



Conducting scientific research

Abstract

Science thrives on high-quality sources of data. Although phenomenological methods inform scientific research on subjective experience, the quality of data that can arise from first-person methods is heavily constrained by people's ability to sustain their attention, which is known to be quite limited for much of the population. To provide science with more replicable and high-resolution methods for studying the mind, the Center for Contemplative Research (CCR) has established *contemplative observatories*, in which aspiring contemplatives complete thousands of hours of full-time training to achieve exceptional attention skills and introspective acuity. By first framing the concept of *semantic information* as a conceptual bridge that links all scientific inquiry to the subjective domain, this essay then answers two questions: Why should scientists work with professionally trained contemplatives, and in what ways are the CCR's contemplatives unique?

Professional contemplatives provide the world's highest-resolution access to the fundamental processes that create semantic information — the processes by which meaning is extracted from our world, and from which all concepts, scientific or otherwise, are derived. For this reason, professional contemplatives provide the best sources of data regarding subjective phenomena like thoughts, emotions, memories, and consciousness. One of the largest scientific contributions that contemplatives can make is to help clarify the nature and potential of both consciousness and genuine well-being. The CCR's contemplatives are unique in that they're engaged in full-time retreats, meditating 8–12 hours a day under world-class instruction and in exceptionally conducive retreat environments, while remaining open to longitudinal collaboration with the scientific community. They also come from diverse backgrounds, demonstrating that the effects of meditation are not exclusive to one race, age group, gender, ethnicity, culture, or belief system.

A bridge to the subjective domain

As scientists, we look for the best sources of data. The scope of this search is expanding as the scope of science itself expands to encompass more of reality, more of the human experience: The *subject* pole of experience — long subordinated to the *object* pole of experience — is increasingly being considered part of the scientific domain. Having studied external objects for most of science's history, scientists are increasingly turning their attention inward, trying to explain our internal experiences of thoughts, attention, emotions, and other subjective phenomena.

It's becoming increasingly useful, if not necessary, for scientists to identify sources of data that will yield insights into the subject pole of experience, including consciousness. Quantum mechanics has demonstrated the infeasibility of a worldview that posits objective phenomena existing independently of any subjective observation. This idea was expressed long ago by the Nobel Prize-winning physicist Max Planck (Sullivan, 1931) —

I regard consciousness as fundamental. I regard matter as derivative from consciousness. We cannot get behind consciousness. Everything that we talk about, everything that we regard as existing, postulates consciousness.

— and decades later by the Templeton Prize-winning physicist Bernard d'Espagnat (1979) —

The doctrine that the world is made up of objects whose existence is independent of human consciousness turns out to be in conflict with quantum mechanics and with facts established by experiments.

— and more recently by Andrei Linde (1998), recipient of the Fundamental Physics Prize:

Will it not turn out, with the further development of science, that the study of the universe and the study of consciousness will be inseparably linked, and that ultimate progress in the one will be impossible without progress in the other? After the development of a unified geometrical description of the weak, strong, electromagnetic, and gravitational interactions, will the next important step not be the development of a unified approach to our entire world, including the world of consciousness?

It's understandable that many scientists would not immediately see a way to study the subject pole of experience directly, as the tools of science have been designed to study objective, physical, quantifiable phenomena. Subjective experience, by contrast, does not appear to have common physical properties like mass, temperature, volume, momentum, or position.

Fortunately, scientists already work with a phenomenon that provides an entryway into the subjective domain. This phenomenon is *semantic information*, referred to below also as *information*. In addition to the concepts of matter, energy, space, and time, scientists are increasingly considering information to be a core facet of science. For instance, computer scientists work with computer hardware but are ultimately most interested in how these computational systems process information. And some physicists have concluded that information is so fundamental to our description of reality that it is meaningless to even draw a distinction between reality and information (Zeilinger, 2004):

One may be tempted to assume that whenever we ask questions of nature, of the world there outside, there is reality existing independently of what can be said about it. We will now claim that such a position is void of any meaning. It is obvious that any property or feature of reality “out there” can only be based on information we receive. There cannot be any statement whatsoever about the world or about reality that is not based on such information. It therefore follows that the concept of a reality without at least the ability in principle to make statements about it to obtain information about its features is devoid of any possibility of confirmation or proof. This implies that the distinction between information, that is knowledge, and reality is devoid of any meaning.

In a sense, reality *is* information; all scientific roads lead to it.

