points to the historical spuriousness of such claims, and also outlines that the issue of greatest friction is that of overriding of autonomy. Just the same, however, Ducu noted in his section regarding privacy and autonomy of research subjects that the available technologies today are largely in no position to be able to exert this type of force over a decision or to create this type of penetration in its gaze.

Murphy et al (2008) noted their own "vexation" with the concerns about overriding consumer autonomy. Labeling such an approach as "stealth" marketing, such circumstances would, in their construct, require the consumer to be unaware of attempts to influence, or to have actual influence. They also acknowledge that current levels of technology wouldn't allow such an event to happen and, even with this piece being nearly a decade old, the technologies still do not seem to possess that degree of efficacy. It might even be that the very design of them precludes it, given our limited understanding of how the processes of the brain actually work.

However, even with the conservative estimate of the capabilities of technology today, Ducu opines that there exists in the current marketing milieu an overuse of emotional cues and that the reliance on brain-imaging studies means that certain parts of the brain are triggered into activity. Such a cascade, Ducu cautions, effectively "traps" a

consumer into a certain decision choice. Using examples of tangential imagery (say, sex appeal), he states that such advertising creates a cycle in which this type of appeal is more and more frequently used. The emotional engagement of the brain would then "override" or overwhelm the areas of decisionmaking and rational consideration.

The problem with Ducu's argument in this instance is that the very idea of the "rational consumer" has been largely set aside amidst the work of Daniel Kahnemann, Antonio Damasio, and others. Indeed, as we saw in Essay One, early psychology-advertising treatises in the first years of the 20th century *already* saw pure rationality in the consumer as a fatuous fiction. Such a construct has dwindled out of favor for more than thirty years, to the extent that Damasio and others argue –and show scientific evidence in the forms of brain imagery and behavioral studies – that emotions are an inseparable and central pillar for rationality. Without emotion, one cannot estimate the relative value of statements which, for example, would push ethical intuitions, or require an assessment of importance. (Damasio 2001) It would seem as well that for the most flagrant attempts to manipulate emotion through overuse, the person being manipulated is likely to shut down emotionally (response exhaustion) or recognize a cynical attempt at manipulation and grow resentful. In such a case, overuse of emotions in consumer decisionmaking poses a serious risk of a backfire. In most examples of the use of CNNM, however, the reality is a bit more prosaic, with more measured studies of the appearance of a package, product design, or advertisement.

Is there no there there? We have instances in which *only* the use of the technologies, as currently constituted, could have a separate ethical epicenter. We also understand that the majority of public concern or outcry has been as regard to the general

public's likely mental enslavement in the face of implacable technological manipulation. Some of the researchers themselves, as we have seen, provided more fuel to the fire when writing in somewhat breathy terms about the capabilities of their favorite medical device for reading the deepest, darkest desires of research subjects. As seen in the content analysis of Essay Two, this behavior and these types of claims have been largely dampened or discredited; at the same time, some parts of the NMSBA Code were designed specifically to limit the types of claims that can be made without running into an ethical transgression.

It seems somewhat likely, however, that we could be one news article away, or even one technological breakthrough away, from all of these concerns resurfacing and, in the face of something that might show greater efficacy, *might* actually get closer to the dreams of faraway manipulation in consumers. It takes only a single news cycle to make everything old new again. Therefore, the need for a robust and cogent ethical analysis that deals more deeply with the issues

A critical aspect that is our focal point in this essay is the role of the technology in differentiating CNNM from ordinary marketing. The hypothesis being considered is that the technology and its uses make for a different calculus than ordinary marketing, with the understanding that the field itself evolved over time and, at one point, contained a debate about the use of tools such as focus groups and ethnographies. These techniques are now seen as the "trad" (traditional) side of marketing and, among the more forgiving purveyors of CNNM, can be seen as being augmented by technologies such as brain imaging. If, however, there is no ethical difference between CNNM and "trad," then the

hypothesis fails and the area is subject *only* to the same ethical concerns that involve ordinary marketing.

There are a number of ways in which CNNM could hypothetically produce different ethical impacts than traditional marketing techniques:

- There is an organic proclivity in a number of persons that create a greater vulnerability to an advertisement either through specifically targeting people with such a weakness or by having an accidental effect. These vulnerable persons could have organic damage, a different brain structure, or suffer from mental illness that can be detected by imaging technologies. The obvious concrete example of this would be a person with a chemical or a gambling addiction who is inveigled into a destructive behavior pattern.
- There is a dormant proclivity in people that is suddenly activated in the presence of a technique or technology. This would be cognate with epigenetics, in which a gene for a trait becomes active in the presence of an environmental factor; only, in this case, the activity could be called "epineuromic."
- There would be the generation of a proclivity that *remains occluded*. That is, even though the technology would exert a change on a physical operation within a brain process, the change never arises to actual manifestation through a change in action. This may not be a concern on the face of things if, in fact, there is not a change in "action" but the question about the ethics of forcing an

unwanted and unknown change in brain operation still might present an ethical concern.

- In another way in which "overclaiming" might manifest itself, the use of the word "neuro" heightens expectations and therefore gullibility and plays on the weakness and lack of knowledge of a party seeking to gain competitive advantage. In such a way, the use of the technology in business, in politics/elections, or in the presence of any claim of the technology, makes people more willing to believe that the result is somehow scientifically informed and its conclusions inarguable. While history is replete with examples of cultural memes and trends that imbue a persuader with a heightened reputation or fearsome nature (such as religion), the technoscientific realm of "neuro" usage appears to be today's meme of mystique that lends itself to be particularly persuasive due to the apparent indisputability of its gaze and its persuasive power. While scientific journal articles might indeed be balanced and cautious, more accessible and less technical reports tend to focus on the hyperbolic possibility present in any one example or situation.

The Foucaultopticon

The usage of Foucauldian thought lends a new and different perspective to ethical inquiry. It adds several further layers of analysis atop the classical considerations of

Western schools of ethical thought, and might offer a more nuanced application of moral balancing and moral direction than "ordinary" business ethics.

Foucauldian analysis does this in several different ways. First, and most obviously given the body of work Foucault left behind, is a unique depiction of power which entreats us to weigh the burdens of history upon the paths taken by any actor in an ethical calculus. More specifically, Foucault recognizes the likely emplacement of systemic power within an actor; for example, an "institution" may have an assemblage of power-manipulating tools at its disposal by dint of its history within a society or culture. This could conceivably come in many different forms, including a university, a hospital, a government agency, or a private organization.

Second, and closely related is the concentration of Foucault on considerations of science and technology. He expressly wrote his interest in this area, so there is the face-value declaration of the same, and, more importantly, his thinking targets the relationship of the human body and its use by society. This line of thought, again a consideration of a power relationship, has been labeled "biopolitics" and, when considering the interaction of technology, the brain, ethical considerations and possible policy outcomes, it is uniquely fitting as an additional way of viewing ethical questions.

In addition to these two considerations in which Foucault is conceptually situated, there is the further consideration of the part of the STS canon which he occupies. Much of his thinking is rooted in modern philosophy and, while he was been sometimes dismissed as a "Postmodernist," he does supply a conceptual bridge between philosophy and social theory and thus links the ethical discussion in this essay with the social

analysis contained in Essay Two. One of the more prominent modern Nietzscheans, Foucault ultimately focused on arrays of power and the meaning of the individual.

While the link between the exertion, maintenance, or oblique demonstration of power and that of knowledge might be at least plausible, what ethical concern does this raise outside of our ordinary considerations of ethical schools? Rather than a classical school of ethics, such as utilitarianism or deontology, or the applied, situational aspect of the combination that is known as business ethics, a Foucauldian point of view would understand the ethical structure in terms of a "network of relations," perhaps not dissimilar from the actor-network construct and the social construction of technology. In an ethical structure as a network of relations, it includes "dispositions, maneuvers, tactics, techniques, functionings." (26) These are all facilities of power, and the two endpoints which describe the boundaries in such an analysis are the human body and the technology used to effect dominance.

In *Discipline and Punish*, Foucault described several historical occurrences and used the concept of the Panopticon, originally created by early utilitarians such as Bentham, to describe ways in which control is maintained by the few over the many. The possibility of one's behavior being observed, Foucault argues, is enough to change the behavior of the many, to create a discipline following a set of prescribed rules and customs which ensure the continuity of the power of the dominant institutions. Much of *Discipline and Punish* focused on prisons and the relationship of the criminal to society, but Foucault expands the concepts in later portions of the work for considerations of broader society and the individual within any institution (that is, essentially, all of us.) The collision of law, history, science, technology, and the body was of special interest to

Foucault and, indeed, were he alive today, one would readily think that he would have already dived into the brain and consumer neuroscience. He made an early declaration that the human body is "situated in a certain 'political economy,'" (25) certainly presaging its use as a research subject, prying "secrets" out of it and, in turn, further submitting other bodies. Foucault's writing might be further thought of as philosophical "wetwork:"

> [T]he body is also directly involved in a political field; power relations have an immediate hold upon it; they invest it, mark it, train it, torture it, force it to carry out tasks, to perform ceremonies, *to emit signs*. This political investment of the body is bound up, in accordance with complex reciprocal relations, with its *economic use*; it is largely as a force of production that the body is invested with relations of power and domination; but, on the other hand, its constitution as labour power is possible only if it is caught up *in a system of subjection* (in which need is also a political instrument meticulously prepared, calculated and used); the body becomes a useful force only if it is both a productive body and subjected body. [emphases added] (25)

The emphases in the above quote can be taken directly into account in terms of technological measurement of brain activity and more general behavior. Under such study, the body certainly will "emit signs" that are observed, measured, cataloged, and so on. In the case of CNNM, or at the very least, NM alone, such signs are studied and transformed into an action aimed at economic use. The transformation of the body into such data is to place it in a system of subjection that can be extrapolated to, and reflect reality of knowledge and power onto, other bodies. This represents somewhat of a departure from Foucault's original conception of the relationship between the human body and power, in that his conception concerned the linkage between *state* power and the individual. More precisely, it is the state's ability to gather large quantities of data and knowledge about individuals that can then lead it to the ability to wield substantial

power over the individual. In the context in this essay, I've adapted the same concepts to considerations of economic power wielded from not *just* the state; although state actors are free to use (and possibly have used) CNNM, my argument is that the application of the consideration is still broader and can include many different forms of relationships and connections within a society and culture.

