

Insight Journal

Summer 2009

Mind and Brain
Editor's Essay

Freedom from Buddha Nature
Ajaan Thanissaro

Mind Changing Brain Changing Mind
Rick Hanson

How Does Meditation Train Attention?
James H. Austin

Buddhism, Body, Mind—Problem?
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Sutta Studies

2010 BCBS Courses

The Greatest Happiness
Pali Poetry



Barre Center for Buddhist Studies





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Corrections to Winter 2009: Two photo captions were wrong. On p. 5, the ordination site should have been Bodh Gaya. On p. 8, the photo is Bertie Seniviratane, not Goenka. *Insight Journal* regrets the errors.

Insight involves an intuition of mind and heart that takes us beyond knowledge toward wisdom. It has to do with deeply understanding the nature of things, rather than with knowing a lot about them.

In the Buddhist tradition wisdom is nurtured by the deep investigation of experience. This involves the careful integration of both study and practice—the study of dharma (the Buddha's teachings), coupled with the practice of meditation.

This journal is dedicated to exploring some of the insights that such a balanced inquiry uncovers about ourselves, our world, and our fellow beings. We welcome you to the discussion.

Mind and Brain

There are generally two approaches to understanding the relationship between the mind and the brain. By mind we mean the subjective side of things, the full range of lived experience, both conscious and unconscious, including such things as thought, cognition, memory, desire, emotional states, and even perhaps the sense of transcendence. By brain we refer to the objective side, the physical stuff between our ears, with its complex architecture of inter-related neurons and the electro-chemical processes activating and connecting them.

One approach regards the two as basically identical. In this view all subjective experience not only depends upon but also *consists of* brain activity, and when we have fully mapped out the functions of the brain we will have explained the mind. The other approach considers the mind to be much more than the brain, extending far beyond the merely physical in both scope and capability in ways that the current scientific models either have not yet conceived or are just beginning to glimpse. In this view there are of course parallels between brain activity and subjective states, but the one does not entirely explain the other. Traditionally (both east and west) this non-physical perspective on consciousness involved notions of immaterial soul or higher modes of consciousness that are outside the matrix of physical cause and effect. This view has been steadily retreating before the advances of neuroscience, but recent iterations of it are looking to the new physics for ways of articulating a deeper and more fundamental relationship between mind and matter than formerly imagined.

In Buddhist terms the question comes down to whether all consciousness is conditioned, as the consciousness of the grasping aggregates surely is, or whether consciousness might also be conceived in larger, even unconditioned, terms. Such is the case in some of the later forms of Buddhism, like the Mahayana and Vajrayana, but there are many in the Theravada who see it this way as well. The issue turns on how we construe the word “unconditioned” (*asankhata*), which is regularly employed as a synonym for *nibbāna*. If everything is conditioned and *nibbāna* is the one state that is unconditioned, then surely awakening consists of at least glimpsing if not deeply experiencing a form of consciousness well beyond conditioned phenomena and thus beyond the mere brain. On the other hand, the term “unconditioned” is most plainly defined only as the absence of greed, hatred, and delusion (as in the *Asankhata Samyutta*, S43), consciousness is specifically declared to be conditioned (*Majjhima* 38) and nowhere, at least in the Pali texts, do we find the (oxymoronic) phrase “unconditioned consciousness.”

Either some are making too much of consciousness, or others are making too little of it. As I understand the early teachings, the Buddha was trying to steer us to a middle way of approaching this issue, a way between what he called eternalism and annihilationism.

It is tempting, both in ancient and contemporary tradition, to essentialize consciousness or ascribe to it a status well beyond

“that which appears” in experience when a sense object or a mental object is cognized by means of its corresponding organ. The classic expression of this in the literature is the case of a lamp and its light: “Would anyone be speaking rightly who spoke thus: ‘While this oil-lamp is burning, its oil, wick, and flame are impermanent and subject to change, but its radiance is permanent, everlasting, eternal, not subject to change?’ ‘No, venerable sir. Why is that? Because while that oil-lamp is burning, its oil, wick, and flame are impermanent and subject to change, so its radiance must be impermanent and subject to change.’” (*Majjhima* 146) If mind is considered to be much more than brain, then we are invoking an ontological category beyond our present capability to articulate, since all our science is a science of conditioned events.

It is equally tempting to want to reduce something we do not understand very well yet (consciousness) to something we do understand (matter). But the inadequacy of our conceptual tools does not necessarily constrain the phenomenon itself. The example that comes to mind from the texts is of the man who inquires about a fire that has just been extinguished: “To which direction has the fire gone, the east, west, north, or south?” (*Majjhima* 2) The problem with simply reducing mind to brain is not only that the teachings about rebirth are challenged, but the scope and promise of awakening seems somehow reduced to accepting one’s death rather than transcending it in some remarkable way. Did the Buddha merely die happily, or did he in some important sense overcome life and death and attain the Deathless?

I suspect our challenge lies not in choosing one horn of this dilemma over another, but in learning how to understand consciousness in a new, middle, way. One step toward the center might be to remove the word “merely” from a physical description of brain activity, such that a material explanation might not bring with it a sense that mind is “reduced” to something of lesser value. Another step in from the other side might involve the recognition that mind, if it be conceived as an emergent property arising from the neuronal activity of the brain, nevertheless virtually creates a higher order of meaning than anything else in our natural world. Even if consciousness is conditioned, it may still be something very special.

In the early texts the Buddha seems to regard the mind and the brain as fundamentally interdependent, each conditioned in experience equally by the other. He describes it in objective terms, as consisting of impersonal, interdependently arising bases, aggregates and elements, none of which, because of impermanence, themselves survive from one day to the next, let alone from one life to another. Yet he also describes the incomparable value of engaging, investigating, and understanding the living experience of moment-to-moment consciousness, from the inside, and guides all of us in that enterprise toward an experience of inexpressible transcendent meaningfulness. These two views may not be antithetical.

—Andrew Olendzki

Freedom from Buddha Nature

“What is the mind? The mind isn’t ‘is’ anything.”

—Ajaan Chah

“The mind is neither good nor evil, but it’s what knows good and knows evil. It’s what does good and does evil. And it’s what lets go of good and lets go of evil.”

—Ajaan Lee

Ajaan Thanissaro

A brahman once asked the Buddha, “Will all the world reach release [Awakening], or half the world, or a third?” But the Buddha didn’t answer. Ven. Ananda, concerned that the brahman might misconstrue the Buddha’s silence, took the man aside and gave him an analogy: Imagine a fortress with a single gate. A wise gatekeeper would walk around the fortress and not see an opening in the wall big enough for even a cat to slip through. Because he’s wise, he would realize that his knowledge didn’t tell him how many people would come into the fortress, but it did tell him that whoever came into the fortress would have to come in through the gate. In the same way, the Buddha didn’t focus on how many people would reach Awakening but he did know that anyone who reached Awakening would have to follow the path he had found: abandoning the five hindrances, establishing the four frames of reference, and developing the seven factors for Awakening.

What’s striking about the Buddha’s knowledge is the implied “if”: If people want to gain Awakening they will have to follow this path, but the choice as to whether they want Awakening is theirs. The Buddha’s knowledge of the future didn’t mean that the future was preordained, for people are free to choose. They can take up a particular course of action and stick with it, or not, as they see fit.

The Buddha thus based all his teaching on freedom of choice. As he said, if everything were

predetermined by things already established in the past, there would be no point in teaching a path to Awakening. The number of people who would reach Awakening would already have been determined a long time ago, and they would have no need for a path or a teacher. Those preordained to awaken would get there inevitably as a result of a long-past action or an essential nature already built into the mind. Those preordained not to awaken wouldn’t stand a chance.