Semantic information gives us a conceptual bridge from the world of objects to the world of subjects because it manifests in aspects of both domains. In the world of objects, information can be represented by symbols made of physical media, such as characters printed on a piece of paper, or bits stored in a hard drive. Although these symbols are critical to scientific inquiry, they don't compose information on their own. It's in the world of subjects — that is, within the minds of sentient beings — that those symbols are actually assigned meaning. Information can be said to exist only when we establish this symbol-meaning association (Faggin, 2021).

More formally, information provides scientists an entryway into the subjective domain for the following reasons:

1. Information exists only when a symbol is assigned a meaning.
2. The assignment of meaning to symbols is currently known to occur only in the presence of consciousness (Faggin, 2021).
3. The ontology of consciousness is usually an irreducibly first-person ontology (Searle, 1992).

An important corollary of these propositions is that information necessarily involves consciousness. This is why it gives us a conceptual bridge into the subjective domain: Information can straddle the objective–subjective boundary, the boundary between the first- and third-person perspectives. Symbols that have physical manifestations in third-person ontologies are assigned meaning — syntax becomes semantics — only in the presence of a first-person perspective. A conscious mind is currently the only bridge that we know of for crossing the threshold between these two aspects of information. Hence Dr. B. Alan Wallace's assertion that you don't have information unless you have someone who is *informed*.

Information is therefore quite different from the other building blocks of science like matter, energy, space, and time, which can at least be conceived of in a strictly third-person ontology, independent of subjective experience. But regardless of one's metaphysics, semantic information cannot even be conceived of in a strictly third-person ontology.

For instance, if the binary digits 011001 are printed on a piece of paper, a person who finds this paper lying on the ground has no *a priori* reason to interpret the digits as an encoding for *green*, or *dog*, or 25. Scientists have not discovered a law of nature that dictates what the binary digits *must* encode. The digits acquire a meaning only with respect to a conceptual framework that is designated by a conscious agent, providing an encoding that can be used to derive an interpretation. If a different conceptual framework is proposed, the meaning changes accordingly. Independent from any conceptual framework, information is literally meaningless, which implies that it was never *inherently* semantic information at all.

People debate whether computer scientists will eventually implement a mind in silicon that will achieve consciousness and the ability to subjectively assign meaning to symbols. However, the truth is that right now, symbols are assigned meaning only in the minds of conscious beings. Furthermore, meaning can be expressed in language only by conscious language-users.

Why scientists should work with professional contemplatives

Professional contemplatives provide the world's highest-resolution access to the fundamental processes that create information — the processes by which meaning is extracted from our world, and from which all concepts, scientific or otherwise, are derived. For this reason, professional contemplatives provide the best sources of data regarding subjective phenomena like thoughts, emotions, memories, and consciousness.

All the other instruments of science — telescopes, microscopes, MRI, etc. — simply can't cross the threshold between the third- and first-person perspectives. They exist as configurations of matter — conceived of in a third-person ontology — and are used to measure other configurations of matter and energy, which are also conceived of in the same third-person ontology.

Currently, the only “instrument” that can access the first-person perspective is a sentient being. And the most refined version of this “instrument” that we have access to is the professionally trained contemplative, who has cultivated *contemplative technology* in the form of exceptionally refined attention, mindfulness, and introspection (Figure 1).

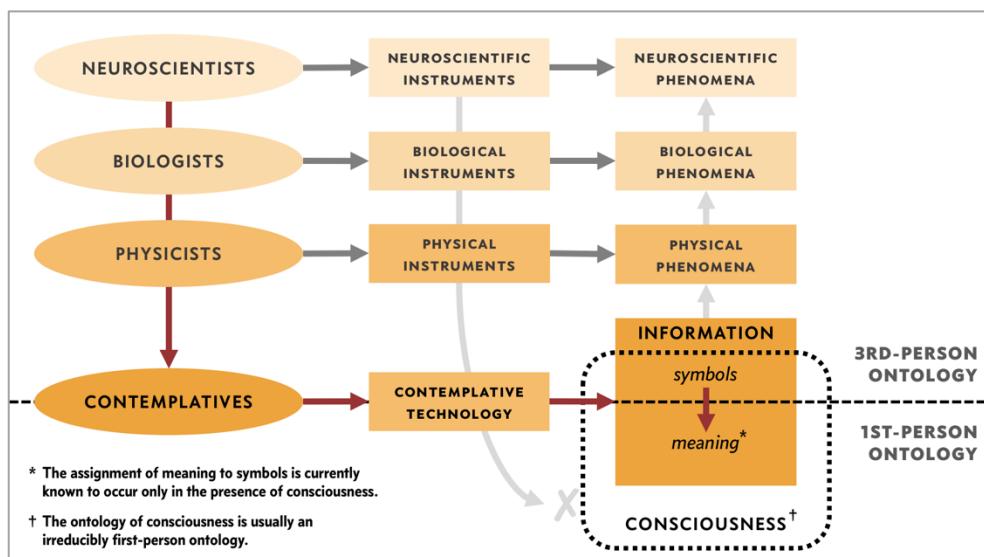


Figure 1: Professionally trained contemplatives offer the most refined technology — albeit of a different sort than scientists are used to — that we have for studying consciousness directly, and thus for studying the creation of information, since this process is currently known to occur only in the mind of a conscious being.

