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This chapter describes the potential far-reaching consequences of contemplative higher education for the fields of science and medicine.

Contemplative Science: An Insider Prospectus

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Contemplative practices, which engage the subjective or “first-person” perspective, are being incorporated into systems of higher education that have traditionally relied on didactic or “third-person” approaches (Dederer 2007; Kroll 2010; Repetti 2010; Roth 2006; Shapiro, Brown, and Astin 2011; Smith 2006; Zajonc 2006). The students who are learning these new first-person methodologies will eventually become the scientists, doctors, and professors who make up the fields of science and medicine. What might be some of the long-term consequences of contemplative pedagogies on academia in general and on science and medicine in particular?

The content of this chapter is not merely speculation but rather is a collective consensus from university-level students who have received this new first-person training. Brown University’s Contemplative Studies Initiative is one of the first to incorporate intensive first-person training into traditional course curricula as part of a concentration at both the university and medical school levels (see Roth, forthcoming, for details). First-person training includes mind-training technologies drawn from both ancient contemplative traditions such as Buddhism, Hinduism, and Taoism, as well as modern mind sciences like psychology and neuroscience. These

technologies represent a wide range of techniques and goals and are often subsumed under the umbrella term “meditation.” Further categories of meditation, including forms that aim to cultivate sustained attention, focused awareness (concentration), and tranquility, have been contrasted to forms that emphasize ongoing nonevaluative metacognitive monitoring, often called “mindfulness” (Lutz et al. 2008). Although there is currently considerable debate about the correct definitions and delineations of different forms of meditation (Davidson 2010), this discussion is beyond the scope of this chapter. For the current purposes in reference to contemplative education, common elements of different forms of mental training or meditation often include the investigation of and familiarity with one’s own mental patterns and the intentional cultivation of specific mental qualities, most notably sustained attention and awareness, as well as affective qualities like patience, openness, and equanimity.

Of the more than six hundred students who have completed the training since 2000, sixteen have come together to reflect on what they feel might be some of the most far-reaching consequences of first-person training on the fields of science and medicine.

This chapter consists of three parts. In Part 1, we describe how the traditional deemphasis of subjective first-person experience in both science and medicine has led to some unexpected negative consequences. In Part 2, we explore how the reemphasis of first-person experience through contemplative training may help ameliorate these problems. In Part 3, we describe the consequences of integrating contemplative practices into other institutions and how new first-person-informed paradigms in business and economics may inspire science to follow suit.

Part 1: How a Deemphasis of First-Person Experience Has Affected Science and Medicine

This section investigates how the emphasis on the objective while simultaneously neglecting the subjective aspects of science and medicine has led to unfortunate consequences for both fields.

Science. Within the domain of science, the absence of first-person approaches has had profound consequences that may endanger the integrity of the scientific enterprise. Historically, science has been characterized by its emphasis on the objective, third-person approach and a deemphasis of a subjective, first-person dimension. American physicist Richard Feynman optimistically described science as a selfless quest for an objective truth that was independent of the subjective influences or desires of the scientist. In his opinion, “experimenters search most diligently, and with the greatest effort, in exactly those places where it seems most likely that we can prove our theories wrong . . . only in that way can we find progress” (Feynman 1965, 158). Although subjectless objectivity is a respectable

ideal, it does not reflect the pervasiveness of subjective influences on the actual practice of scientific research. Instead, subjective influences, in the form of self-serving biases, have been silently eroding this ideal objectivity. Although the effect of these biases on scientific integrity has been met with extreme concern, only after exhaustive investigation and many failed attempts at remediation has the first-person root of the problem begun to be considered.

Science has long acknowledged the influences of unintentional biases (Sackett 1979) such as selection bias, and a number of procedures (such as randomization and blinding) that minimize these biases have become incorporated into standard scientific method. Although some biases can be ameliorated by methodological modifications, these corrections offer no protection from intentional biases, such as the self-serving desire to confirm one's own hypotheses rather than rely solely and honestly on the data in the service of truth.