But these things are not preordained. No one is doomed never to awaken, but—until you’ve had your first sight of the deathless at stream-entry—neither is Awakening assured. It’s contingent on intentional actions chosen in each present moment. And even after stream-entry, you’re constantly faced with choices that will speed up final Awakening or slow it down. *Nibbāna*, of course, is independent and unconditioned; but the act of awakening to *nibbāna* depends on a path of practice that has to be willed. It happens only if you choose to give rise to its causes. This, as the Buddha noted, involves determining to do four things: not to neglect discernment, to preserve truth, to develop relinquishment, and to train for peace.

Assumptions about the Mind

To stick with these four determinations, the mind has to make some assumptions about itself: its power to do the necessary work and to receive the anticipated benefits. But one of the central

Even though the Buddha's primary focus was on the mind, he nowhere stated any assumptions about what the mind is.

features of the Buddha's strategy as a teacher was that even though his primary focus was on the mind, he nowhere stated any assumptions about what the mind is. As he said, if you define yourself, you limit yourself. So instead he focused his assumptions on what the mind can do.

To begin with, the mind can change quickly. Normally a master of the apt simile, even the Buddha had to admit that he could find no adequate analogy for how quickly the mind can change. We might say that it can change in the twinkling of an eye, but it's actually faster than that.

And it's capable of all sorts of things. Neither inherently good nor inherently bad, it can do a huge variety of good and bad actions. As the Buddha said, the mind is more variegated than the animal kingdom. Think of the many species of fish in the sea, birds in the sky, animals on the land and under the ground, whether extant or extinct: All of these species are products of minds, and the mind can take on a wider variety of forms than even that.

This variety comes from the many different choices the mind makes under the influence of ignorance and defilement. But the mind doesn't always have to be defiled. Past *kamma* is not entirely deterministic. Even though past *kamma* shapes the range of options open to the mind in the present, it doesn't have to determine present *kamma*—the intentions by which the mind chooses to fabricate actual experiences from among those options. Thus present *kamma* can choose to continue creating the conditions for more ignorance, or not, because present choices

are what keep ignorance alive. Although no one—not even a Buddha—can trace back to when the defilement of ignorance first began, the continued existence of ignorance depends on conditions continually provided by unskillful *kamma*. If these conditions are removed, ignorance will disband.

This is why the Buddha said that the mind is luminous, stained with defilements that come and go. Taken out of context, this statement might be construed as implying that the mind is inherently awakened. But in context the Buddha is simply saying that the mind, once stained, is not permanently stained. When the conditions for the stains are gone, the mind becomes luminous again. But this luminosity is not an awakened nature. As the Buddha states, this luminous mind can be developed. In the scheme of the four noble truths, if something is to be developed it's not the goal; it's part of the path to the goal. After this luminosity has been developed in the advanced stages of concentration, it's abandoned once it has completed its work in helping to pierce through ignorance.

The fact that the mind's own choices can pierce its own ignorance underlies the Buddha's most important assumption about the mind: It can be trained to awaken, to see the causes of ignorance and to bring them to an end. The primary step in this training is the first determination: not to neglect discernment. This phrase may sound strange—to what extent do we consciously neglect discernment?—but it points to an important truth. Discernment is insight into how the mind fabricates its



Peace grows from the simple choice to keep looking at the mind's fabrications as processes, as actions and results.

experiences. This process of fabrication is going on all the time right before our eyes—even nearer than our eyes—and yet part of the mind chooses to ignore it. We tend to be more interested in the experiences that result from the fabrication—the physical, mental, and emotional states we want to savor and enjoy. It's like watching a play: We enjoy entering into the make-believe world on the stage, and prefer to ignore the noises made by the back-stage crew that would call the reality of that world into question.

This ignorance is willed, which is why we need an act of the will to see through it, to discern the back-stage machinations of the mind. Discernment thus has two sides: understanding and motivation. You have to understand the mind's fabrications as fabrications, looking less for the what—i.e., what they are—than for the how—how they happen as part of a causal process. And you have to be motivated to develop this discernment, to see why you want it to have an effect on the mind. Otherwise it won't have the conditions to grow.

The understanding comes down to the basic insight of the Buddha's Awakening, seeing things as actions and events in a pattern of cause and effect. It also involves seeing how some actions are unskillful, leading to stress and suffering, while others are skillful, bringing stress to an

end; and that we have the freedom to choose skillful actions or not. This understanding—which forms the basic framework of the four noble truths—is called appropriate attention.

The motivation to develop appropriate attention grows from combining good will with this understanding. You set your sights on a happiness that is totally harmless. You see that if you make unskillful choices, you're going to cause suffering; if you make skillful ones, you won't. This motivation thus combines good will with heedfulness, the quality that underlies every step on the path. In fact, heedfulness lies at the root of all skillful qualities in the mind. Thus, in encouraging people to want to awaken, the Buddha never had to assume that they were already good or already awakened by nature. He simply assumed something very basic and ordinary: that people like pleasure and hate pain, and that they care about whether they can gain that pleasure and avoid that pain. It was a mark of his genius that he could see the potential for Awakening in this very common desire.

Building on Discernment

When you stick with the understanding and motivation provided by this first determination, it sets in motion the other three. For instance, the determination to preserve the truth grows from seeing the mind's capacity to lie to itself about whether



*The Buddha never advocated attributing an innate nature to the mind
—good, bad, or Buddha.*

its actions are causing suffering. You want to be honest and vigilant in looking for and admitting suffering, even when you're attached to the actions that cause it. This truthfulness relates to the path in two stages: first, when looking for unskillful actions that keep you off the path; and then, as the path nears fruition, looking for the subtle levels of stress caused even by skillful elements of the path—such as right concentration—once they have done their work and need to be let go for the sake of full liberation.

The determination to develop relinquishment can then build on this truthful assessment of what needs to be done. Relinquishment requires discernment as well, for you not only need to see what's skillful and what's not; you also need to keep reminding yourself that you have the freedom to choose, and to be adept at talking yourself into doing skillful things you're afraid of, and abandoning unskillful actions you like.

The determination to train for peace helps maintain your sense of direction in this process, for it reminds you that the only true happiness is peace of mind, and that you want to look for ever-increasing levels of peace as they become possible through the practice. This determination emulates the trait that the Buddha said was essential to his Awakening—the unwillingness to rest content with lesser levels of stillness when higher levels could be attained. In this way, the stages of concentration, instead of becoming obstacles or dangers on the path, serve as stepping-stones to greater sensitivity and, through that sensitivity, to the ultimate peace where all passion, aversion, and delusion grow still.

This peace thus grows from the simple choice to keep looking at the mind's fabrications as processes, as actions and results. But to fully achieve this peace, your discernment has to be directed not only to the mind's fabrication of the objects of its awareness, but also at its fabrications about itself and about the path it's creating. Your sense of who you are is a fabrication, regardless of whether you see the mind as separate or interconnected,

finite or infinite, good or bad. The path is also a fabrication: very subtle and sometimes seemingly effortless, but fabricated nonetheless. If these layers of inner fabrication aren't seen for what they are—if you regard them as innate or inevitable—they can't be deconstructed, and full Awakening can't occur.

No Innate Nature

This is why the Buddha never advocated attributing an innate nature of any sort to the mind—good, bad, or Buddha. The idea of innate natures crept into the Buddhist tradition in later centuries, when the principle of freedom was forgotten. Past bad *kamma* was seen as so totally deterministic that there seemed no way around it unless you assumed either an innate Buddha in the mind that could overpower it, or an external Buddha who would save you from it. But when you understand the principle of freedom—that past *kamma* doesn't totally shape the present, and that present *kamma* can always be free to choose the skillful alternative—you realize that the idea of innate natures is unnecessary: excess baggage on the path.