Obtaining such a firsthand, high-resolution glimpse at the processes by which meaning is derived from reality is tremendously important, with implications for virtually every human endeavor — and certainly for the sciences, which are increasingly taking information to be a fundamental concept within the scientific worldview.

One of the largest scientific contributions that contemplatives can make is to help clarify the nature and potentials of consciousness, as well as the relations between consciousness and other aspects of the natural world. For instance, studies on these topics may involve both neuroscientists seeking to address the so-called “hard problem” of consciousness and physicists seeking to

address the measurement problem in quantum mechanics. The working hypothesis at the Center for Contemplative Research (CCR) is that progress on these issues has stagnated “because the radical empiricism that has been the hallmark of the great scientific revolutions of the past has been neglected when it comes to the scientific study of the mind” (Wallace, 2018, p. 205).

Contemplatives can thus help realize William James’s vision of radical empiricism (James, 1976), which failed to take hold in science following the rejection of introspectionism. The introspectionist movement within psychology may not have been dismissed had its researchers been exposed to the advanced contemplative methods that were developed in Asia thousands of years before Western psychology began. The 19th-century world that William James lived in was unfortunately too disconnected — and frankly, Western societies were too ethnocentric — for scientists of that time to not only engage with but also *learn* from contemplatives who shared common empirical interests. At the CCR, we believe that the time is now ripe for this exchange to occur. Scientists now understand that no single culture holds a monopoly on truth, that geniuses have equally arisen throughout world civilizations, and that diverse cultures may have made genuine discoveries in areas that modern science has yet to fully explore.

One challenge of radical empiricism is to acknowledge that the faculty of *mental perception* is a legitimate tool of empirical inquiry — a tool that professional contemplatives have been refining for thousands of years, largely beyond the purview of the Western scientific tradition. Bringing these two traditions together will yield an unprecedented convergence of evidence that may enable unprecedented progress on the mind–body problem, the measurement problem, and other foundational questions that remain mysteries to modern scientists.

A second scientific contribution that contemplatives can make is to clarify the nature of genuine well-being, or human flourishing. What can we do to achieve sustainable and resilient happiness? To what extent can we eliminate suffering? What are the upper limits of well-being? Despite the amazing advances in modern technology, which is supposed to make life easier, depression is now the leading cause of disability around the world (World Health Organization, 2017). In addition, the growing climate emergency is demonstrating that insatiable consumption is not only a bad strategy for happiness but also a catastrophic threat to our ecosystems. Although social isolation is often assumed to lead to despair, contemplatives from multiple traditions have repeatedly endured months, years, and even decades of extreme isolation during meditation retreats and emerged from such

experiences not only free of mental illness but *profoundly* sane: sharply attentive, discerningly intelligent, emotionally stable, and deeply compassionate. There are tremendous opportunities to research the transformational power of contemplative practices and to apply this power to a broad array of human endeavors — including education, mental health, business, and athletics.

Professional contemplatives are also ideal collaborators for experiments that require exceptionally high degrees of attentional stability. For instance, cognitive scientists who study mental imagery obtain brain scans of subjects who are intentionally generating visualizations that they perceive with the “mind’s eye.” As opposed to sustaining only a hazy mental image for a few seconds, contemplatives with the proper training can sustain highly focused visualizations for minutes or even hours — far more time for researchers to obtain high-quality data on the neural correlates of such experiences.

Contemplatives’ attention skills would also facilitate physics experiments that test whether the human eye can perceive a single photon of light — a terribly small signal, and one that participants can easily miss if they’re just a bit inattentive. Physicists have proposed a version of such experiments in which the photon is fired at a retina while being placed in a quantum superposition. How we perceive this phenomenon could have massive ramifications for how we formulate and interpret the principles of quantum mechanics (Holmes, 2019). Regardless of how this experiment would turn out, the experimental method is already an enormous paradigm shift: Participants’ verbal reports of their experiences would be taken seriously enough by physicists that the subjective experiences could actually be used to update physical theories regarding objective phenomena. Given that participants would be looking for a minuscule signal, and given that their perceptions could have large implications for science, contemplatives with superb attentional stability would be the optimal participants, as they could achieve an unusually high signal-to-noise ratio in their visual perception.