Ironically, one of the steps that my analysis must take in the Foucault context is to impose a degree of structure or discipline upon the area of inquiry. One critique of Foucault is that he failed to define solid and referenced evidentiary bounds and standards within his analysis of history, but this critique can be addressed in the context of the arguments here, which is to understand how power and technology affect ethical inquiry in consumer neuroscience. In drawing the boundaries in this way, we understand that the effect of technology is one that must be studied, to see what, if anything, is different in an ethical construct for neuro-study with a commercial end in mind. Given these boundaries, Foucault's sometimes wild-eyed gaze is dimmed around the edges, but sharpened in the areas where it can generate the greatest insight.

The three stages of Foucault folding into the areas illustrated for special concern are: situating the human body in ethical and biopolitical terms; understanding and defining the roles of power within those ethical terms; and developing a context-specific reckoning for any policy recommendations that would differ given a potentially different set of ethical emphases. Foucault himself did not supply this stepwise-style analysis, and the reality is that his self-referenced "discourse" approach would ordinarily defy it. Its use here, therefore, is best seen as a way of re-viewing ethical inquiry not as a discipline in itself, but more as a scattered set of imagery from which we can hope to draw new

conclusions. This perhaps unsatisfying view dates very far back in philosophy, perhaps beyond even Plato's *Allegory of the Cave*.

The originating touchstone for Foucault is the relationship between knowledge and power. All knowledge is formed from power. Foucault wrote: "[p]ower produces knowledge (and not simply by encouraging it because it serves power or by applying it because it is useful); that power and knowledge directly imply one another; that there is *no power relation without the correlative constitution of a field of knowledge, nor any knowledge that does not presuppose and constitute at the same time power relations.*" (27) The exertion of power creates knowledge, and the use of knowledge is an exertion of power. Perhaps this is an oversimplification of the broader ideas (and, on balance, Foucault was using it in the sense of a legal framework for justice and punishment in the prison system), but the declared intent of the marketer is, in fact, to influence decisions and consumer choice. The parallel declaration is the intent to acquire knowledge which allows the marketer to be more effective *at* influencing decisions and perceptions.

Critics of Foucault might state, in response to this assertion, objections to it in terms of what evidence Foucault offers and what standards of review would be historically applied to this. These are worthy objections in virtually all circumstances, but the concerns here are more easily answered. It seems readily apparent, on the surface, that the use of technology to gain greater insight and knowledge about decision-making and consumer choice is the *direct* Foucauldian concern. There is, in short, no allegory here, but instead the concern is exceptionally concrete. If one can rightly argue that Foucault's context should be narrowed to smaller and narrower domains, the claims

here would still stand by the very dint of the actions that occur when brain research is undertaken.

One must, however, take another leap of faith with Foucault, and that is to accept his lack of definition of either power or knowledge in *Discipline and Punish.* While Foucault goes through great effort to trace the history of this dialectic, he does so in a way that may make the reader uncomfortable with an ever-shifting definition, however subtle those shifts might be. One must take it as a given in the context of whatever milieu in which power-knowledge is being explored; for Foucault, it was largely the state and marginalized peoples, such as the insane or prisoners. In the context of CNNM and to a similar extent, neuroscience research more generally, it is the proposition of knowledge possessed by experts, the concomitant lack of knowledge in consumers and subjects, and an equation that might allow us to see –and just perhaps define—the meaning of power as neglected by Foucault.[33]

In the separate situations that trigger the special interest, iterated above, the claim that knowledge and power are inextricably linked resolves itself in clear fashion in the concrete applications we see in CNNM. Without the knowledge of, say, a unique predilection (or weakness), there is no direct power to be exerted over it. In the opposite situation, the power is there – either in potential or kinetic form. This is still not satisfyingly defined for all comers, especially if one expects completion in terms of an ethical model. It is, however, a first step, instantiated more securely by understanding what technologies are and what the goals of the research are.

[33] Foucault explores knowledge thoroughly and expresses his thinking on this issue in other works, such as *The Archeology of Knowledge.* Perhaps this represents a future possibility for next steps in this inquiry, to seek to better define how this would in fact link to power.

But there is a larger question: whether there is power in the face of lack of efficacy. In short, suppose that all or at least most of brain imaging data are, on some level, in error. These errors then, one supposes, leads to errors of misinterpretation all throughout the different areas of behavioral sciences that the images purport to assist (or even supplant.) The field becomes modern phrenology, or, perhaps, a part of the field suffers from a similar reputation. If the entire field becomes discredited and the technology useless outside of that of medical diagnostics, it would undoubtedly become a major story, likely to develop quickly, in the public awareness. In such a case, the knowledge that had been thought to have been attained (and the Foucauldian power attending to it) would undoubtedly disappear, perhaps in the blink of an eye.

If, however, the knowledge is *not* widely distributed in the public awareness, the subject under the gaze might be under the impression that the power attendant to the knowledge is still present. Certainly, a study subject would likely expect that such a setting would lead to knowledge about the self being extracted for study.[34] Every outward sign or cue would be present – technicians, technological devices, even the legal structures by which consent to perform the study.

There is power, then. But would there be knowledge?

This too can be thought of in terms of deception or fraud. And yet, the Zimbardo and Milgram experiments disclosed their relevant and highly important knowledge about human behavior with the exertion of a similar set of cultural cues regarding power. The

[34] One can readily think of the Stanford Prison Experiment to realize how quickly the roles themselves might control a body; even more to the point, Stanley Milgram's laboratory experiments showed an astounding rate of compliance among average people when confronted with an authority figure (whose only outward sign of such was that of a lab coat.) Under these conditions, the experimental subjects readily found themselves able to deliver "shocks" to other people (human confederate actors) even though all outward signs pointed to great distress. The Zimbardo and Milgram experiments and findings do not tempt one with overwhelming optimism regarding human nature.

knowledge is still there, though it is likely *not* the knowledge that the subject would have expected to be elicited. Perhaps in an extreme case even the researchers are self-deceptive to the extent that the information elicited is, in a more objective sense, useless; this is one of the central arguments of the epistemological critics of brain imaging techniques. In such a case, the knowledge received would be fraudulent, while the probative knowledge would be ignored. It would be there, though, for the rightly-calibrated observer. The power would have been kinetic, while the knowledge would be potential.

To a lesser degree, this represents an area of current disagreement about the status and merit of the practice of brain imaging for commercial purposes. There is at least some portion of the population at large that believes that the threat of manipulation and vitiation of privacy is not only possible, but absolutely real. Such beliefs are analogs to conspiracy theories and religious faith. In CNNM, such a belief, while factually incorrect, is interpreted as an act of power with erroneous knowledge being collected and analyzed; at the same time, an entire body of knowledge –telling us about deeper social and cultural fears and concerns – goes largely unremarked.

The epistemic question of what is the nature of knowledge erupting from the brain when scanned falls squarely within the concerns of power and discipline. Foucault wrote that "power exercised on the body is conceived not as a property, but as a strategy, that its effects of domination are attributed not to 'appropriation', but to dispositions . . . ." (26) The act of the scan itself is an episode of power which creates knowledge and then has no choice but to interpret it in the way that the power does. The easy case with this is the gaze of the fMRI, with its world of image precision and brightly contrasting colors.

Epistemological objections to overinterpretation of fMRI images can be significant in certain contexts (particularly in the case of dramatic claims), and this Foucauldian warning essentially tells us that in such an arena, researchers run a risk of seeing what they want to see. In imaging technology, this frequently arises in the context of reverse inference, but there is an added layer of power in this context due to the communication of the ideas themselves.

Frequently, the sexier or more outrageous the claim, the greater the likelihood that it appears in wide circulation in the mass media. (Iacoboni) Martin Lindstrom's confused infomercial for brain center affection for the iPhone is another example of this (2011) and is also, fittingly, one of the major sources of concern for the realm of the NMSBA's Code of Ethics (Code), overclaiming, and the implicit importance of trust in business ethics. At the same time, the broader questions of social and cultural impact of false belief in the efficacy of the technologies warrants study, but other than to provide background and context to some of the controversy involved with commercial use of brain imaging and behavioral recordation techniques, not much more can be stated, other than to turn to the specific questions involved.

At the outset of the essay, it was noted that the French Parliament in 2011 changed regulations governing the use of neuroimaging technology and limited such use to medical diagnosis and legal determinations. Since the development of some of these technologies, some have, therefore, marched the techniques from the medical setting to the commercial one (Essay One). The evolution in usage of these medical and clinical technologies seems to represent an analog to the expansion of power and knowledge that Foucault had already described. In a sense, the employment of the technology as a

disciplining force and elicitation of knowledge regarding the body and mind can cross the imposed disciplinary (in a broader sense) boundaries and accomplish parallel outcomes. Institutions, in Foucault's analysis, would include the military, schools, and hospitals "for controlling or correcting the operations of the body." (136) Once sufficiently disciplined, "docility" becomes the main tendency.

This is more than just a concern or, more appropriately, a statement regarding the nature of things. For Foucault, the docility creates a heightened economic utility sought and given from the body. Thus, the move from a knowledge-power operation in the medical sense to an economic-power construct in the commercial sense is largely a function of the institution in which the discipline occurs and the knowledge accrues. As mentioned earlier, the movement from "curing" or "helping" the disabled can quickly sluice toward something else entirely, all fraught with fine-grained shadings of concern relating to the concept of normalcy. One historical example of this would be the movement of people into institutions meant to "help" disabled community members and their families – and the abuses and atrocities that happened therein. (Brignell) The trends are thoroughly Foucauldian in such a way and, ultimately, relate to the ideas that Foucault presented as the body being both the subject and object of political economy. The utility of "normalizing" (or disciplining) would mean a great deal to many parents dealing with the prospect of operating in a social network with a child that would affect the child's prospects in that same network.