And it bogs you down. If you assume that the mind is basically bad, you won't feel capable of following the path, and will tend to look for outside help to do your work for you. If you assume that the mind is basically good, you'll feel capable but will easily get complacent. This stands in the way of the heedfulness needed to get you on the path, and to keep you there when it creates states of relative peace and ease that seem so trustworthy and real. If you assume a Buddha nature, you not only risk complacency but you also entangle yourself in metaphysical thorn patches: If something with an awakened nature can suffer, what good is it? How could something innately awakened become defiled? If your original Buddha nature became deluded, what's to prevent it from becoming deluded after it's re-awakened?

These points become especially important as you reach the subtle levels of fabrication on the more advanced stages of the path. If you're primed to look for innate natures, you'll tend

First the nouns of natures and identities fall away, as you focus on the verbs of action and choice. Then the verbs fall away, too.

to see innate natures, especially when you reach the luminous, non-dual stages of concentration called themeless, emptiness, and undirected. You'll get stuck on whichever stage matches your assumptions about what your awakened nature is. But if you're primed to look for the process of fabrication, you'll see these stages as forms of fabrication, and this will enable you to deconstruct them, to pacify them, until you encounter the peace that's not fabricated at all.

Exploring Freedom

So instead of making assumptions about innate natures or inevitable outcomes, the Buddha advised exploring the possibility of freedom, as it's immediately present each time you make a choice. Freedom is not a nature, and you don't find it by looking for your hidden innate nature. You find it by looking at where it's constantly showing itself: in the fact that your present intentions are not totally conditioned by the past. You catch your first glimmer of it as a range of possibilities from which you can choose and as your ability to act more skillfully—causing more pleasure and less pain—than you ordinarily might. Your sense of this freedom grows as you explore and exercise it, each time you choose the most skillful course of action heading in the direction of discernment, truthfulness, relinquishment, and peace. The choice to keep making skillful choices may require assumptions, but to keep the mind focused on the issue of fabrication the Buddha saw that these assumptions are best kept to a bare minimum: that the mind wants happiness, that it can choose courses of actions that promote happiness or thwart it, that it can change its ways, and that it can train itself to achieve the ultimate happiness where all fabrications fall away.

These assumptions are the Buddha's starter kit of skillful means to get you on the path of good will, heedfulness, and appropriate attention. As with any journey, you do best to take along only the bare essentials so that you don't weigh yourself down. This is especially true as you test the limits of freedom, for

the closer you come to ultimate freedom, the more you find that things fall away. First the nouns of natures and identities fall away, as you focus on the verbs of action and choice. Then the verbs fall away, too. When the Buddha was asked who or what he was, he didn't answer with a who or what. He said simply, "Awakened": a past participle, a verb that has done its work. Similarly, when the suttas describe the Awakening of an arahant, they say that his or her mind is released from fermentations. But when they describe how this release is experienced, they simply say, "With release, there is the knowledge, 'Released.'" No comment on what is released. Not even, as it's sometimes translated, "It is released." There's no noun, no pronoun, just a past participle: "released." That's all, but it's enough.



Ajaan Thanissaro (Geoffrey DeGraff) has been a Theravadin monk since 1976. The abbot of Metta Forest Monastery in San Diego County, CA, he is a prolific translator of Pali texts and Thai meditation guides. He is the author, among other books, of *Wings to Awakening*, *Mind Like Fire Unbound*, and *Meditations*.

Mind Changing Brain Changing Mind

The Dharma and Neuroscience

by Rick Hanson

The knowledge of neuroscience has doubled in the last twenty years. It will probably double again in the next twenty years. I think that neuropsychology is, broadly, about where biology was a hundred years after the invention of the microscope: around 1725.

In contrast, Buddhism is a twenty-five-hundred-year-old tradition. You don't need an EEG or MRI to sit and observe your own mind, to open your heart and practice with sincerity. I don't think of neuropsychology as a replacement for traditional methods, but simply as a very useful way to understand why traditional methods work. This is helpful in our culture, since arguably the secular religion of the West is science. If you understand why something works in your own mind, that promotes conviction (*saddhā*, trust in the Buddha's teachings). Understanding a little neuropsychology also helps you to emphasize or individualize those particular aspects of traditional practices that best suit your own brain; natural differences in the brain are a fundamental kind of diversity, and if teachers and meditation centers want to respond to the needs of their existing members and to reach out to new ones, they will have to take into account normal variations in the brain.

Breakthroughs in brain science create opportunities to develop new or refined methods of practice. As Buddhism spread through Tibet, China, and Japan, it learned from the cultures in those lands and developed new methods. Similarly, as Buddhism has come to the West and encountered what is arguably its dominant cultural force—science—it is beginning to draw on science for ways it, too, might be of use on the path of awakening. Not in any way to change the aims of practice—as the Buddha said, I teach one thing: suffering and its end—but to increase the skillful means to that end.

Immaterial experience leaves material, enduring traces behind. In the saying from the work

of the psychologist, Donald Hebb: “Neurons that fire together, wire together.” This is a neurologically informed way to appreciate why your experience really matters, and how important it is to have a kind of mental hygiene, to really appreciate what we allow in our minds.

Perhaps your mind is running themes of threat, grievance, and loss. Or alternately, perhaps it is running heartfeltness, generosity, kindness to self and others, awakening. Whichever movie we're running, those neurons are firing and wiring together. So learning how to use your mind to shape the wiring of your brain is a profound way to support yourself on the path of awakening.

The mind & brain co-arise co-dependently

There's been a lot of research and clarification over the last several decades about how the brain makes the mind, and how the mind makes the brain, in a codependent, circular kind of way.

Let's begin with some clarifications:

- By “mind” I mean the flow of information through the nervous system, most of which is forever unconscious. We privilege what's in the field of awareness because that's what we're conscious of. But cultivating beneficial factors down in the basement of the brain, outside of conscious awareness, is actually more influential in the long run.
- Further, the brain is embedded in larger systems, including the nervous system as a whole, other bodily systems, and then biology, culture, and evolution. It is shaped by those systems, and also shaped by the mind itself. For simplicity I'll just refer to the brain, but really we are talking about a vast network of interdependent causes. Much as the Buddha taught.
- There may well be transcendental factors required for the mind to exist, to operate: call

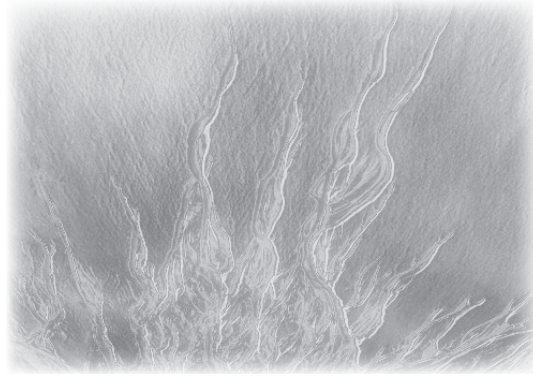
Mental activity is like a spring shower, leaving little traces of neural structure behind...

those factors God, Buddhanature, the Ground, or by no name at all. Since by definition, we cannot prove the existence or non-existence of such transcendental factors either way, it is consistent with the tenets of science to acknowledge transcendental factors as a possibility. That said, and with a deep bow in their direction, we will stay within the frame of Western science.

- Within that framework, the brain is the necessary and proximally sufficient condition for the mind. (It's only proximally sufficient because the brain is nested in a great network of causes, without which the brain could not exist.) This view, generally shared within Western science, is that every mental state is correlated with a necessary and proximally sufficient brain state.