These quasi-intentional experimenter biases are surprisingly pervasive (Steen 2011b). More than a third of scientists admit to "questionable research practices" that range from "failing to publish data that contradicts one's previous research" to manipulating or falsifying data (Fanelli 2009, 5738). Most instances of data fraud go undiscovered. As a result, more than 90 percent of research papers confirm their hypotheses (Fanelli 2010b, 2011), despite the odds in favor of disconfirmation, leading to the realization that many, if not most, scientific findings are probably false (Ioannidis 2005). Peer-reviewed science journal retractions have increased more than tenfold over the past two decades for misconduct or questionable practices, with the United States having the highest proportion of retractions due to data manipulation (Fanelli 2011; Steen 2011b). The prestigious journal *Nature* retracted four papers in the last year alone (Van Noorden 2011).

The consequence of compromised scientific objectivity is, at best, a waste of time and (taxpayer) money and, at worst, a threat to public health, especially when the data in question includes areas like vaccines and infectious diseases (Steen 2011a). As a result, entire branches of the government have been dedicated to investigating what causes scientific misconduct. The Office of Research Integrity (ORI) has launched several iterations of investigation and attempts at rectification. ORI first characterized the problem as incomplete ethical education (National Academy of Sciences 1995) and implemented a variety of training requirements in ethics and research integrity in the form of third-person knowledge of regulations and more punitive action for ethical violations. Indeed, didactic training requirements in scientific integrity and ethics have expanded immensely in the last decades (Steneck, 2006). However, a second round of investigation yielded no evidence that this third-person didactic training and increased oversight have had any positive effects. Instead, evidence suggests that scientists are now less likely to admit misconduct, but not less likely to

commit it or report it in others (Anderson, Martinson, and De Vries 2007; Plemmons, Brody, and Kalichman 2006; Turrens 2005). Thus, didactic forms of education have failed to address the core problem.

Noting the failure of didactic training, the ORI began to investigate factors in the “research environment,” joining forces with the National Research Council (NRC) to form the Committee on Assessing Integrity in Research Environments in 2001. Overwhelming evidence suggests that research environments that promote competitive self-interest are toxic to scientific integrity (Anderson et al. 2007; Fanelli 2010a). The most recent consensus reported that the prevalence of individual competition and unethical conduct are highly correlated, as misconduct is more prevalent in organizations that encourage competition, self-promotion, and hierarchy among workers and reward individual commitment to the self, rather than to peers or the organizational as a whole (Hegarty and Sims 1978; Kurland 1996; National Research Council/Institute of Medicine [NRC/IOM] 2002; Treviño, Butterfield, and McCabe 1996). Thus, in contrast to the assumption that self-centered competition fosters higher quality research, scientific bias of all kinds and scientific misconduct are more common in more competitive academic environments. The NRC reflects that the adage, “produce at all costs,” sends the wrong message (NRC/IOM 2002, 58) and instead references a quote from Einstein, “Many people say that it is the intellect which makes a great scientist. They are wrong; it is character” to summarize their report.

As a result of these investigations, the US government’s recommendation for improving scientific integrity advocates strengthening cooperation and reducing self-centeredness amongst scientists and academics (Ioannidis 2005). However, the ORI admits that the best methods for creating a less competitive ego-centric environment “are not precisely known” (NRC/IOM, 2002, 25–26). At this stage, the NRC is encouraging novel pedagogical approaches, beyond the traditional third-person training. The majority of recommended methods involve “more personal engagement” and “collegiality and sharing of resources,” as well as being more aware of and openly discussing conflicting pressures that interfere with collaboration and objectivity. In other words, the government is advocating greater awareness and deeper first-person investigation into the nature of self and consequences of self-centeredness. In Part 2, we describe scientific research that explores the effects of contemplative practices on self-centered tendencies and cooperation, as a rationale for using first-person pedagogies to improve the state of academia and science.

Medicine. Like science, medicine has certain historical and traditional emphases that downplay the subjective dimension of the clinician, especially the acknowledgment of the clinician as one who also experiences suffering and distress. Although neglecting subjective experience in research has produced scientific misconduct, the avoidance of the subjective experience of the clinician has had a range of negative

consequences on the field of medicine, including a loss of important therapeutic ingredients (empathy) and poor clinician health.