Thus begins the movement from what would have been the well-insulated walls of clinical and medical consideration, as in the case of Levy, Roskies, Jespers, and others' discussions relating to neuroethics, into the commercial world. Such a movement

represents not only a transgression of defined borders within the clinical sense but exposes the body and mind to far more diverse and varied areas of discipline; as much as there is a marketplace of ideas and knowledge, there is a marketplace of power. The technology, such as eye-tracking, could be used to observe behavior while reading, and it is just a form of reading to study the eye's attraction to various points on a supermarket shelf. It is easy to see why, with colorful imagery, the fMRI became a favorite of those studying brain processes in a clinical sense, to understand the biological houses of emotion within a brain and just extending that a bit further to see those same houses illuminate when exposed to products and advertisements.

The radiation of these ideas throughout the various streams of human activity is reasonably easy to consider. One can use terms originating in modes of classical economics (supply and demand, perhaps) or terms of social construction of technology (interpretive flexibility and relevant social groups). The violence issued by Foucauldian considerations are additive to this and gives us insight into the dimensions of power that are perhaps elided by the other, more polite concepts housed in economics and sociology.

Taking stock so far, we see the distribution of the technologies and the knowledge in different forms. The forms have moved from medical and clinical settings to commercial ones. Attendant to that movement, when viewed through Foucault's lenses, we see the distributions of power and with that power, knowledge. We must then address the issues brought about by the use of neuroscience and technologies in the commercial realm.

Just as Foucault's ideas about the discipline of the personal body finds its way to the discipline of the social body via its institutions (schools, medicine, military), one

arrives at a juncture with the conception of the technology of power and what that discipline actually means. "The perfect disciplinary apparatus would make it possible for a single gaze to see everything constantly." (173) In other words, an unblinking eye that provides a continuous level of surveillance, disciplining and ensuring the discipline is maintained. Could it be argued that this gaze is that of the brain imaging device? Or perhaps it could be that the results of behavioral measurement technologies provide this service? The research, gained through participation of human bodies, creates standards and prescriptions for conduct against which other humans might be measured.

Foucault also argues that the differentiations discovered between the observations and the research also creates individuals and groups of individuals. The economic operation of the "gaze" of the technology continues to create its own necessity by being the only method by which these gaps can be examined. The examination itself places people in the "field of surveillance" (189) and the ensuing observation of them situates them in a "network of writing," echoing the Latourian discussion of reducing people to tables and graphs. Each individual is a "case" in the documentation and the individualization that accrues comes about as sovereignty might be marked. In the example of marketing, there has been a long-term trend toward products which might be called "mass customization," with details suited for unique individual situations but still produced at a large scale of efficiency. Such a trend, when reinforced by the "gaze" which can purportedly yield superlative insight into the desires of the individual ("the constitution of the individual as describable, analyzable object" (190)), seems to be at the very least a loosely-defined goal of both product design and market research. This Panopticon appears, eventually, in the laboratory as well (203).

The question then comes back to the same one as before: is there an ethical issue present in CNNM when the efficacy might be questioned? As long as there is either awareness of the gaze by the recipient, or by the purveyor, this analysis suggests that the power is present. The knowledge, however erroneous and misguided, still attends it.

This *Matrix*-like outcome undoubtedly sounds gloomier than what it really is. The point here is not to judge the circumstances through the lenses of some normative political or economic goal; instead, it is to recognize the presence of the power and the knowledge that comes with it. The words Foucault uses to describe these circumstances were chosen specifically for metaphors of violence and domination, which tends to spring from the Nietzschean construct that Foucault favored. At the very least, it's a system under which we all labor and which recognizes the importance of the technological tools that we use to assess and make decisions. The technology effectively creates modern definitions of humanity and this, combined with participation in a market, describes the most basic and common behaviors in which billions participate every day.

So much for the general case involving all, or at least the vast majority, of us. What about the specific cases mentioned at the beginning of this section, the ones that would seem to test what *difference* the technology would make for some and not for others? These are examined in turn, below.

Uncovering an Organic Proclivity

The first of the four considerations mentioned above is the situation in which autonomy is vitiated in a small percentage of the population. In such a situation, the

concrete outcome is that a technology renders some number of people helpless with regard to actionable autonomy; they have no choice but to purchase. In this respect, the majority, or perhaps vast majority, of consumers would be largely unaffected by the technology, except to find it persuasive in a way that still might be resisted. Persuasion falls short of absolute coercion in this sense, except that in this particular example there is a group for which a particular persuasion equates to absolute coercion.

The Foucault aspect here seems fairly straightforward; there is a specific knowledge attendant to the specific power in a specific group of people. Without the knowledge, the power seems unlikely to be exerted, except in the circumstances which we already know about, such as those persons afflicted by compulsive behavior patterns, which includes shopping or gambling. (Black 2007, 2010) The individualization that occurs under Foucault also re-coalesces in the sense of larger groups which have been subjected to it. This state of affairs is a relationship of powers relations: “Instruments of power, coextensive with the multiplicity that they regiment, such as hierarchical surveillance, continuous registration, perpetual assessment and classification.” (Foucault 220)

This situation seems to beg for an examination of intent. That is, was this specific, small group targeted for its weakness and the possibility of helplessness but to purchase? In a Foucauldian sense, the question of intent is largely irrelevant. The power-knowledge axis is the salient, central pillar of importance in understanding it. The discipline that comes about is separate from any one particular body (either the eliciter or the elicited) but is imposed on them all. The fact that some are differentially treated as a result is not without moral consequence, but not within the Foucauldian sense. Instead, it

does illustrate the value of such an analysis, as it might be questioned at the outset: what is the source of and intent of this knowledge, this power? This is a question outside of history that Foucault would have not necessarily deemed important to answer. He would have said, and did write: "Another power, another knowledge." (226) But to the extent that we view this as a component of ethical analysis, rather than the total of it, an attempt to answer should come to mind. That answer will, however, not come from Foucault.

Instead, the most germane aspect that emanates from Foucault is the awareness that the technology causes individualization and group formation, at least in this hypothetical circumstance. In this specific instance, neuroscience as applied through CNNM has created a disciplined knowledge about a subgroup of individuals with a special vulnerability. Marketing is one problem; they would be faced with many others. We should be aware of the role of the power and the knowledge that the technology generates on the population and be ready for certain consequences. The technology of a casino does not necessarily vitiate its role or its cause for existence, but it does make us aware that certain unhappy results might develop as a result of their form of "another power, another knowledge."

The Epineuromic Eruption

This instance is clearly a nightmare scenario already concocted by those who are critical of market functions and have simultaneous concerns with power and insight given by brain scanning technologies (and perhaps unrealistic expectations of the technologies currently available). This is the same as the first situation, only grown large, that the

technology used in CNNM creates an advertisement, design, or product that is irresistible to all, despite its value or lack thereof.

In one sense, this is the ideal situation for any industry and history has plenty of examples where products have found their way to such mass usage that they've become commonplace, accepted, and perhaps only their absence is noted as a fundamental difference. One readily thinks of mobile phones and televisions, perhaps, but even more basic technologies such as electric light bulbs, running heated water, and motorized transport are more fundamental and more common (at least in the West.) The difference between the situation envisioned in the nightmare scenario and these real-life examples of useful things is that of an objective sense of value. Clean, potable water needs little "manipulation" or even "persuasion" to understand its value. One might argue about other artifacts, such as automobiles or mobile phones, but the overwhelming popularity of them seems to indicate some degree of widespread agreement on value. There is also an opposite difference—namely, widespread criticism and debate over the value or harm of automobiles and mobile phones—that equally suggests a lack of compulsion in adopting them.

Instead, the epineuromic nightmare is the conception of a widget which offers little in the sense of any objective value and is instead an artifact prized only for the persuasion or coercion used by its purveyors. In this circumstance, the role of power-knowledge would be absolute or as close to it as to make very little difference. The change of scale for its compelling all, rather than a tiny part of, the population would again seem to have very little essential difference for Foucault in a normative sense.

What is does instead is it makes the situation of coercion, of the installation of power-knowledge, much more obvious. The concern about this circumstance is far removed from reality, given the capabilities of today's technology and today's understanding of brain science. There is a vast gap between studying arousal and attention while a customer views items on a grocery store shelf and that of concocting a scenario in which that customer helplessly flings all of the items from the shelf and into the cart. Such a scenario shows the ultimate knowledge leading to the ultimate power – the keys to the economic kingdom (at least in the short term.) Its unlikelihood, however, tempers the concern in a most considerable fashion.

The Tree Falls But No One Hears: Pure Knowledge in the Commercial Discipline

For Foucault, with knowledge, there is power. In the instance imagined here, there are discoveries made about brain structure or mind function which might show some knowledge relating to the functions of the body or illustrates the roots of behavior, but is not relevant to and does not effect purchasing decisions.

Instead, this appears to be a further transition or transmission of power and knowledge across a discipline. Much like what has been traced out above, with regard to the flow of knowledge from the institutions of medicine and clinical research to that of the commercial realm, a stream of knowledge curving back to those originators –if they may be called such—hails from commercially-oriented discovery. The argument comparing science to technology and vice versa is an old one and most likely stems from whatever camp the person arguing happens to occupy. Latour and others within the

"French school" of ANT, social studies of scientific knowledge, and the social construction of technology threw up their hands and termed it "technoscience" as a single discipline.

This seems to be especially apt considering the circular process of scientific knowledge used to create the technology and, in the case of, for example, brain imaging equipment, the knowledge elicited by the technology circulating back to the realm of "pure" scientific research. This question is rather outside of the scope of the current essay, but the extent to which the findings of CNNM have influenced other papers in other disciplines would be an interesting one; the first step of conducting the inquiry would be through citation analysis, but this would also come with a weak point: the relatively small number of papers published in a peer-reviewed setting that stem from commercial research.