This integration of mind and brain has three important implications. First, as your brain changes, your mind changes. Second, as your mind changes, your brain changes. Many of those changes are fleeting, as your brain changes moment to moment to support the movement of information. But many are lasting, as neurons wire together: structure builds in the brain. Mental activity is like a spring shower, leaving little traces of neural structure behind. Over time, the little tracks in the hillside draw in more water down, deepening their course. A kind of circular self-organizing dynamic gradually develops, and then the mind tends to move more and more down that channel, and soon enough you've got a gully.

For example, if you are using neural circuits a lot, they actually become more sensitive to stimulation, for better or worse. Over time if a region is increasingly active, it gets more blood flow, more glucose, more oxygen and so forth. Existing synapses get stronger and new synapses form. Cortical layers actually get thicker as neural structures build; for example, the thickening in the part of the brain called the insula—which senses the internal state of your body—that is due to meditation, is on the order of a two-hundredth of an inch, which may not sound like much, but that's lots and lots of new synapses.



Remarkably, synapses began forming in your brain before you were born, and your brain will keep changing up to the point of your last breath. Since neural activity continues in an increasingly disorganized way for a few minutes after the last breath, synapses may still be forming as the lights in the great mansion of the mind slowly go out.

The third implication is the practical one, and that's where we'll focus: you can use your mind to change your brain to benefit your whole being—and every other being whose life you touch.

Your complex, dynamic, interdependent brain

Your brain has about a hundred billion neurons in it (see the sidebar for more basic facts about your brain). In principle, the number of possible states of the brain is the number of possible combinations of a hundred billion neurons either firing or not (“on or off”). That number is really big: ten to the millionth power, which is one followed by a million zeros. To put this in perspective, the number of particles in the known universe is about ten to the eightieth power—one followed by eighty zeros versus a million zeros. The brain—your brain, right now—is the most complex object known to science. It's more complex than an exploding star, or climate change.

The brain functions through a mixture of specialization and lots and lots of teamwork. Parts of the brain do specialized things, like the speech centers in the left temporal and frontal lobes. On the other hand, if you map the communications pathways among the regions and specialized tissues of the brain, you see that it's highly interconnected. It's a little bit like tracking roadways from space or information on the Internet: a very dense network. So when people talk about specialization and function in just one place, like “The amygdala

Understanding the chaotic and sometimes frankly wacky flux of neural activity can allow you to take it less seriously.

is the fear part of the brain," or "The left hemisphere is bad and the right hemisphere is good," it's an inaccurate simplification.

Within the networks of the brain, there are lots of circular loops. To simplify, there is the "A" neuron connected to the "B" neuron, connected to the "C" neuron, connected to the "D" neuron, and then back to the "A" neuron. These possibilities of recursion, as a computer programmer would call it, give you the capacity—among other things—to become aware of awareness.

Neurons also share each other. To simplify again, let's say you activate the "C" neuron in our A-B-C-D-A loop, and the "C" neuron is shared with another loop. So there you are, irritated because the faucet's dripping in the middle of the night, and suddenly you think about the smell of your grandmother's cookies. Why? For some reason, there was shared circuitry in the coalitions of synapses that momentarily formed. The discursive stream of consciousness is so complex that as a system it exhibits some chaotic qualities. Understanding the chaotic and sometimes frankly wacky flux of all that neural activity can allow you to take it less seriously.

Neurons often fire in harmony with each other, five to fifty times a second—maybe even eighty or a hundred times in some parts of the brain. They're synchronizing with each other, and that's what produces the rhythmic waves of electrical activity—"brainwaves"—that are picked up with EEGs. Types of brainwaves are grouped together based on how fast they are; for example, brainwaves that happen 30—80 times a second are called gamma waves. In one study, when experienced Tibetan practitioners meditated, there was a spreading and strengthening pattern of gamma wave activity in the brain: billions of neurons firing in harmony with each other, 30-80 times a second. Synchronizing microscopic neurons spread across broad regions of your brain is like everybody between Barre and Boston clapping in unison let's say thirty times a second. Wow! And these effects of synchronization and integration are seen outside of formal meditation: in the same study, those Tibetan monks—who

Amazing brain facts

Your brain weighs about three pounds, with the consistency of soft tofu. It is made of about 1.1 trillion cells. About a hundred billion of these cells are neurons; the others are the support structure of the brain, the white matter, the glial cells, predominantly, that help build myelination around the long axonal fibers of the neurons, which accelerate neurotransmission.

Each of those neurons on average has about five thousand connections with other neurons. That creates about five hundred trillion connections, called synapses. These are tiny little junctions between neuron "A" and neuron "B" where they communicate. In most neurons, each time a neuron fires, neurochemicals move across the synapse (a small fraction of your neurons make direct, electrical connections).

Each neuron is always either firing, or not. Each firing is a signal, like "green light/red light;" it tells the downstream neuron to fire or not. So each neuronal firing is like a bit of information in a computer, a zero or a one. Most of the neurons in your brain are firing five to fifty times a second. They are very, very busy.

As a result, this little organ, two percent of body weight, uses twenty to twenty-five percent of the body's metabolic supplies. Even in the deepest sleep, even in a coma, the brain is busy. It's like a refrigerator; it's always on. The brain keeps going so that if you're suddenly attacked in the wild or you've got to deal with something in your cave, kaboom, you're ready to go.

We can recognize maybe four thoughts per second, if we're pretty aware. If we get really quiet, we might be able to see eight to ten, at the most. Working memory circuits, which are a key neural substrate of conscious awareness, seem to update about six times a second. So that's roughly how tight the granularity is of discrete thoughts. That is really slow, as far as the brain's concerned. So what we think of as thought—this slow, congealed, turgid stuff—is just the tip of the iceberg of mental activity.

As we practice more and more, there's more integration and coherence in the brain, growing stability and spaciousness—equanimity, in other words.

have done 30,000 to 50,000 hours of meditation in their lifetimes—have resting state gamma activity that's greater than people who don't have so much practice. This suggests that, as we practice more and more, there's more integration and coherence in the brain—which corresponds to a growing stability and spaciousness, equanimity in other words, in the mind.

Brain and body benefits of meditation

The anterior cingulate cortex (ACC) is a brain region that is ground zero for a lot of very important functions. For one, it's the part of the brain that manages what's called "effortful attention," which is basically paying attention in a deliberate way. That sounds like meditation. The ACC is the part of the brain we use for mindfulness in all four postures, not just seated, but walking, lying, and standing. It's also the main source of the focused attention we use for talking, and doing other activities that call for deliberate focus. Your cingulate cortex tends to get thicker to the degree you meditate.

For many people, it's easy to feel when they feel, or think when they think, but to bring mental clarity into being upset, or to warm up cold cognition with heartfelt emotion, is hard. The capacity to do that is centered in the anterior cingulate cortex. So, for example, doing things like compassion meditation, particularly mingling thoughts and feelings of compassion together, stimulates the ACC and therefore strengthens it; you're firing those neurons and therefore you're wiring those neurons.

Another region that gets thicker with meditation is called the insula. If you strengthen a part of the brain through meditation, you get to reap those rewards for other uses. For example, the insula is crucial for one the three main aspects of empathy: visceral resonance with the feelings of another person (the other two aspects are simulating inside yourself the actions ["mirror systems"] and the thoughts/wishes/psychodynamics ["theory of mind"] of others). To the extent that we're in touch with own inner being, including our gut feelings—and this degree of in-touchness correlates with the activity of the insula—we become more able to be empathic with others.