Empathy requires clinicians to engage their own subjective experiences as they encounter patient distress. Clinician empathy has been long recognized as being an important ingredient in effective medicine. Clinician empathy influences patient satisfaction (Bertakis, Roter, and Putnam 1991; Blatt et al. 2010; Kim, Kaplowitz, and Johnston 2004; Zachariae et al. 2003), adherence to medical recommendations (Kim, Kaplowitz, and Johnston 2004; Pollak et al. 2007; Vermeire et al. 2001), and medical-legal risk (Spiegel and Kavalier 1997; Vukmir 2006). Clinician empathy is related to clinical competence (Arora et al. 2010; Hojat et al. 2002) and strongly predicts clinical outcomes (Burns and Nolen-Hoeksema 1992; Di Blasi et al. 2001; Hojat et al. 2011; Norcross and Wampold 2011). In sum, empathy appears to be an essential ingredient in effective treatment outcome in medicine, and a part of “good doctoring.”

However, research has also shown that empathy declines linearly with every year of clinical training, including undergraduate medical education (Hojat et al. 2004) and residency (Bellini and Shea 2005) with the lowest levels of empathy among alumni and teaching faculty (DiLalla, Hull, and Dorsey 2004). Thus, medical training, which emphasizes third-person pedagogies and deemphasizes the subjective dimensions of the physician (Helmich et al. 2011), may result in lower quality health care.

In addition to a decrease in empathy, medical training is also associated with decreases in well-being. By the fourth year of medical school, 73 percent of interns will meet criteria for psychiatric morbidity, particularly anxiety, depression, and substance abuse (Willcock et al. 2004). Suicide rates among physicians are 40 to 130 percent higher than age-matched samples of the general public (Schernhammer 2005; Schernhammer and Colditz 2004). Despite their knowledge of sources and treatment of depression and anxiety, physicians and medical students are less likely to seek help for and receive treatment for mental illness, particularly depression, even though they are more likely to be depressed (West, Shanafelt, and Cook 2010). Together, these data suggest that third-person training (knowledge and information) is not enough. The avoidance and stigmatization of the physician’s subjective experience (and suffering) results in poor health (Schwenk, Davis, and Wimsatt 2010) as well as poor empathy, which, given its importance in patient outcome, translates to “poor doctoring.”

Part 1 described the limitations and unintentional negative consequences of traditional third-person methodologies that deemphasize first-person perspectives. In science, the recently discovered relationship between self-centeredness and scientific integrity has led to a call for horizontal cooperation over hierarchical competition. In medicine, the lack of first-person perspectives has led to noticeable deficits in doctors’ self-care and clinical skills, particularly empathy. In the following section we explore

the science of contemplative practices with a special emphasis on the areas of science and medicine that could benefit the most from first-person methodologies, including self-centeredness, cooperation, and empathy.

Part 2: The Science of Contemplative Practices

This section explores the scientific evidence for the effects of contemplative practices in general and on medical practitioners in particular.

The Self in the Brain. Many health care professionals and educators are aware of a growing body of research that supports the use of contemplative practices to improve self-awareness; attention (Lutz et al. 2009); and physical and psychological well-being, including depression, anxiety, and emotional reactivity (Grossman et al. 2004; Hofmann et al. 2010). Although the effects of meditation practices on self-centeredness are less well known, a reduction in self-centered or “self-referential” processing is one of the central mechanisms by which meditation is thought to improve well-being.

The locus for self-referential processing in the brain is called the default mode network (DMN). First described as the brain regions that were active when an individual was not engaged in any purposeful activity, this network of brain regions is now thought to underlie certain components of our sense of self (Qin and Northoff 2011). The DMN is responsible for the narrative self, connecting experiences of the self (me, my, and mine) across time and situation (Farb et al. 2007; Gallagher 2000). The sense of a permanent, solid, or continuous “self” is dependent on the construction of a self-narrative that connects temporally disparate experiences over time (Gallagher 2000). Because this sense of continuity must be continually constructed, such self-related processing represents the default mode of our brains and is always active, except when our attention is otherwise engaged. However, even though thinking about ourselves appears to be our favorite pastime, such self-referential processing is highly associated with distress and psychopathology such as anxiety, rumination, and depression (Buckner and Vincent 2007; Farb et al. 2007; Gentili et al. 2009; Hamilton et al. 2011; Lemogne et al. 2010; Segal 1988; Sheline et al. 2009; Sheline et al. 2010; Whitfield-Gabrieli et al. 2009; Zhao et al. 2007). Together, these somewhat counterintuitive findings beg the question: If our habitual ego-centric mode of relating to the world promotes unhappiness, is there a more positive alternative?