While I have been treating consumer neuroscience and neuromarketing as one phenomenon for the purposes of exploring autonomy and privacy, this split between academia and industry is a real one when it comes to application. The power-knowledge basis would seem again to rear its head, though perhaps not in a way that would be obvious; the power would be channeled through a succession of peer-reviewed combinations that would, at some point, presumably, lead to a "finished" or at least coherent, understood set of knowledge with its own power base.

Unpublished findings, however powerful in the sense that it might help a single organization build a product or produce an advertisement with effect, would have very little power in the sense of any other finding. If, for example, a brain study found an interesting phenomenon that was not central to the point of an attempt to make a better

ad, and it was never published, this knowledge has little power. Many would argue that this is a loss to the scientific project at large, and that is likely correct. What it does underscore, however, is a further reiteration of the Foucault map of power and knowledge, even when not directly connected to the consumer.

Gullibility by All

Universal gullibility is a variation on the theme explored earlier involving the overclaiming and over-promising elements associated with aggressive sales tactics exerted on desperate business executives, but expands and broadens it. Zack Lynch, author of *The Neuro Revolution* and founder of the Neurotechnology Industry Organization, wrote with no small enthusiasm about the trend toward "neuro-everything." The BRAIN Initiative, spearheaded by the US National Institutes of Health and announced by the Obama administration in 2013, is an example of public policy measures taken to further research and to hasten development through the use of government grants and programs. Before the turn of the century, the first Bush administration hailed the 1990s as the "Decade of the Brain," a turn of phrase that has been re-worked and repeated many times and highlighted scores of magazine covers since. (Penrod 2018)

At the same time, however, the simple use of the word neuro has cachet, to the extent that even including it as a part of a trade name or title changes the perception of the product or service. Nowhere is this more in evidence than the names of the neuromarketing firms themselves (Neurensics, NeuroInsight, Neurofocus, Neurosense)

but also, Lindell and Kidd (2013) found that educational products with the word "neuro" included in the name had higher sales and enhanced perceptions about it than those without. The actual efficacy of the product was immaterial to either perception or sales.

Viewing this through the Foucauldian lens, we see the ultimate manifestation of knowledge's power. One could also potentially argue that this represents the ultimate in the Panopticon-type gaze of the technology. One seems prepared to surrender privacy and autonomy when bowing before the neuro-reputation, as the power exhibited by it is all-pervasive and indomitable. Despite the reports of dead salmon exhibiting brain activity in the fMRI machine (Bennett 2010) and the reporting coverage of sharp scientific disputes regarding the probative value of neuroimaging technology, the gaze remains, relentless. Despite the careful and more nuanced view of majority of scientists involved in the inquiry regarding brain structure and function, the more scrupulous attention to credibility and value by neuromarketing professionals, and the cautious assessments by many in the mainstream marketing profession, the gaze remains, relentless.

In this case, the gaze settles on, derives knowledge from, and exerts power upon the social body rather than a specific biological body. It also appears to answer the question regarding whether ethical considerations exist with the possibility of no efficacy; that answer is affirmative, not the least reason being that the technology does have efficacy. There are debates as to the extent of the efficacy and applicability of the knowledge, but some sense of power indeed remains.

Foucault wrote: "While, on the one hand, the disciplinary establishments increase, their mechanisms have a certain tendency to become 'de-institutionalized', to emerge

from the closed fortresses in which they once functioned and to circulate in a 'free' state: the massive, compact disciplines are broken down into flexible methods of control, which may be transferred and adapted." This is an elegant conclusion, describing the evolution of the use of the CNNM technology, its deployment in different settings, and its eventual flexibility through different institutional parameters, to be used on different groups and different individuals. The wrinkles, corners, holes, and blank spots on the map can all be seen in the matrix attendant to this. Falling short of suggesting the substitution of Foucault's views for ethical constructs, it can still be recommended that his analyses will, in fact, provide greater insight into the assumptions and consequences of the use of technology and its limits.

Specific Technologies, More Specific Problems

Most of the discussion within this piece has been confined to a general conception of brain scanning and behavioral measurement technology and its direct linkage to CNNM. Some distinctions should be made when considering specific technologies and recognizing that the ethical calculus differs, along with the Foucauldian framework that would accompany it in the context of this essay. My work in this portion of the analysis again adapts Foucault, creating a continuum of the power-knowledge concept plotted in conjunction with the type and invasiveness of a specific technology. The greater the knowledge, the greater the power –in Foucault's model—and the following analysis follows the type and quality of technologies that would generate information.

In this way, two major components of each form of technology would seem to form the borders of this calculus: the invasiveness of the technology and the probity of it.

Invasiveness is a concept that has a number of different dimensions. First, the invasiveness of the procedure itself on the research subject – the difference, for example, of wearing a pair of eyeglasses that track pupil movement and that of being placed in a machine (perhaps after having been administered a contrasting agent) to have brain activity monitored for a period of time. Another sense in which "invasiveness" should be considered is the degree to which a consumer's thoughts, decisions, or actions can be controlled by the information gleaned from the research on another. As we've seen, the direct efficacy of the techniques is quite low, but the Foucauldian aspect of the impression of control is another and distinguishable element.

Probity of a given technology is, in some cases, related to the invasiveness of it. This likely is the case whether in the context of a research subject or a consumer, but this is not always the case. The content analysis in Essay Two would underscore considerations other than bright, colored pictures of the brain, with the most frequent technologies being relied upon to study consumer behavior being the EEG and eyetracking. If the reliance on technology in those data are to be understood to be related, however roughly, to the value that the researchers find in the use of it, probity is context-dependent and largely dependent on external factors.

One Foucauldian approach would be to discuss these technologies in the context of biopolitics. Michel Foucault himself experimented with EEG in the 1950s, early in his career, which focused on the history of psychiatry and mental illness, particularly in France. This vision of state power and confinement (certainly involuntary but perhaps

also voluntary as well) were important central pillars for Foucault and were largely emblematic of the twin visions of power and knowledge that would be associated with it. Interestingly, Foucault's own use of the EEG in the clinical setting, coming about as a significant component of his doctoral research, was something that he found deeply intriguing; his reports of the experience seemed untroubled by the "gaze" of this technoscientific artifact into the activities of the brain. What this would mean, for the estimation of biopolitics, is that the technology itself asks the question of identity. (Pugliese) Instead of searching for impersonal truth about a given set of circumstances, the technology is designed to answer the question "Who are you?" which Joseph Pugliese terms "the biopolitical question *par excellence.*" (Pugliese 50)

Pugliese's work, also deploying Foucault, examines the use of biometric technologies, particularly when applied by the state. The issues in his monograph are largely ones of racism, immigration, and cultural identity (for example, some of Pugliese's research suggests that facial recognition software is calibrated toward Caucasian features). These issues are, of course, not without bearing and import in the context of CNNM, but our focus in this essay is different. Biometrics, as a class of technology, are used widely in CNNM, but the ethical issue is one of privacy and autonomy, with the question in this section being whether certain technologies trip the "power-knowledge" balance in Foucault in a way that is more or less problematic than others.

With the knowledge that Foucault personally used EEG on psychiatric patients, and the problems that are frequently represented by state use of technology against citizens, we recognize the same dynamics: privacy and autonomy. Natural ancillary

questions also arise; for example, the privacy of data extracted through private means against state or governmental bodies (the police), or even other private bodes (such as insurance companies). However, the scope here is to only compare the technologies along the power-knowledge axis proposed by Foucault.

I address first the technologies in CNNM which are deployed to measure physiological and behavioral reactions (eye-tracking and biometrics) and then technologies which examine brain activity (EEG and fRMI). The two categories are more separate from each other than each of their constituents, though, as we've seen in Essay Two, many practitioners favor a mix of the technologies rather than acting as an evangelist for one. The categories seem to be separated by a type of viscerality associated with the technologies; the imaging techniques imply a gaze, a distance with an intermediary not only of inscription and representation, but also of translation in terms of the expertise. The meaning of a given fMRI scan, or an EEG result, is also a matter of human interpretation; meaning is rendered through the interpretation of the machine's gaze. By contrast, measuring bodily functions – the pulse, the sweat, the dilation and direction of the eye – give an immediacy that renders an interpretation that does not depend on an expert gaze. Without question, the more complicated behavioral tests are subject to expertise filters as well, but, at some level, an increased pulse or heightened sweating means something to most anyone with a rudimentary understanding of physiology and the human experience. It is a measure that we all understand, though specific interpretations of it are open for psychological and behavioral expertise. Very few people can, without specific training, interpret the finding of an fMRI.

The distinction is one of knowledge and therefore, in Foucault's terms, also of power. There is a power relationship concentrated in the expertise attendant to the ability to read and interpret EEG and fMRI, a phenomenon also seen in the content analysis in Essay Two. Just the same, however, there is a power and knowledge with regard to the use of the visceral technologies as well – perhaps something that is more democratized and more available to a far wider array of persons. The technologies, as deployed, are still *created* with expertise, but the results elicited do not seem to be as rarified, perhaps because observing the results are a the product of a gaze shared and shareable by many.