The research examples described above are by no means exhaustive; they’re merely intended to provide examples of how contemplatives can meaningfully collaborate with scientists in a variety of disciplines. As contemplatives continue to engage with the scientific community in a spirit of open-mindedness, new experimental possibilities and avenues for collaboration are likely to emerge.

Why the CCR's contemplatives are unique

To our knowledge, never before has there been an international community of contemplatives who have been engaged in full-time, multi-year retreats under expert guidance while being open to longitudinal collaboration with the scientific community. In this regard, the CCR is designed to sustain a set of favorable conditions, the combination of which is currently difficult, if not impossible, to find elsewhere:

- **The contemplatives are all engaged in full-time meditation retreats, meditating 8–12 hours a day.** Every contemplative commits to at least a three-month retreat, though most intend to complete retreats of much longer durations (i.e., years or even decades). This level of commitment affords the CCR unprecedented opportunities for longitudinal studies on the effects of meditation, as well as other types of research.
- **The contemplatives are open to collaboration with the scientific community.** Those who apply to train at the CCR understand the organization's vision and are thus willing to work with scientists from various fields. This kind of openness to collaboration is not often present in contemplatives throughout the world, who may have little or no prior contact with science and may therefore not see its potential.
- **The contemplatives are training in exceptionally conducive retreat environments.** The CCR's primary location, Miyo Samten Ling in Crestone, Colorado, is a 110-acre hermitage near the Sangre de Cristo mountain range. All the contemplatives have their own private cabins, far from any noise or distractions. The CCR is actively developing similar sites in other countries around the world.
- **The contemplatives are being led by the renowned Buddhist scholar and meditation teacher Dr. B. Alan Wallace, who has 50 years of meditation experience, having been trained under the guidance of His Holiness the Dalai Lama.** Dr. Wallace also co-designed the Shamatha Project, a landmark meditation study, conducted in 2007, which evaluated the effects of long-term meditation on a variety of physiological and psychological factors.
- **The contemplatives come from diverse backgrounds, demonstrating that the effects of meditation are not exclusive to one race, ethnicity, gender, age group, culture, or belief system.** Although the CCR specializes in Buddhist contemplative methods, our current retreatants do not uniformly come from Buddhist backgrounds. They are men and women

of various ages from a variety of faith traditions, including Islam, Christianity, and Judaism. We anticipate that in the next few years, retreatants will arrive from more than twelve countries on five continents.

References

- D'Espagnat, B. (1979). The Quantum Theory and Reality. *Scientific American*, 241(5), 158–181.
- Faggin, F. (2021). Consciousness Comes First. In E. F. Kelly & P. Marshall (Eds.), *Consciousness Unbound: Liberating Mind from the Tyranny of Materialism* (pp. 283–319). Lanham, Maryland: Rowman & Littlefield.
- Holmes, R. (2019, April 24). Seeing the quantum world. *Aeon*. Retrieved from <https://aeon.co/essays/an-eye-on-experiments-that-make-quantum-mechanics-visible>
- James, W. (1976). *Essays in Radical Empiricism*. Cambridge, Massachusetts: Harvard University Press.
- Linde, A. (1998). Universe, Life, Consciousness. In *Science and Spiritual Quest*. Retrieved from web.stanford.edu/~alinde/SpirQuest.doc
- Searle, J. R. (1992). *The Rediscovery of the Mind*. Cambridge, Massachusetts: MIT Press.
- Sullivan, J. W. N. (1931, January 29). Interviews with Great Scientists VI: Max Planck. *The Observer*.
- Wallace, B. A. (2018). *Fathoming the Mind: Inquiry and Insight in Düdjom Lingpa's Vajra Essence*. (E. Natanya & D. Blundell, Eds.). Somerville, Massachusetts: Wisdom Publications.
- Wheeler, J. A. (1990). Information, Physics, Quantum: The Search for Links. In W. H. Zurek (Ed.), *Complexity, Entropy, and the Physics of Information* (Vol. VIII). CRC Press.
- World Health Organization (2017). *Depression and Other Common Mental Disorders: Global Health Estimates*. Geneva.
- Zeilinger, A. (2004). Why the quantum? “It” from “bit”? A participatory universe? Three far-reaching challenges from John Archibald Wheeler and their relation to experiment. In J. D. Barrow, P. C. W. Davies, & C. L. Harper, Jr. (Eds.), *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity, honoring John Wheeler's 90th birthday* (pp. 201–220). Cambridge: Cambridge University Press. <https://doi.org/10.1017/cbo9780511814990.014>