Meditation and the Self. Converging evidence suggests that meditation training may be associated with decreased self-referential brain activity (DMN) and greater well-being (Berkovich-Ohana, Glicksohn, and Goldstein 2011; Brewer et al. 2011; Farb et al. 2007; Farb et al. 2010; Taylor et al. 2011; Travis et al. 2010). Multiple studies have found that advanced meditators had consistently less self-referential activation than nonmeditators (Brewer et al. 2011; Taylor et al. 2011). Other studies have found that

mindfulness training diverts activation from self-related, ruminative brain areas to areas related to embodiment, attention, and modulation of the limbic system, the emotional center of the brain (Farb et al. 2007; Farb et al. 2010; Taylor et al. 2011). These neuroscientific findings align with the traditional intention of contemplative training, which was specifically designed to reduce the process of “selfing.” As Brewer et al. (2011, 20254) describe, “Concentration meditation is intended to help individuals retrain their minds from habitually engaging in self-related pre-occupations (such as thinking about the past or future, or reacting to stressful stimuli) to more present moment awareness.”

How is training attention related to changes in a sense of self? Through the diligent investigation of one’s own present-moment sensate reality, nowhere can a stable, solid self be found—thus, every aspect of one’s experience is “not-self.” Contrary to being dissociated or numb, decreases in self-referential processing are associated with increases in well-being, including fewer symptoms of depression and anxiety (Delaveau et al. 2011; Farb et al. 2010). In addition to greater emotional well-being, decreased self-referential processing is thought to promote prosocial behavior, such as increased cooperation and altruism and decreased competition and aggression. Psychologist Harvey Aronson (2004, 64) explains:

Understanding that our sense of “I” is not as solid, permanent, or substantial as we habitually hold it to be ultimately uproots clinging, attachment, and hostility. Understanding this burns up the fuel that runs our repetitive habits. . . . Those who have understood this report a sense of spacious lightness and freedom. They exhibit deep concern and tenderness for others.

These types of claims have only recently been investigated in scientific paradigms. In controlled studies using meditation in conjunction with behavioral economics, meditating participants consistently display more altruism and less self-referential behavior than the nonmeditators. In one study, Kirk, Downar, and Montague (2011) found that because nonmeditators use a self-referential brain network (DMN) to make decisions, emotional reactions undermine the ability to behave in the most beneficial way. Meditators, on the other hand, use attention and body awareness-related brain areas, not self-referential ones, and are able to decouple their behavior from emotional reactions and make more beneficial decisions. Experiments on Buddhist monks have found that not only do the monks behave more altruistically, but that their decisions are related to the length of their contemplative training (Li 2008). Furthermore, the prosocial pattern of altruism is a self-reinforcing mechanism. Neuroscientist and meditation researcher Richard Davidson (2009, 1:05) suggests, “The more one redistributes, the more empathic one is.” In addition, there is now emerging evidence that contemplative training increases empathy (Beddoe and Murphy 2004; Birnie, Spica, and Carlson 2010; Block-Lerner et al. 2007;

Shapiro, Schwartz, and Bonner 1998); increased social connection and improved relationships (Carson et al. 2004; Carson et al. 2007; Hutcherson, Seppala, and Gross 2008); and higher “adaptive socioemotional functioning” (Sahdra et al. 2011, 299), all important factors for cooperation.