Viscerality: Eye-tracking, Bodily Responses

Eye-tracking is a technology evocative of Foucault. It looks at nothing *other* than gaze; it is a gaze upon a gaze. It renders meaning into this through the linkage to attention, both overt and covert. Tracking the eyes might, in some way, be akin to tracking the "windows to the soul" if, in fact, the soul consists of attention and fixation of the visual field. This is not as glib as it may appear; the visual sense occupies the vast majority of attention and cognition by the brain. Humans are, above everything, visual animals. (Beaulieu)

Much of the scholarship, both current and over the time since the 1970s, has utilized eyetracking as a measure of decisionmaking by exploring the linkage between eye movement and mental attention. The polarity of that attention –is something being attended to because it represents beauty or is it repulsive? – is the frank spectrum of

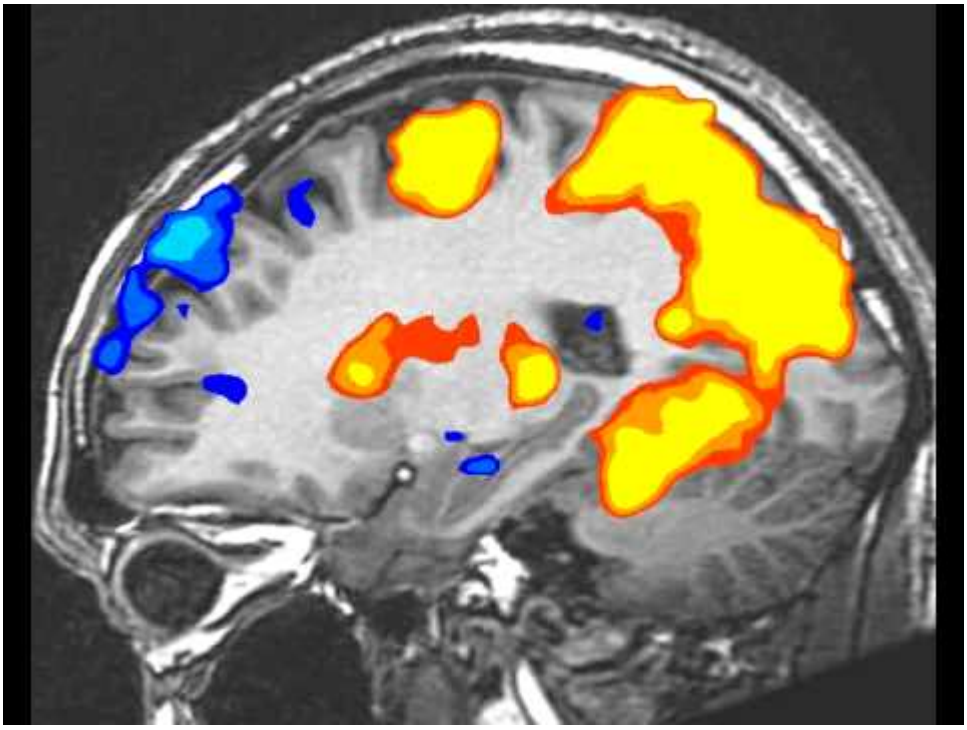
inward bodily responses that might also be followed through other technologies such as pulse and galvanic skin response.

What are the ethical implications of the visceral technologies, at least in Foucauldian terms?

First, as noted, the knowledge and ability to read and interpret meaning into altered bodily states is widely distributed. Identification and measurement of the body's reactions are the roles of the technology, but the understanding of the meaning of those measurements is relatively open. There is, like many things, the possibility for erroneous interpretation, but one could be fairly assured that the chances of that occurring would be demonstrably less than that of looking at an fMRI scan or EEG readout and attempting a similar interpretation by peering at a network of activated voxels on an unlabeled brain map.

EEG:

fMRI:



ABOVE: Both the EEG and fMRI scans have aesthetically intriguing appeal, but without an understanding of anatomy, fundamental psychiatric, and engineering principles, the average person would be lost in attempting to make sense of these types of images in response to a marketing event. In addition, many modern EEG systems result in brain-imaging-type of visual depictions that look, to the layman, very similar to what might be found as a result of an fMRI scan.

This democratization of knowledge also means that the power would be similarly distributed. The knowledge of person A having an elevated response (B) to advertisement (C) would indicate that C "did" something to A, as measured by B. This knowledge may or may not be sensitive in nature and, in the absence of C containing something truly shocking to A as an individual or as a part of a culture, would be more or less open to interpretation and error.

Eye-tracking does have a level of technical complication that is perhaps separable from other visceral measures. The sophistication of the way eye movement itself is

tracked and cataloged requires technological and engineering know-how, as does the interpretation of the result:

ABOVE: Eye-tracking study showing areas of greatest attention and the movement of the gaze on a website. Taken from https://www.usability.gov/how-to-and-tools/methods/eye-tracking.html. Such a schematic can also be done using a "heat map" which shows in color where gaze fixated the longest.

However, the measurement of *attention* is something that would be more straightforward to interpret. It is, after all, up to a machine to measure something like blood pressure or levels of sweat from the skin, but it is up to the human to know what it

means – just as in the above image, the areas of greatest gaze would appear to have held the greatest attention. This measure, however, is also subject to wide variation of knowledge and potential for error.

It could be argued that the corpus of knowledge created by a visceral reading is a diffuse measure. The non-specific nature of it does mean that, while it is accessible to non-experts, the power that is thought to be part of the knowledge, in Foucauldian terms, is also diffuse. Such knowledge and power could be concentrated into an individual or a small group but that would be due to circumstances largely *outside of* the technology. It could be a product of the setting or the experimental design, but the knowledge-power ethical constituent inhering in the technology itself is spread more widely and thinly.

It seems ironic that the visceral technologies, at least in the context of CNNM, could be considerably less ethically troublesome than the non-visceral examples. Of course, the data collected might still be subject to issues such as research subject and data protection, but those are not in the narrow context *of the* technological method. On the field of visceral technologies, the consumer and the marketer are much closer to one another, the embodiment of the technologies more intimate and confused. An elevated heart rate might be signifying the arousal by a package; it might also mean the consumer is having a reaction to lunch. The uncertainty taken on by the marketing expert in this context is precisely both the loss of knowledge and the loss of power. In addition, any of the technologies involved in CNNM possess epistemic confounders which increases risk and uncertainty on the part of the marketer performing the interpretation of the information gathered.

Non-Viscerality and the Machine Gaze: EEG and fMRI

Brain-scanning and imaging technology requires a highly specialized level of skill and knowledge to interpret and render meaning. The ability to understand brain anatomy and have knowledge of the meaning of evoked potentials in an EEG is but one layer; being able to attempt an interpretation of this activity and its relationship to specific affective state or behavior is another. Neither of these is within the ambit of the general understanding of the visceral technologies. Having an increased signal in a certain part of the brain is not cognate with an increased pulse or respiration rate.

One of the difficulties continuing to inhere in the "gaze" technology is one of epistemology, an ongoing debate best covered elsewhere. (Penrod 2018) Even taking the most charitable interpretation of fMRI and its ability to link certain brain activity to affective states, the knowledge and therefore the power of its gaze remains concentrated in an elite group.

One of Foucault's main areas of thought and concern is the negotiated structure of knowledge within a group. In the case of the non-visceral technologies, this negotiation of "truth" is necessarily limited to an exceptionally small group with concentrated and specific knowledge. (Pugliese) This is also therefore foreclosed to most of the public (and, largely, foreclosed to other scientists in psychological research and certainly foreclosed to the vast majority of marketing experts.) This concentration of power-knowledge creates a deeper ethical concern within the Foucauldian construct due to the concentration of power and knowledge in a highly specific group with abundant incentive to ensure that the barriers to entry of their expertise remain high.

In assessing this in some practical terms, through examining the discourse provided in Essay Two, the temptation is to "read into" some of the presentations an oral clue that this type of barrier-construction is taking place. Given, however, the prevalence and favoring of the usage of the visceral technologies, the discourse cannot bear out the supposition. If, by the way, such barriers *were* being constructed, one could re-try a more classical ANT analysis which would involve a traditional discussion of enrollment and mobilization, rather than the modified theory I used, grounded in the data provided at the conferences.

Of course, the content analysis in Essay Two does not represent the entire universe of CNNM, much less that of brain imaging and neurology more generally. Usage of the non-visceral technologies was, especially in the case of fMRI, part and parcel of social neuroscience, and this not only essentially launched modern neuroscience, but created the privileging of the visual representation and the widespread popularity of the fMRI technique found in mass media reports (and also the target of the overclaiming aspect so distrusted by many others, including the most respected figures within the CNNM community.)

The Foucault elements seem to be, in this context, far more Panopticon and less discipline and punish. By the time the people (in the form of information) get converted into standardized data with the non-visceral gaze, the group and individuals have been entirely summarized into bits, sorted into categories, and imbued with meaning that registers only in the set of sounds that can be heard with trained ears. Some discussion has been made about the "fear" regarding neuromarketing, in the sense of an organization "needing" to do it just in case there is "something to it" that a competitor might be doing.

This seems to be a perfect Foucauldian dilemma. The organization or person charged with the responsibility of the decision to enter the arena has virtually no knowledge and power.

Why is it, then, still not terribly widespread? Is there something to be learned in these ethical and Foucauldian terms? Perhaps. The field of knowledge is still contested. The degree to which brain activity depicted in the scans might have behavioral analogs is the source of continued controversy within psychological and neuroscience circles. This alone might simply be enough for some organizations and individuals to avoid the dilemma of power and knowledge; the knowledge is not yet clear, so the threat of power is likely an empty one.

This also goes strongly to the point of power and knowledge. With uncontested knowledge, there likely follows uncontested power, at least in some narrow domain. This is not the case here, so the power is very much amorphous and contested. One possible speculation is that organizations that tend to use CNNM insights are already invested in power and knowledge in other areas, and therefore have either the luxury or the epistemic foundations for which CNNM would make sense. Coca-Cola, for example, has not only incentive to conduct such studies, but the economic resources and the expertise to truly garner an understanding of CNNM and its application to their brand and product.

The question here, however, is not the epistemic strength or the actual contestation of the science. It is whether Foucault has something to say about the ethics involved, and the evidence and these arguments would appear to indicate that, indeed, the intertwining of the human body, the technology, and the power-knowledge axis all lead to the conclusion that there is value in this added ethical consideration.

Other ethical considerations for future reflection

While this essay has closely analyzed notions of power and knowledge in a Foucauldian sense because of the unique mixture of brain and technology involved in CNNM, it should not preclude consideration under larger ethical schools as well. Studying the field in the context of personal privacy and autonomy on the part of the consumer, rather than research subject, tends to complicate factors, but it is not impossible. Some examples follow.

At its most basic level, the watchword for utilitarianism is happiness.[35] Without diving into the history of this ethical school and the pitched battles fought over the meaning of positive or negative utilitarianism, the meaning and measurement of happiness, rules, and so on, consumer autonomy can be given due consideration. Like many aspects of utilitarianism, so much depends on the weighting of the inputs, but, as long as those are fully described and understood, it might yield a transparent and considered approach for the gauging of happiness. Better products for us all might yield greater social happiness, and this might even be weighed against the most pernicious aspects that the fears regarding privacy and autonomy could generate.