True compassion, true loving kindness, requires empathy. I've known people who are sort of generically compassionate, and generically kind, but aren't actually moved by the inner state of the other person. That's not the real deal. So it's foundational to strengthen your empathy. I can tell you from twenty-seven years of marriage, empathy's a good thing! (And there are of course lots of important places for empathy outside of marriage.) Also, if you understand how to be empathic yourself, you understand better how to ask for it from others.

Meditation is probably the most researched mental activity in terms of neural impact. We know, for example, that meditators have less cortical thinning with aging. As I see more gray hairs on my head every year I appreciate the fact that one of the great ways to promote mental faculties well into old age is through contemplative practice. One exploratory study has shown a correlation of about a fifteen per cent reduction in Alzheimer's symptoms if a person has a religious background (there was only one Buddhist in the sample, and any kind of religious activity counted, but the study is still suggestive). That reduction of fifteen percent is about as much as the best current medication can do for Alzheimer's.

In another example, Richard Davidson did a very interesting study with people in a high tech company. He had some of them do daily meditation. After just six weeks, the people who meditated had stronger immune systems. They fought off a flu virus more effectively than people who hadn't meditated.

So meditation benefits us through multiple pathways. Parasympathetic activation ("rest-and-digest")—relaxation, in other words—is very supportive of immune system functioning, whereas sympathetic activation ("fight-or-flight") suppresses immune function. Chronic stress exposes us to illness to a marked degree. Sleepy meditating is better than no meditation in terms of parasympathetic activation, or dampening sympathetic arousal (wakeful meditation is usually best of all). We can get attached to and even righteous about one specific method, whereas actually meditation has a lot of important general effects not specific to any particular method.

Equanimity can break the chain right between feeling tone and craving, like a jumbo scissors.

Another major Richard Davidson finding is that people become increasingly happy as they meditate—positive emotions become more prevalent, broadly defined. There's a greater asymmetry of activation, left front to right frontal. To illustrate this with stroke patients, people with a stroke in the right frontal region tend to become kind of mellow. Maybe they can't walk well, but they're often relatively serene about it. But if they have a stroke in the left frontal region, they're a lot more likely to be grouchy and grumpy.

Why is that? Because the left frontal region is involved in dampening, inhibiting negative emotional activity, whereas the right frontal region tends to promote negative emotional activity. In the wild, there's a lot of survival value to negative emotional activity; right hemisphere activation—which tracks the spatial environment from which most threats originate in the wild—primes you for dealing with threats: in other words, primes you for aversion, for what are called avoidance behaviors, namely fight, flight, freeze, appease. Maybe sometimes those behaviors are useful; in our evolutionary history, they certainly promoted survival and passing on genes. But today, in different settings and with different aims (like spiritual practice), it's great to have relatively strong left frontal activation.

Dependent Origination, brain, & equanimity

The feeling tone is a good example of where the Dharma maps well to neuropsychology. In the Dharma, there's this notion of the chain of Dependent Origination. One part of that chain that contains great opportunities to reduce or eliminate suffering is the sequence of contact > feeling tone > craving > clinging > suffering.

Contact is the meeting of three things: an object, the sense organ that apprehends that particular kind of object, and the consciousness that goes with that particular sense organ. Following contact, the brain produces a feeling tone that is pleasant, unpleasant, or neutral to help you know what to do: approach the pleasant, avoid the unpleasant, and move on from the neutral. This mechanism is a very effective way to promote survival in the wild and the passing on of genes. Feeling tones are important in evolution and they are a central theme in the Dharma: for example,

they are one of the Five Aggregates, and also one of the Four Foundations of Mindfulness.

Say the phone rings. Depending on whether you're waiting for a call from a dear friend, or doing something really important and don't want interruptions, you'll get a different feeling tone: pleasant, unpleasant or neutral. In the brain, the amygdala and hippocampus register pleasant/unpleasant and then broadcast a signal widely.

In Dependent Origination, what follows feeling tone is craving. We crave the pleasant, and the ending of the unpleasant. Either way, it's a kind of craving. After craving comes clinging, a sort of a more congealed, substantiated, enacted, "you're in it" form of craving. And then, what follows clinging? Suffering.

Equanimity can break the chain right between feeling tone and craving, like a big, jumbo scissors. You let the feeling tone be. It gets into the "mud room" of your mind—that outer room where the muddy boots and wet jackets get left—but it doesn't enter the central "living room" of your mind. Equanimity increasingly allows us to just be present with the pleasant, the unpleasant and the neutral, alike, without getting reactivated around them.

Equanimity is a very deep matter in Buddhism. It is one of the Seven Factors Of Awakening, and one of the hallmark characteristics of the *jhānas* (states of concentration). Notice, for example, the difference between calm and equanimity. Calm is when you don't have reactions. You're chilled out. But with equanimity, you're not reacting to your reactions; they stay in the mud room. It's as if the reactions are surrounded with a lot of spaciousness. You prefer the pleasant to continue and the unpleasant to end—that's OK. But you don't even react to not getting that preference. You just surround it with space, and that's where freedom is. I think that's how people like the Dalai Lama can be sorrowful about what's happening in Tibet, and yet simultaneously have enormous equanimity around it.

Calm is based on conditions, and thus not that reliable. But equanimity is based on insight, wisdom, and is thus much more dependable. For example, disenchantment is a key factor of equa-

Abiding increasingly in that fertile, generative space in which neural assemblies take form is a central process along the path of awakening.

nimity. We start to realize, "Won't get fooled again." Ice cream tastes like ice cream, orgasms are orgasms, being angry is being angry. Winning an argument, being right and showing them the error of their ways is just that. After a while you go, "so what?" Wisdom allows you to let go of the lesser pleasure, chasing the pleasant or resisting the unpleasant, for the greater pleasure of equanimity.

What happens in the brain when people become equanimous? In a sense, equanimity is unnatural, since we evolved to get really good at reacting to the feeling tone. Our ancestors that were all blissed out, and not driven to find food and mates, and not driven to avoid predators and other hazards... CHOMP, did not pass on their genes. The ancestors who lived were extremely easy to activate into states of "greed" and "hatred;" realizing this helps bring self-compassion to a path of practice that involves, in part, moving upstream against evolutionary currents. And it is important to remember that when we are not activated, our natural resting state is characterized by the Five C's: Conscious, Calm, Contented, Caring, and Creative. It's just that we are very vulnerable to signals of opportunity and threat—and especially to signals of threat, since in evolution it is more important to dodge sticks than to get carrots: if you miss out on a carrot today you'll probably get another chance at them tomorrow, but if you fail to duck the stick today—POW—you won't have any chance for carrots tomorrow. I think this is the evolutionary reason for the Buddha's emphasis on dealing with aversion, since aversion to threats is so central to human existence.

In your brain, equanimity entails insights and intentions centered in the prefrontal cortex as well as prefrontal buffering of the feeling tone signals pulsed by the amygdala. It also entails the stable spaciousness of mind characterized by increased gamma wave activity of the brain. These neural developments are the fruits of sustained practice.

Seeing the origins of mental activity

One of the possibilities of meditation, or practice broadly, is to get us closer to the bare processing of "this moment, this moment, this

moment." The brain takes the noisy, fertile chaos of billions of neurons networked together in intricate and transient circuits, and then it forms assemblies which may last a few tenths of a second, or a few seconds at most. When you observe your mind you can see the outer signs of this neural activity by watching your thoughts merge into solidity and then crumble and disperse.

Just before a new neural assembly forms, there's a space of fertile emptiness, where structure hasn't yet congealed. Once a representation becomes fully established—an image, an emotion, a view, a thought—it is no longer free. You can have freedom around it, but whatever it is, that representation is set until it disperses.