Rather than going against the grain, meditation practices may help uncover a natural tendency toward cooperation. In contrast to popular beliefs about humans’ inherent selfish and competitive nature, findings in neuroscience support that idea that we are “wired” for cooperation (Rilling et al. 2002). Trust and cooperation are inherently rewarding, and they are thought to have evolved in concert with natural selection and evolution (Decety et al. 2004; Krueger et al. 2007; Rilling et al. 2002). Indeed, neuroscientists are now claiming that “the brain is wired to positively reinforce reciprocal altruism, thereby motivating subjects to resist the temptation to selfishly accept but not reciprocate favors” (Rilling et al. 2002, 395). Cooperation has been suggested as the third fundamental evolutionary principle, after natural selection and mutation (Nowak 2006).

Thus, contemplative practices may help bring awareness to and eventually decrease the habitual self-centeredness that appears to be threatening the integrity of science. The possibility that integrating contemplative practices into scientific training may actually result in greater cooperation and better science is not just theoretical, a growing body of neuroimaging and behavioral studies support this possibility. We now move into descriptions of other fields, which, by comparison to science, are much further along in recognizing and implementing the potential benefits of contemplative practices.

Meditation in Medicine: Effects on Clinicians. The first of these fields is medicine, which can greatly benefit from the integration of first-person contemplative training, particularly through increases in empathy and physician health. A number of studies have found that meditation training helps increase empathy, particularly the ability to take on the perspectives of others (Beddoe and Murphy 2004; Birnie, Speca, and Carlson 2010; Block-Lerner et al. 2007; Britton and Davis 2011; Shapiro, Brown, and Astin 2011). Empathy has been described as having an affective or “hot” domain and a cognitive “cool” domain. Hot forms of empathy include feelings of personal distress and anxiety at others’ pain and other forms of emotional mimicry. Cool forms of empathy include perspective taking and empathic concern that do not include involuntarily sharing or “catching” the other person’s emotions (that is, emotional contagion; Davis 1983). Effective physician performance is positively correlated with cognitive (cool) dimensions of empathy like empathetic concern and perspective taking (Blatt et al. 2010; Riggio and Taylor 2000). Hot forms of empathy, however, are associated with poor self-regulation, depression, and anxiety (Birnie, Speca, and Carlson 2010; Britton and Davis 2011). Mindfulness meditation training has been found to be associated with increases in cool forms and decreased hot forms of empathy (Beddoe and Murphy 2004;

Birnie, Speca, and Carlson 2010; Britton and Davis 2011; Krasner et al. 2009). Contrary to the fear that meditation training will make physicians hyperempathic and overly emotional, the research suggests that these practices will promote more balanced and effective care especially in highly emotionally charged situations (that is, emergencies).

Beyond the benefits for the patients, mindfulness practices also have immense benefits for the health care practitioners themselves. Specifically, multiple studies have shown that mindfulness training decreases burnout and psychological stress for physicians, nurses, and medical students (Beddoe and Murphy 2004; Hassed et al. 2009; Krasner et al. 2009; Shapiro, Schwartz, and Bonner 1998). Given that the health and empathy levels of physicians and medical students are surprisingly poor, these data support the inclusion of contemplative practices in medical school curricula.

In contrast to scientific training models that have been slow to catch on, medical and clinical education administrators have recognized the potential benefits of first-person methodologies. In fact, over 250 medical schools have incorporated contemplative practices into their curricula, and many have even made them required and examinable (Hassed et al. 2009). At Brown University, medical students can concentrate in Contemplative Studies, which includes a combination of first- and third-person trainings, including silent meditation retreats.

In addition to their use in medical schools, first-person methodologies have become a standard form of clinical training in clinical psychology and psychiatry. Specifically, the Mindfulness-Based Stress Reduction (MBSR) and, by extension, most mindfulness instructor training models rely heavily on first-person experience. Training requirements recommend at least three years of prior experience with contemplative practices, including several silent retreats. In contrast to traditional models where the clinician's personal history of trauma or distress is disregarded, in this model the instructor's own suffering, especially if prolonged, is viewed as a valuable source of expertise and shared humanity. The authors of *Teaching Mindfulness: A Practical Guide for Clinicians and Educators* (McCown, Reibel, and Micozzi 2010, 103) describe the collaborative, participatory characteristics of the training:

Because it is a co-creation in which the teacher may be a catalyst, but in which every participant contributes, a nonhierarchical, non-pathologizing ethos develops. Everyone involved, teacher and participant alike, shares the sufferings and joys of the human condition.