In deontological terms, CNNM might be thought of as an encoding of systems of rights, as deontological thought tends to prioritize rules and systems of rules for

[35] An interesting contrast could be noted here that, while utilitarianism is designed for something akin to maximizing overall human happiness, the jury is very much out as to whether this is the ultimate purpose to which the human *brain* is attuned. Evolutionary theorists might point to the fact that the brain and its architecture originated in a complex and hostile environment and the primary purpose of the great intelligence evinced by the human brain is to avoid threats. Whether this apparent incongruence makes utilitarianism incompatible with human life is a question for future consideration.

governing conduct. Given the ordinary points of contact that deontological ethics have with history, Immanuel Kant and Kantians would like also focus on the body but in the more classically Continental style of philosophy with a focus on autonomy. Indeed, autonomy tends to be stressed within the deontology of Kant, and "central to the ethical theory." (Taylor) At the same time, autonomy rings a bit differently within deontology than it does in other ethical schools and is thought of more in terms of interests than power. Deontology would likely involve a thorough and sometimes self-contradictory system of rules governing the conduct of commercial research within CNNM. Given Kant's reluctance to consider economic value of any aspect of the human body (he held that selling one's hair would be immoral), it may be that there would be no room at all for the commercial use of technologies such as this in a pure Kantian construct. This brings up added questions about the possibility of an affront to generalized dignity, given a concern about privacy and autonomy.

Last, virtue ethics also points in certain directions with regard to CNNM. Virtue ethics has, at its core, the ideas about the strength of character and that virtue flows directly from the elements of character, such as honesty or benevolence. (Stanford) Virtue ethics tends to defy both codifiability and black-letter rules, which opens it up for critiques of inconsistency and relativism. It certainly stands to reason that certain virtues may be present in greater amounts in some cultures, as opposed to others (an ancient example being Athens and Sparta), and Western society has already found its way to different policy conclusions with regard to the legality of commercial neuroscience. While the inconsistency argument may be quite strong, the ordinary values of virtue ethics which do uphold general concepts of liberty, privacy, and autonomy. Given that

assumption, it seems that use of CNNM for undue influence over unwitting consumers would be considered unethical.

Other contemporary thinkers particularly in the realm of the philosophy of technology may also provide grounds for further consideration. The contributions of the American postphenomenologist Don Ihde are notable in recognizing the concepts of technological augmentation of the human body, not just in the transhumanist fashion, but in the more prosaic artifacts which virtually everyone uses daily – glasses or contacts, telephones, automobiles. The role of technology and the role of the body become increasingly blurred…so much so, in fact, that the use of the technology itself becomes seamless and conveys information not as discrete steps but as a single act. Dylan Wittkower has analyzed some of the consequences of this phenomenological view and argues that the act, as opposed to the object (in our case, a brain imaging sequence or a behavioral measurement sequence), is an ethical consideration, as the focus point is the relationship between the "interaction and the consent" for its use. (Wittkower 2016)

At the very least, just viewed through Foucault's lenses, we can also imagine a world in which all individuals are on offer for comparison to the "disciplined" scans. This has already been the case not only in the history of imprisonment and criminal law, but in today's courtrooms. (Fallon) A temptation to make similar comparisons –be the technology visceral or the gaze—as economic and related efficiencies continue will make the database of knowledge of brains and bodies continue to grow. At the very least, there is a risk of an imposition of structure (for the gazing technology) and parameter (for the visceral technology.)

The importance of the use of Foucault and his lens on business and marketing ethics has widespread possibilities for further consideration. First of all, many things are marketed in today's world, even things and ideas that we don't classically consider as "marketing." The introduction essay discusses the appeal of political candidates and some of the popular news items that appear to further the narrative of omniscience and neuroscience. We have explored at length the gaps in efficacy and the gaps between understanding true efficacy and yet the sense of *being able to influence* as standing in for *actual* influence. The strength of Foucault, despite the problematic definitional aspects, is the clear linkage of the technology to the researcher, and the researcher –possibly—to a power relationship. Indeed, another aspect is that the linkage can serve as a notice to those within the CNNM field, and consumers more generally, about the linkage between the two. It might be best described at this point as an intuitive suspicion about any number of people with superior knowledge (fear of an expert), be it a fast-talking salesperson, a lifelong political operator, or even a design engineer. It allows us all to be more reflective; to have awareness of the impact of the technologies and the impact of the perception of the technologies. Much of this might be limited by competitive forces in the marketplace (it hardly benefits a firm to sacrifice secrets to its competitors) but it does allow a degree of transparency when seeking to curb potential excesses and abuses of power.

At the same time, Foucault's lack of definition of power –or, perhaps, his one-size political approach within *Discipline and Punish*—stands as a problem. While at a very high level of generalization, having knowledge about the world has a clear association (though perhaps not pure causation) with efficacy *in* the world, there is a difference

between competence and power. Expert knowledge, performed in a medical, clinical, research, or marketing standpoint, need not always be considered as oppositional to the interests of everyone else. In Foucault's work, the opposition between the state and the individual seems clear, but in many other aspects of social action and life, expert and non-expert might very well be aligned in the interest of attaining a goal. This is the clear end of most of marketing and commerce: a beneficial and mutual exchange.

There is a further concern, not just within the realm of CNNM, but with the perception of omniscience that sometimes accompanies brain imaging studies. As noted in the introduction, Iacoboni and colleagues had widely-distributed prognostications about affective states of the viewer when watching political candidates. The tincture of omniscience throughout the text is worrisome, especially when the technique and the science are still open to so much interpretation and controversy. What the researchers – not invested in CNNM—were doing in this context was engaging the mass media is the heart of one of the issues outlined above: that the perception of knowledge *gives power.* And that should let us think very carefully indeed about Foucault's points.

In terms of concrete recommendations, where does this get us? I propose the following recommendations, or at least areas for further ethical consideration:

- Pro-social messaging and tactics to encourage cooperation. Environmental awareness, public health measures (such as smoking cessation), advertisements for charity, legal aid, medical assistance are all excellent grounds for marketing and communications firms to pursue using a pro bono pathway. At the same time, the industry must be ready to defend against charges of "manipulation" in terms

of social engineering and achieving government policy; however, techniques such as those outlined by Sunstein and Thaler in *Nudge* might prove to preserve choice and individual liberty while also assisting in a pro-social manner.

- Establish and maintain a clearinghouse of publicly available information relating to CNNM research in an effort to de-mystify the processes. Any attempts at influencing thought and behavior will, at some level, always be criticized, but by showing bona fide efforts to share the knowledge widely, the concern about the abuse of power might subside.
- Assist in unlocking behavioral, emotional, and psychiatric disorders. Mechanisms associated with compulsion and affect are widely researched in CNNM and elsewhere in the neuroscience realm; establishing a fund or program to assist this research and such clinically identifiable individuals will help the ongoing challenges in providing mental health treatment in society.
- Be prepared to create and foster a program for unanticipated mental and psychiatric findings. One of the ongoing ethical concerns in CNNM research and neuroscience at large are the questions of what to do if one finds an anomaly (such as a potentially cancerous growth) on, say, a brain image. Confusion may exist in terms of legal, ethical, and medical obligations due to study or equipment limitations but, again, establishment of a coherent and consistent policy will go some distance in allaying ethical worries.
- Establishment of a more meaningful set of ethical norms which can be articulated through voluntary industry standards, with a third-party audit and review program. Some critique has been leveled at the CNNM research industry and the

NMSBA due to its minimal attempts at rectifying abuses such as overclaiming. Further improvement in this area could also deflate some of the criticism and worries, and stave off market backlash or burdensome government regulations (as has already happened in France).

We have, in this essay, briefly explored the policy and ethical landscape involved in the commercial use of neuroscience. After examining the roots of the issues, based in ethics and bioethics, we turned specifically toward the use of Foucault's thought as a way of better illuminating the edges and wrinkles within ordinary ethical constructs. Considerations of the power-knowledge relationship, and the relationship of the body to the social body provide more specific information as to the problems of control and consent in regard to the third party consumer. Future research directions should include these considerations and might be further enhanced through the view of the relationships of the technologies to the body, as what one finds in Ihde and the postphenomenological legacy. The externalized consciousness, represented by the market, promises to be a fruitful area for empirical, sociological, and ethical research for much time to come.

Conclusion

Technoscience, Commerce, and Consciousness: Some Concluding Thoughts on Innovating the Mind

The essays within this work have developed a framework for further understanding the socio-technological implications of consumer neuroscience and neuromarketing (CNNM). The questions that remain at the end of such an exercise are, perhaps, tempting to approach in such a way so as to create an estimation of the "big picture." Where is it that we now see CNNM?

In Essay One, we recounted the history of psychological decision theory and the major technologies used (and, at least as interesting, not used) to study and measure brain activity and human behavior. We saw that the types of technologies and the results elicited from their usage are not as intuitively obvious as many, including stories in the mass media, would have us believe. During this analysis, we proposed and employed an adapted theory of technological and scientific change that applies to the context of when the controversies involving the scientific fields and technological tools are still very much alive. The new adaptation, convergence, comparing the insights gained from interpretative flexibility and technological momentum, helps pinpoint and fashion a descriptive framework for scientific inquiry and technology that has not yet reached closure; instead, there is a catalyzing moment in which a combination of theories combine to form a single direction. I argued that the ascent of social neuroscience, after a long history of agglomeration of technologies and behavioral sciences, made for a concrete road to realization of CNNM.