So abiding increasingly in that fertile, generative space, in which neural assemblies take form, is a central process along the path of awakening. I think the people who are really far along in the practice are increasingly abiding in that territory. Thought is occurring, but they're living more in that space of fertile freedom.

Self is like a unicorn

Components and functions of the apparent self—*Me! My Precious! I want! How'm I doin'?*—are widely distributed in the brain. Take just three kinds of self-related activities. One is recognizing yourself, distinct from other people, or noticing an "x" on your forehead someone put there without you realizing it. Only a few animals can do that, including humans, other "great apes" such as monkeys and gorillas, whales and dolphins, and elephants. Another aspect is personal history, your memories. The third aspect is making decisions; I want chocolate, not vanilla, for example. Studies have shown that those self-related activities are spread out throughout your brain. There's no homunculus looking out from your eyes. Self in the brain is just like the Buddha says in the Dharma: compounded (made of many parts), variable and transient, and interdependently arising. It has no inherent, underlying self-arising on its own; therefore it's empty of absolute existence.

Much of the time there's not much selfing present; there is presence and mental activity without much activation of "I" or "mine." You

shift your body in your seat because it's gotten tight somewhere: probably there's not a lot of self present. But suddenly someone says something to you, or you notice, hum, their chair is crowding into mine: *Hey, don't you respect my space?!* Then the self really activates. There is a process of varying self-related activities; self is not a noun but a verb: there is selfing. Selfing developed in evolution to help us survive, and so it shows up particularly under three conditions: pursuing opportunities (often associated with "greed"), avoiding threats (often associated with "hatred"), and interactions with others (since we evolved to be the most social animal of all).

Aspects of self arise as impermanent but existent patterns of mental and therefore neural activity. These patterns exist in the sense that the patterns which correspond to a thought of a butterfly or the knowledge that $2+2=4$ exist. Patterns exist, but they're impermanent and dependently arisen: they're empty. Mental/neural patterns related to self are just more patterns in the mind and brain, not categorically different from other mental/neural patterns. The problem is that we privilege those particular patterns above all others. They are the ones we most identify with, and the trickiest ones to disidentify with as we proceed along the path of practice. The mental/neural activity of selfing is designed by evolution to continually claim ownership of experiences, claim agency of actions, and claim identification with both internal states and external objects (like political groups or sports teams we like): it's very powerful! Watch your mind: a strong reaction will arise, let's say, and for the first second or two there is not much self entwined with it, but quickly self jumps on the bandwagon and then claims the reaction as its own. Self does give rise to desire, but much of the time, it is desire that gives rise to self.

But actually, much of the time self is truly superfluous to functioning well in the world, and feeling good inside. Without much if any selfing present, there can be executive functions at work, such as organizing and planning or the will. There can be wholesome desire, *chanda*, present—which is distinct from *tanhā*, thirst or craving, which the Buddha said caused suffering.

Walk across the room: does there need to be self present? Lift the cup to your lips: is self needed?

The patterns of selfing in the mind and brain are real; they exist in the way that memory or an emotion exists. Their existence is transient and empty, to be sure, and thus not worth clinging to. But even more to the point: does what they point to, what they represent, actually exist? In other words, is there actually a coherent, unified, stable, enduring being somewhere, somehow, in the brain? Actually, no such being exists. Whatever of self there is in the brain, it is compounded and distributed, not coherent and unified; it is variable and transient, not stable and enduring. In other words, the conventional notion of self is a mythical creature. Representations of a horse in the mind/brain are real representations of a real thing. But representations of the self in the brain are like representations of a unicorn: real representations of an unreal thing.

In sum, when you appreciate that the representations of self in the brain are empty, that what they represent does not exist, you start taking your own "self" much less seriously.

Conclusion

The reality is that the more we study how the mind and brain intertwine, the more we find how well it maps with Dharma. The Buddha clearly understood this cycle of using the mind to change the brain, which then changes the future mind. If this is done well, it reduces suffering. He showed us ways to examine our experience, see how this works, and use that intuitive, direct understanding to free ourselves from suffering—completely free ourselves, in this very life, potentially. Just about everything we have found in neuropsychology supports the idea that he was right. This should give us a lot more conviction in our practice, along with a continuing

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How Does Meditation Train Attention?

By James H. Austin, M.D.

"Attention, attention, attention!"

—Zen Master Ikku's answers when asked
for the source of the highest wisdom

It helps to conceptualize meditation as an attentive art, so let's start with meditation's two basic categories. The first kind employs an effortful, sustained attention. This variety of *concentrative* meditation is the easiest to understand. It's what we begin with and what we return to frequently during meditation. Concentration implies that we narrow our focus voluntarily. We choose *this* target and exclude others. When we intensify concentration in such a "top-down" executive manner, it can later evolve into the absorptions, the *jhānas*. When we describe this focused, top-down form of meditation as implicitly *Self*-referential, it means only that we ourselves are *doing* it. We're the active agents in charge. Even when we're following our breath down to its slightest movements in the lower abdomen, our *Self* is still in there "paying attention" in this willful, voluntary manner.

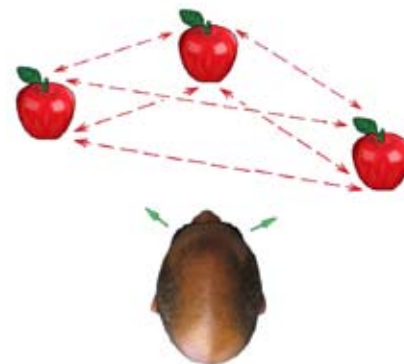
(We'll use a capital S to suggest that this personal *Self* creates many large problems.)

The second category, *receptive* meditation, is less obvious and less easily defined. It begins as a bare, choiceless awareness. Why is this awareness called choiceless? Because no person is in there choosing what to focus on. Therefore, this kind of involuntary meditation is more *effortless*. Its modes of "bottom-up" attentive processing are wide open to include any stimulus that might come *unexpectedly* from anywhere. A receptive awareness so universal in scope is basically *other*-referential. Subsequent sections expand on several important implications of such "bottom-up" receptivities. Increasingly, they are poised to shift into intuitive modes of comprehension—into insights of various depths (hence, its common name in Western Buddhism: Insight Meditation, from the Pali *vipassanā*).

Our two ways of perceiving reality

Two processing streams are involved when we perceive reality. The first is our familiar *egocentric* processing system. Take, as an example, someone who looks down toward a table to reach for a nearby apple. Photons from that apple are transformed by the eyes into impulses coursing toward the back of that person's brain. In the opening milliseconds, the brain represents this apple's raw visual image in 3-dimensional spatial coordinates. This apple-message is referred directly back to circuits representing his or her own physical *Self*. This somatic *Self* remains the central axis receiving all such *Self*-referent 3-D perceptions. This is an automatically *Self*-centered, *egocentric* reconstruction of a real apple. It's also the obvious way that we're each continually reminded: *I am this* unique someone who is looking at *that* thing down there.

But there's a second, covert way of perceiving reality; we're normally totally unaware of it. Its mode of perception is *other*-centered, not *Self*-centered. Therefore, most research reports in psychology now refer to it as *allocentric* perception, from the Greek, *allos*, "other." Allocentric accurately describes the seemingly objective, externalized



It's almost as if the allocentric functions exist on some other planet, having no need for us back on earth to be witnessing it.

perspective that first creates images of objects in the outside world. The apples it sees co-exist in relation to other apples “out there,” *not* with reference back to our body in the center.