This validation of subjective experience, combined with the acknowledgment of universal and shared suffering, has enormous potential in the clinical setting. The ability of a provider to take the perspective of the patient reflects a shift in the clinician–patient relationship, one that flattens a sense of hierarchy. The patient is no longer below the doctor, reduced to

a disease, dehumanized, or dependent. To further break down notions of hierarchy that disempower the patient, the mindfulness instructor and students sit in a circle, and the instructor uses co-inquiry rather than providing answers to questions. “Diffusing the focus through the group suggests that the answers lie within the participants” (McCown, Reibel, and Micozzi 2010, 108).

In medicine, the benefits of first-person methodologies have already been widely recognized and incorporated into clinical training models. These new training models are already having potentially far-reaching consequences on the field of medicine, including a shift in the traditionally hierarchical nature of the clinician–patient relationship.

Part 3: Contemplative Institutions

The recognition and incorporation of contemplative practices is not limited to medicine. Businesses such as Deutsche Bank, Google, and Hughes Aircraft also recognize the potential of teaching contemplative practices to their employees. Interviews with more than seventy chief executive officers of organizations that use contemplative practices have reported a positive impact of contemplative practice in the workplace, including improved communication and a greater sense of team and community (Duerr 2004). This new contemplative business model is based on a shift in values away from self-promotion, competition, and hierarchy toward empathy, selflessness, and cooperation. What Arthur Zajonc (2010) ironically termed “pious sentiments” of compassion and empathy are, frankly, more cost effective (Gentry, Weber, and Sadri 2007). High levels of compassion and empathy are associated with higher interpersonal competence, lower aggression, more amiable relationships, helping behavior (Batson et al. 1997), and lower egocentrism (Block-Lerner et al., 2007), which are all qualities of successful leadership (Gentry, Weber, and Sadri 2007; Walumbwa et al. 2008). In regard to cooperation, the *Harvard Business Review* (July–August 2011) devoted more than thirty pages to advocating collaboration rather than competition as a successful business model. The article points to the unexpected successes of collaborative companies such as Wikipedia, a profitable online open-source encyclopedia, which effectively bankrupted Microsoft’s Encarta (Benkler 2011). These recent observations confirm organizational research findings that cooperation is considerably more effective in promoting achievement and productivity than interpersonal competition and individualistic efforts (Johnson et al. 1981).

The shift in values away from self-centeredness and toward cooperation has also begun to be felt on political and global levels. In response to the global economic crisis, former U.N. Secretary-General Kofi Annan (2009) observed, “It’s either destructive competition or cooperation . . . the only way to move forward is to cooperate” (quoted in Zajonc 2010, n.p.).

These examples in medicine, business, and politics serve to illustrate that a more collaborative science, acquired through first-person pedagogies, would not just be the unshared privilege of the Ivory Tower elite. On the contrary, any movement within science and academia toward greater cooperation and less self-centered competition are being echoed in organizations and institutions on much larger scales. Many of these institutions already have fairly well-developed contemplative pedagogical systems in place. It is slightly ironic that scientists, who are the first to collect the data, are some of the last to apply it toward the health and welfare of their own field.

This chapter represents an initial attempt to envision a new kind of science, one that balances both first- and third-person methodologies in a way that is committed to the greatest level of truth and well-being. The available data suggest that a more collaborative science would be more effective, accurate, and perhaps even more enjoyable and that incorporation of contemplative practices into scientific training may be a viable method to achieve this transformation.

Postscript

It should be noted that this chapter was written by members of one of the first generations of up-and-coming “contemplative scientists” who have received intensive first-person training as part of their scientific education. To demonstrate that this collaborative approach is more than theoretical pipe dream, this entire chapter was collaboratively written as a Wiki, on a shared online Google document by seventeen authors. The decision of whether authorship would be represented simply by the designation of “The Contemplative Studies Research Lab” (that is, no individual authors) or alphabetically (as in economics) or by order of contributions was reached through discussion and consensus.

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