In Essay Two, we examined the formation of an expert group engaged in the practice of CNNM (albeit, more NM than CN). The categories of discourse signified a cross-disciplinary engagement with neuroscience, technology, and marketing, all of which were analyzed with a modified actor-network theory. We found with the analysis of content that the usage of specific technologies were not necessarily congruent with the "headline-making" aspects in the mass media, and also that older technologies were frequently used with greater efficiency and effect. At the same time, this did not diminish the expertise that was accepted and developed as a part of the group formation. Essay Two's findings as well tended to show that the diverse technologies and development of psychological decision theories chronicled in Essay One are congruent. The expertise shown as constructed within the discipline in the discourse captured is best described in a modified approach to actor-network theory. The adaptation of ANT became necessitated by the grounding and shape of the discourse itself. The new categories that describe group formation transcend the technological and scientific, which reflects the discipline of CNNM itself.

In Essay Three, we moved beyond the "ordinary" considerations of neuroethics and neuromarketing ethics and explored the meaning of concepts such as biopolitics and the Foucauldian framework of the knowledge-power axis to better understand the ethical implications of technologies which might impinge on privacy and autonomy of the consumer. Using different formulations of ethical dilemmas and the possible different meanings of different technologies, we found a likelihood that there does, in fact, exist a controversy in terms of possible privacy and autonomy aspects even in the absence of true efficacy, and that the visceral technologies possess a more democratically

understandable (and possibly less manipulative) set of consequences than the more advanced and non-visceral gazing technologies. The conclusions of Essay Three are best understood in the context of a continuum across technologies and applications of those technologies and should not be interpreted as a pathway to panic. Instead, it shows that the role of expertise might heighten certain types of ethical concern, and an approach to address it is to be aware of the role of the expert. The conclusions of Essay Three also seem to be borne out by the catalyzing moment in Essay One, where the most esoteric technology and exotic science finds its way to the greatest levels of probity. Similarly, within Essay Two, many of the participants seek to show expertise, in at least a part of CNNM, by showing conversance with the knowledge that one would, in Foucauldian terms, expect to follow with power. Essay Three also contains some concrete policy-oriented recommendations informed by the novel ethical analysis which might be implemented in an effort to de-mystify the field and allow it to bring new efficiencies and innovations.

One important conclusion to draw across all three essays is that the controversies mean something in terms of the science and technology. Usage of the theories and the artifacts to answer questions about marketing has implications that go beyond marketing. One of the most intriguing possibilities is that the research into consumer preferences and bodily responses might create meaning that is generalized and rendered back into basic scientific understanding about the human condition, something openly pondered by Plassmann and colleagues. (Plassmann 2015) CNNM is as much of a reflective tool as anything else, particularly when done in ways which are well-controlled and well-considered. Very few behaviors are as omnipresent and accessible as a purchase

decision, which includes desire, assessment, intrigue, affection, disgust, and countless other human states.

In an informal conversation I had several years ago with a practicing neuroscientist at Johns Hopkins, during the initial stages of scoping out this project, he told me that whenever he heard a fellow neuroscientist publicly ruminating on questions about "consciousness," it was nearly a sure bet that the ruminator was close to retirement. I interpreted this remark to mean a couple of things; first, most neuroscientists have been "burned" in some form or fashion by overwrought claims about findings of brain activity, second, that most neuroscientists are happily engaged in what Kuhn would have called "normal" science and aren't looking for headline-grabbing paradigm shifts, and third, a lot of these same questions aren't really within the realm of neuroscience but might be more properly addressed in other forums, such as those populated by philosophers.

Still, though, the meaning associated with something that we ordinarily view as prosaic behavior -- making a purchase, responding to an advertisement— does lend an important window into human existence if for no other reason than its commonality. At the very least, we can say that our most prosaic behaviors can be interpreted as a cascade of breathtaking complexity, to see the most ordinary of tasks to be so effortlessly executed by systems that we don't even notice in operation. These are *all* internal activities, processes and thoughts and actions and reactions, all occurring within our central nervous system. With this comes the temptation to assume that all we need know about consciousness is contained within a skull. Many would have us interpret those plates of bone a half inch thick as the physical and tangible boundary point of consciousness and the limit of what the *meaning* of consciousness actually is. The old

time-worn metaphor of a brain in a vat is thus made manifest in some way, with our bodies as the vats and the physical containment of the skull spelling out the boundaries of the known universe.

What we see through CNNM and other research that has been a part of the enterprise is that this cannot serve to explain the complexity of our simplest behaviors; it does in part, but if one seeks the total from the approach, one is likely to miss out on both observable phenomena and the meanings of them. If one takes a justified true belief in assuming that we are not either taking part in a simulation in one tiny corner of a hyper-real universe and that our lives are not an intermediate chemical cascade shimmering through our suspended-in-solution vat-mired brains, then we must know that our experiences lie *outside* of our skulls as well.

Antonio Damasio and many others have shown that our nervous systems are instantiated in our bodies, and our bodies are in the world. We are all in the world, experiencing the countless stimuli and responding in countless ways...again, the vast majority of which are mechanisms that we are not aware of, nor know anything about. Our bodies are the vats which interact with other vats, with substances, with information. Our brains cannot function without the external world providing feedback to our bodies in some constant way. Most of the action associated with consciousness seems to happen on the external side of our skulls, which is even more complex than the internal side.

Philosopher Alva Noe is one of the leading thinkers regarding the environmental elements of consciousness. He writes that our skulls are vats, our bodies the life support systems, and the actions we take being in the world are at least as a central constituent of consciousness as anything inside. "To understand consciousness in humans and animals,

we must look not inward, into the recesses of our insides; rather, we need to look to the ways in which each of us, as a whole animal, carries on the processes of living in and with and in response to the world around us. The subject of experience is not a bit of your body. You are not your brain. The brain, rather, is part of what you are." (Noe, 7). Noe also would describe his own concerns with an over reliance on technological methods for understanding human nature, the struggle over which was a recurring item of controversy throughout all three essays in this work. As stated in Essay One, Noe wrote that “like teenagers, neuroscience is in the grip of technology; it has a grandiose sense of its own abilities; and it is entirely lacking a sense of the history of what, for it, seems so new and exciting.”

Ever since the days of Descartes, and perhaps long before, the idea of coexistence of the brain and mind was controversial, in large part due to questions of the existence (and location) of the soul (Makari), but even without the supernatural or religious context, the debate still rages along the borders of where the brain and mind begin and end. The idea that that mind is largely housed in the brain is uncontroversial; such a statement would have been known for centuries. Taken in this context, the actual localization of some processes or behaviors to some parts of the brain might be academically interesting, but not a dramatic breakthrough. The case study of the sudden personality change of Phineas Gage will only get you so far. We've known for a very long time that speech is processed in the brain; that is not news. What may be more newsworthy is the ability of the brain to recover from certain localized injury which would have previously been thought to preclude language ability. The plasticity of the brain and the ability to recover from such horrendous injury is an important area for

research. It does not, however, truly point to a new understanding of consciousness, what it feels like to be a bat (the famous example by Thomas Nagel), or to be able to communicate the meaning of the color "red." The meaning comes from somewhere else, areas that have not found agreement, much less satisfaction, among those who do think about the nature of consciousness.

Re-enter considerations of marketing. What better way to rate and categorize and measure experience than through the acts of exchange with others? Marketing, as a discipline, has been labeled as an applied form of sociology, and the social nature of the interactions within the field are some of the most central elements to it; how could a market exist if not for a plurality of persons seeking ways to exchange ideas, money, items? Plassmann (2015) also shows a list of areas for investigation which would help sharpen and define the relationship between marketing and science and refine the central theses within CNNM, including ideas regarding distinctions between psychology and physiology, underlying mechanisms of biases, and the incorporation of emotions into decisionmaking.

All three investigations in this dissertation involved the role of external forces acting on mental processes and, likewise, the shaping of the external environmental by internal cues. At the same time, an exchange is definitionally a collaborative process by which two or more parties agree to trade items of value. Persuasive or informative measures which seek to assist and to smooth terms of the trade are a necessary part of the discussion, used to ascertain and negotiate value of the terms of the trade.

One strong conclusion might be that there may be no better example of external consciousness as Noe describes than that of a marketing measure. The ability to reify this

through the mechanisms, processes, and theories we've seen throughout this work should also be examined. What do they each tell us regarding the collaborative nature of consciousness?

In the first essay, we witnessed the progression of technologies from a variety of sources converge on the central point of examining human responses to characteristic situations in the market: an experience of a product or advertisement, for example. The biological findings --whether visceral-oriented or gaze-oriented -- shows the connection of something outside of the skull, outside of the vat. Something has been exchanged, not only in terms of a possession of a thing or an idea, but also the very idea of the exchange itself. A notion of possession has crossed from one party to the next, a new sequence of events that occurred only within the internal-external consciousness.

Within this analysis, we can also detect, through a new adaptation of two theories widely used in the analysis of technological-cultural interaction, a phenomenon nearly gravitational in its properties, in the way that the disparate technologies and scientific theories moved toward providing explanations of human behavior when active in a purchase decision.

In the second essay, we could see another example of this non-concrete phenomenon, this formation of a group that is informed by congruent and similar concepts regarding the ability to exchange and share information about humans and their buying behaviors. None of the evidence from the content analysis presented in the essay would indicate that any of them grappled with the question of the larger meaning of the CNNM (except to, on occasion, defend its value). Despite this, the interconnections detected using the modified ANT approach give every indication of the clarity of further

steps that we would need to take in order to see full dimension of Noe's interpretation of external consciousness.

In the third essay, we could see that with the ideas of external consciousness comes the possible desire to control or shape the ways in which that external consciousness flows. The knowledge-power element is perhaps the most central consideration of what we could witness and the thesis involved -- that this same element includes an even more important consideration in terms of ethics -- becomes even clearer.

In other works, many of which have been covered in the form of summary in this work and others, we see the effects of exchange passed back and forth between the brain of one individual into that of another (or of a group.) The affective results of this, measured oftentimes by the technologies we've discussed, give a window not just into some abstract form of the mind or part of the brain that has academic interest, but a real window into a behavior that we see repeated countless times per day, across cities, countries, continents, and cultures.