Functional anatomy of two streams, E & A

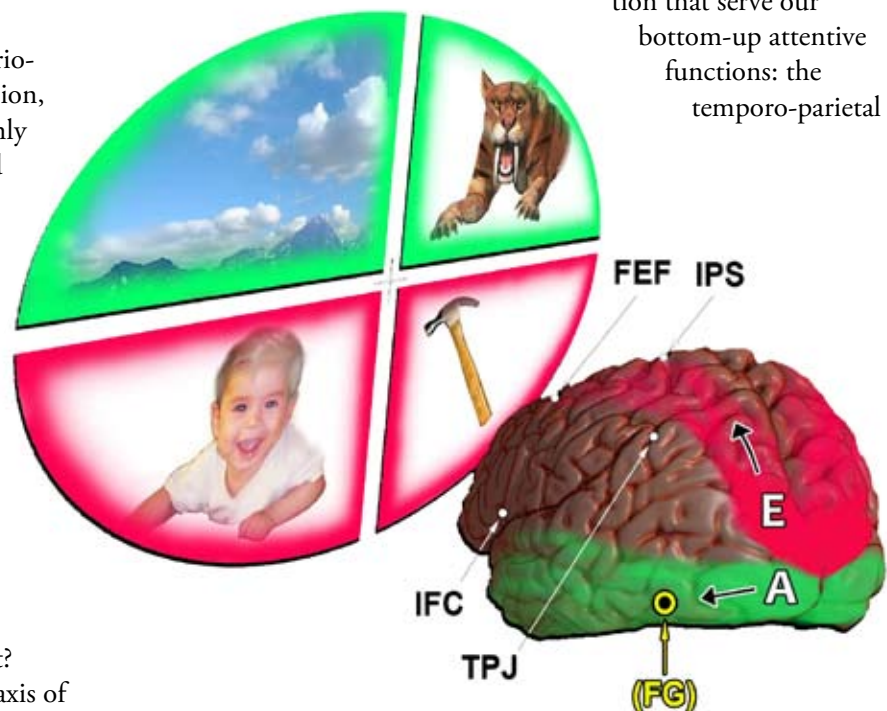
Let's now return to take up the first, egocentric processing stream in greater detail. [See figure, below.] Here, your vantage point is from a position behind the brain's left hemisphere. This brain is shown gazing up and off to the left into quadrants of outside scenery. The egocentric processing pathway (E) is shown pursuing its *upward* trajectory. Along the way, it overlaps with the two major modules for our top-down visual attention. These are the intraparietal sulcus (IPS) and the frontal eye field (FEF). On this upper trajectory, it's clear that our Self-centered stream flows first through the parietal lobe. Note what this implies: our top-down form of attentive processing is inherently linked with that of our own body, our *soma*, our personal physical self. Up here, in the parietal lobe, this Self-referential stream enlists the services of two highly personal special senses. One is proprioception—our subliminal perception of exactly where and how our body parts exist in space. The second is our sense of touch. Note that we use proprioception and touch to help us handle things close to our body.

In a top-down proprioceptive and tactile decision, the functions are not only intimately Self-centered (egocentric), their metrics are also action-oriented. Indeed, when objects are positioned *down* here close in front of us, we're often looking down at them *below* the horizon of our gaze, and our hands are working on them with tools. How do we localize the position of a tangible object? We refer it back to the axis of

our “body image,” a schema divided into left and right halves, for example.

In contrast, the allocentric stream (A), pursues a trajectory lower down. This processing stream flows through networks down in the temporal lobe. As soon as they register an object farther away, they *identify* it, aided by their pattern recognition functions. Moreover, this lower processing stream is also poised to infuse *meanings and values* into whatever it perceives out there. It's hard for us to get our mind around the notion of this allocentric stream because it begins so anonymously. It's almost as though its functions exist on some other planet, having no need for us back on earth to be witnessing it. Its mode also seems inherently objective. Why? Because none of our private subjectivities are involved in it. In this respect, note that it enlists the vital associations of two other special senses—vision and hearing. These are the two special senses we use when we wish to detect objects and evaluate them at much greater distances from our bodies.

Note how this lower stream flows downward first, then runs through the temporal cortex on its way toward the lower frontal regions. Along the way, its trajectory is accessible to the two other modules of attention that serve our bottom-up attentive functions: the temporo-parietal



Imagine that the right side of the brain struck a bargain eons ago with its opposite hemisphere: you handle language, but I'm going to take our subtler kinds of attention.

junction (TPJ) and the inferior frontal cortex (IFC). Keep in mind that these temporal lobe networks are designed for meaningful interpretations based on seeing and hearing.

The “crossings” of functions

By now, the general public tends to be aware that the *left* hemisphere plays the dominant role in the way people speak, read, and listen to language. This left hemisphere also handles fine details more efficiently, using its fine-grain discrimination functions. Moreover, when the left hemisphere looks out, it tends to see things that lie over in the opposite *right* side of the environment.

Why do so many of our functions seem to cross over *to*—and return *from*—the opposite side? Brain pathways often do cross over when they transmit messages entering from the opposite side of the outside world or the opposite side of our body. Indeed similar crossings also point to the way that our temporo-occipital region (low down in the back of the brain) attends most efficiently to visual stimuli that enter our *upper* visual fields. Referring again to the figure, this explains why the green allocentric stream (A), which flows through the *lower* regions of the brain, is shown receiving visual information from the green-framed scenery in the *upper* visual quadrants. In contrast, the *upper* red egocentric stream (E) receives visual information from nearby targets framed by red in the *lower* visual fields.

However, there's another important point: the *lower* pathways in the *right* hemisphere play the predominant role in certain key aspects of our attention. This information is crucial for meditators to be aware of. Because when you want to further refine both your involuntary forms of bottom-up attention and the interpretive nuances of their nearby allocentric processing, you'll be chiefly exercising these automatic intuitive functions of your *right* hemisphere.

Moreover, this right hemisphere takes on another responsibility. It attends not only to the opposite (left) visual field but *also* to the *right* side of the outside environment. Imagine that the right side had struck the following kind of

bargain eons ago with its opposite hemisphere: OK, you can handle language over on your left side, but I'm going to take credit for our subtler kinds of attention. These are the skills poised to service unexpected needs to attend to *both* sides of the environment. Today, what is the result of such a pre-emptive decision? A right hemisphere that enables us to attend—in an *other-referential manner*—to the outside world *on both sides, simultaneously*. Consider how this sets the stage for higher states of attention to develop.

Note also the survival advantage. Hearing detects some rustling noises. Vision glimpses the potential predator. Such a brain can identify a fearsome beast while it still remains a relatively long distance away from one's body.

Why is that saber-tooth tiger pictured in the *upper* field of vision? To identify the beast instantly, one needs to discriminate the tiger's color patterns from those of the adjacent green foliage. Nerve cells specialized for color discrimination are located in the fusiform gyrus (FG) at an early stage along the allocentric pathway. From there, the pathway diverges into the pattern recognition regions of the rest of the temporal lobe. Later, a grateful survivor might look up above the horizontal and off to the left, to enjoy the mountain scenery and distant clouds.

Perhaps you're also wondering why a baby and a hammer are shown nearby in the lower visual fields. Everyone worries about the possibility of actually dropping a baby. It takes top-down decisions to pick up a baby and balance it on your lap. You pay careful executive attention to how you position your hands. It also takes a lot of skill to aim a hammer when you hold a small nail. That hammer head must come down smack on the nail head, or your fingers are history.

In summary, thus far, evolution seems to have wired our circuits in the following manner:

- The lower right hemisphere plays a dominant role in our bottom-up, reflexive attentive processing. In this respect, its functions are reminiscent of the way corresponding regions over on the left side were designed to exercise its dominant role in our motor speech and comprehension of language.