Surely it's not even a stretch to suggest that something different might also be happening in today's era of globalization. The cross-cultural exchanges that have occurred as a result of this phenomenon could also be fundamentally changing and re-shaping our conscious experiences. The market, once interpreted to be something that can shaped by science and technology, instead becomes consciousness itself, interpreted by technoscience.

We can close this project by noting, in overview, some of the scholarly contributions made to the study of CNNM and STS, along with some future directions that this research may take in its next steps. First, the modified theory presented in Essay

One allows for consideration of a unified vision of an evolving and poorly-defined area of technoscience. At the same time, the history of decision theory and the technologies accompanying it is largely unique in the scholarship of marketing. The next steps of research in the areas surveyed by Essay One would be an expansion and more detailed treatment of the various aspects and intersections of the theories and technologies used. A more technical construction on some of the elements of the decision theories might also yield further insights and congruence with the technologies available at different times.

Essay Two took an approach to modifying another cornerstone STS analytical framework, in the form of ANT, and used it to study the formation of expertise through the analysis of conference presentations. This was a unique twist on the theory that expands its descriptive power based on evidence more resident in a confined area and when the actors were more congruent in their convergence on the goal of reifying CNNM and their own claims to expertise. I replaced the concept of "obligatory passage point" with a two-step problematization approach that better fit the environment of an entire field that struggles with legitimacy. In such a way, while ANT has been used to study innovation to great success, these slight modifications may serve to emphasize the special nature of innovation in an emergent and controversial area of technoscience. The next steps for research in this area is very straightforward – to expand the data set and add actors and actants to the network. The inclusion and interpolation of a thorough literature review and the peer-reviewed network to compare with the contents of the conferences covered (and others) would be a rich trove of information and proceed even further to that oft-hallowed "thick description" so closely associated with an ANT approach.

Last, the contribution of Essay Three is a direct inculcation of a Foucauldian approach to a standard ethical calculus. While not without its methodological difficulties, the simple and elegant Foucault continuum of power and knowledge added a much different and novel dimension to understanding the ethics of some aspects of CNNM, especially when it became clear that expertise would grow more and more concentrated in the direction of hyper-specialized professionals. At the same time, there is a countervailing effort of economic efficiency and a possibility that the epistemology of the visceral technologies are, in fact, more capable under field conditions, which would result in a greater spread of less-rarified knowledge. Next steps in this area would be a further exploration, perhaps empirically, of the epistemic and ethical differences between visceral and gaze technologies; another fruitful area for next investigations would be a thoroughgoing scholarly legal analysis of many of the issues raised by privacy and free-speech advocates and jurisprudence. Following such an analysis would be a set of policy recommendations that the private sector may elect (or not) to follow, or for policymakers to consider.

All of this has combined to create a fruitful partnership for marketing, management, business, and STS. With new considerations for marketing to use to reflect and to pursue its own goals, and new directions for STS to investigate, we have arrived at an interesting new departure point. We can conclude too that, for whatever the truth relating to the nature of consciousness, we can see the social dimension to both the scientific and technological enterprises present within CNNM. The essential point of STS, the role of society in shaping technology and science, and technology and science's shaping of society, is shown thoroughly throughout the work. Very few areas can show

the relationship more closely than an examination of CNNM, and the contributions of the theories of STS, as presented in each of the essays, can be seen readily in how we understand, appreciate, and shape these technoscientific entities. And, just as they will be re-formed and re-shaped, so shall we.

One final consideration is to think about the context and shape of the fields involved here: STS, certainly, and CNNM, but also neuroscience more broadly and technological applications. The technology, science, and techniques are going to continue to improve across all of the subfields: CNNM, medicine, clinical research. Never before have we, as a species and as a global society, been closer to understanding and, one day, defeating some of the cruelest conditions extant in the world today and within our own bodies. Neuroscience seems to be on the verge of solving some issues in horrible medical conditions, such as the notorious "locked-in syndrome." Similarly, researchers for CNNM are on the verge of finding new ways to increase the utility and usability of products and services of all shapes and sizes. Both areas will find ways in which we can better understand the human frailties of compulsion and illness, and both areas will enhance all of our lives considerably. There is hope in this new, external consciousness. Perhaps even Foucault would smile at the sight.

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Appendix A: NMSBA Code of Ethics

The NMSBA Code of Ethics for the Application of Neuroscience in Business.

Adoption of this code is a condition of membership to the NMSBA. The code may be revised from time to time to ensure that it adequately reflects the highest ethical standards for the neuromarketing research industry.

The NMSBA code accepts the principles enshrined in the ICC/ESOMAR code

DEFINITIONS

1. **Neuromarketing Research**, is the systematic collection and interpretation of neurological and neurophysiological insights about individuals using different protocols allowing researchers to explore non-verbal and physiological responses to various stimuli for the purposes of market research.

2. **Neuromarketing Researcher** is defined as any individual or an organization carrying out, or acting as a Neuromarketing consultant on, a Neuromarketing research project, including those working in organizations buying services from a neuromarketing research company.

3. **Neuromarketing Client** is defined as any individual or organization that inquires, buys or sponsors or a Neuromarketing research project.

4. **Neuromarketing Research Participan**t is defined as any individual or an organization from which insights are collected using neuroscientific methods for the purposes of market research.

5. **Neuromarketing Study** is defined as a session with a participant during which

Neuromarketing insights are collected.

6. **Neuromarketing Insights** are informed deductions supported by analyzing the amount of brain activity produced by marketing stimuli (advertisements, websites, packaging, etc.).

7. **Functional brain imaging** is defined as any technique that permits the in vivo visualization of the distribution of brain activity.

Articles

ARTICLE 1: CORE PRINCIPLES

a. Neuromarketing researchers shall comply with the highest research standards enforced in their respective countries and use accepted scientific principles.

b. Neuromarketing Researchers shall not act in any way that could negatively impact the reputation and the integrity of the Neuromarketing research profession.

c. Neuromarketing findings shall be delivered to clients without exaggerating or misrepresenting the neuromarketing insights beyond what is scientifically accepted.

ARTICLE 2: INTEGRITY

a. Neuromarketing researchers shall take all reasonable precautions to ensure that participants are in no way harmed or stressed as a result of their involvement in a Neuromarketing research project.

b. Neuromarketing researchers shall not deceive participants or exploit their lack of knowledge of neuroscience.

c. No sales offer shall be made to a participant as a direct result of his/her involvement in

a project.

d. Neuromarketing researchers shall be honest about their skills and experience.

ARTICLE 3: CREDIBILITY

a. Concerns or critics about publicly known neuromarketing projects shall be first presented to the attention of the NMSBA before they are shared widely.

b. Neuromarketing researchers involved in functional brain imaging shall disclose a protocol for dealing with incidental findings.

ARTICLE 4: TRANSPARENCY

a. Participation in a Neuromarketing research project shall always be entirely voluntary.

b. Neuromarketing researchers shall maintain a public website describing their services and the credentials of their core team members as well as post a physical address where officers of the company can be contacted.

c. Neuromarketing researchers shall allow their clients to audit the process by which neuromarketing insights are collected and processed.

d. Neuromarketing researchers shall ensure that Neuromarketing research projects are created, delivered and documented with transparency and reported with as many details as the clients would require to understand the scope and relevance of the project.

ARTICLE 5: CONSENT

a. Neuromarketing researchers shall explain the tools they use to participants in layman

terms.

b. Before providing consent, participants in Neuromarketing research shall explicitly express their understanding of the protocols as well as the general objectives of the study.

c. Participants shall be fully informed about the project before any Neuromarketing technique can be used to collect their neuromarketing insights.

d. Once a Neuromarketing study has commenced, participants shall be free to withdraw.

ARTICLE 6: PRIVACY

a. Neuromarketing researchers shall ensure that participants are made aware of the purpose of collecting insights.

b. Neuromarketing researchers shall have a privacy policy which is readily accessible to participants from whom they collect insights.

c. The identity of participants will not be revealed to the client without explicit consent.

d. Personal information collected shall be collected for specified Neuromarketing research purposes and not used for any other purpose.

e. Personal information may not be kept longer than is required for the purpose of the neuromarketing project.

f. Neuromarketing researchers shall ensure that adequate security measures are used to protect access to the insights collected during any project.

g. The Neuromarketing research data itself, including brain scans and brain data shall remain the property of the research company and will not be shared.

ARTICLE 7: PARTICIPANT RIGHTS

a. Participants to any neuromarketing research project shall confirm that they are not obligated to participate in the project.

b. Participants to any neuromarketing research project shall be able to withdraw from the research at any time.

c. Participants to any neuromarketing research project shall be guaranteed that their personal data is not made available to others.

d. Participants to any neuromarketing research project shall be guaranteed that the insights will be deleted or modified upon request.

e. Particular care shall be taken to maintain the data protection rights of participants when personal data is transferred from the country in which they are collected to another country. When data processing is conducted in another country, the data protection principles of this Code must be respected.

ARTICLE 8: CHILDREN AND YOUNG PEOPLE

Neuromarketing studies involving participants less than 18 years of age shall only take place with the informed consent of the participant's parents.

ARTICLE 9: SUBCONTRACTING

Neuromarketing Researchers shall disclose prior to work commencing, when any part of

the project is to be subcontracted outside the neuromarketing researchers' own organization (including the use of any outside consultants).

ARTICLE 10: PUBLICATION

When results of a project are publicly shared, neuromarketing researchers shall clearly articulate which part of the report represents interpretation of the data vs. which part of the data represent the key findings. Neuromarketing researchers shall not associate their names to a Neuromarketing research project unless they have actively participated in the project and are able to defend the findings

ARTICLE 11: COMMITMENT

Neuromarketing researchers shall commit that they will apply this code and ensure their own clients and other parties will comply with its requirements. Failure to do so will result in the termination of their membership.

ARTICLE 12: IMPLEMENTATION

a. Neuromarketing researchers and their clients shall acknowledge that they know the code and also respect other self-regulatory guidelines that are relevant to a particular region or project; The Code is applicable for all involved in a Neuromarketing project.

b. The NMSBA Members shall show their acceptance of the code, by publishing the code on their website or by publishing a link to www.nmsba.com/ethics