Our "I" is arrogant and aggressive. Our "Me" is its vulnerable partner, trembling with fear.

- The upper, parietal pathway in each hemisphere is designed to service our Self-centered behaviors, especially when we look down to grasp and manipulate things held close to our body.
- In contrast, the temporal lobe pathways lower down are tuned to attend most efficiently to other messages entering from the more distant environment. Visually, the temporal lobe is more sensitive to stimuli that can enter from the scenery higher up above our horizon of gaze. Moreover, it is poised to interpret sound stimuli that arise from anywhere.

The *I-Me-Mine* Triad

It's useful to envision three main interactive components of our personal Self, in order to understand why they go on to have maladaptive consequences.

The *I-Me-Mine triad* operates within certain overlapping premises. The *I* itself has a tangible core. Our *soma* obviously exists physically, and it obviously feels emotions of all kinds. Moreover, the *I* knows that it is aware, knows that it acts, thinks, and personifies various roles.

Things happen to the *Me*. Things hurt *Me*, both my soma and psyche. This *Me* is the target for every sling and arrow of outrageous fortune.

Finally, the *Mine* represents our greedy, possessive self. All private thoughts, opinions, and body parts are mine. Don't invade *My* turf. Remember: these prized possessions are *Mine*.

This complex triad clearly serves useful and adaptive ends. But many maladaptive dysfunctions are associated with such a Self. For example, our *I* is arrogant and aggressive. Our *Me* is its vulnerable partner, trembling with fear. It feels besieged and gets battered. Finally, our *Mine* is easily captured. It covets and craves material goods. It clutches at other people. An especially pernicious habit is the way our *Mine* cherishes and clings to old biased opinions. These are the kinds of "*a-b-c's*" that suggest the everyday liabilities of our *I-Me-Mine*.

Our active "resting" brain

Only recently did neuroimaging researchers actually pay volunteers to do nothing. The subjects were instructed to relax yet stay awake. The resulting passive setting resembles a preamble to several of the more relaxed styles of meditation—but only in the sense that these research subjects were being encouraged to begin with few top-down goals in their conscious minds.

The subjects' earlier PET scans and more recent fMRI scans (functional magnetic resonance imaging) show two big regions of activity, deep *inside* the brain, along the inner surfaces of its right and left halves. One big "hot spot" lies in the medial prefrontal cortex, again on each side. The other lies in the deep medial posterior parietal region, also on each side. A smaller "hot spot" lies on the *outside* of the brain in the lower parietal cortex on each side. It involves each angular gyrus, a crossroad in the egocentric pathway. Is this truly a "resting brain?" If so, these particular regions are very active.

Later, researchers asked their subjects to engage in some *precisely Self-related activity* (such as introspecting into their very own personality). Now, each large medial frontal hot spot became even more active than it was during the resting baseline period. Later still, the subjects could be asked to dig back into their own memory of a particular event, one in which they were personally involved. Now, when the subjects re-imaged the circumstantial details of *that particular scene*, their parietal regions also became even more active than they had been at rest.

We might briefly summarize this evidence about the *already hot* spots existing inside the so-called "resting" brain: 1. Some regions are further activated when that person engages in intuned, Self-relational functions; and 2. Others also become turned on more when such Self-inspired acts become *recorded in the context of other circumstantial details* drawn from the outside world.

These observations suggest that the brain has ways to enlist a spectrum of "self-othering" functions. What practical purpose might be served by blending the contributions of these Self-centered frontal networks with those supplied

Each time our attentive regions are enhanced, its shifts can deactivate our Self-referential regions.

by their Self-other parietal partners? It's possible to envision such interactions as the source for entries to our ongoing, daily journal. Each of us stores a lifetime of personalized events as we go about our ordinary, everyday activities. They take the form of "who-what-where-and-when" entries. They help us remember: "I graduated from *this* high school, and with *these* guys and girls, umpteen years ago. *This* church is where my wife and I were married. *This* is where we went on our honeymoon. This is how I reconstruct *my* life narrative when I explain who I am to a stranger. Each time I need to navigate within *my* surroundings, I can consult this vast storehouse of *my* detailed memories."

These memory traces (engrams) record our ongoing private sense of Self. They need to be indexed, distributed and stored in ways that are readily accessible. We require baseline resources of metabolic energy to maintain these journal entries. We also need standby reserves of energy instantly to select and recall which precise entries match our most urgent needs.

Our "monkey mind"

We've jam-packed these networks with trivial entries accumulated over a lifetime. We also keep them preoccupied with dire worries about fictitious events that we continue to project into an imaginary future. Is it any wonder that thoughts intrude when we meditate? Where do such frantic fears, plans, and scenic details come from? They reflect the over-activities of distributed networks that stay ready to be engaged, even when we'd much prefer otherwise.

"Monkey-mind" describes these intrusive thoughts. They leap around between past, present, and future, jump from one branching topic to another. In contrast, the emphasis in Zen is on no-thought meditation, *mushin*. One ancient adage concludes: "Forget about the branches—get to the underlying root."

Attention triggers deactivation

To get to the root means going deeper in the brain. The next research findings become more complicated, because sometimes researchers presented their resting subjects with *a significant fresh task* to perform. Now, those three previous

hot spots became "cooler." Those three active spots became *deactivated*. Let's not be misled by how much processing was obviously required to solve the whole task itself. Let's focus first on just what's needed in the earliest milliseconds: *a task must first capture our attention in order to be considered significant*. First, we need to *attend to it*. We also need to *sustain this attentive interest to process the task appropriately*.

The two-word phrase, *attentive processing*, condenses this practical principle. The order of these two words is instructive. Attention comes first. Attention is the vanguard. Each sharp point of attention is the salient event that impales its target. Only when attention helps focus on any new task can we then mobilize our subsequent processing. Indeed, as soon as our brain confronts a fresh demand to attend, the fMRI evidence can be interpreted to suggest that the brain's former active hot spots react by becoming cooler ("deactivated.") Such a shift could help cut through all the trivia, and point directly toward those few circuits that are essential to solve the immediate task at hand.

Brain's slow, spontaneous intrinsic rhythms

Other intriguing things happen in the so-called "resting brain" when researchers stop assigning new tasks and simply observe a resting subject's functional MRI scan for as long as five minutes. Sometimes the hot spots get a little hotter. At this same time, the different cool spots get a little cooler. After a while, the reverse occurs: when those different cool spots now get a little hotter, the previous hot spots now get a little cooler. A reciprocal "see-saw" effect keeps recurring. It turns out that one of these reciprocal effects increases the activity of those *outer* cortical regions involved in attentive functions; *simultaneously* it decreases the activity of those mostly *medial* fronto-parietal regions that we've seen are especially involved in a spectrum of Self-other functions.

These up-and-down fluctuations shift spontaneously back and forth between Self and attention three or four times a minute, on their own. Is such a slow, spontaneous rhythm of interest to meditators? Yes, because many Buddhist

The amplitudes of attention, enhanced and sensitized by long meditative training, suddenly captured by an unexpected stimulus: the personal Self can drop out.

practices are dually oriented: 1. toward enhancing attentiveness; 2. toward decreasing the pejorative influences of the maladaptive Self. This recent fMRI evidence suggests that our normal brain has these same innate reciprocal capacities: each time our attentive regions are enhanced, its shifts can deactivate our Self-referential regions.

Note: we're not referring to our usual brain waves, the kinds recorded in electroencephalograms (EEGs). EEG rhythms go up and down at much faster rates, multiple times each *second*. Instead, we're observing an ultraslow fundamental rhythm of the human brain. This kind of metabolic-bioelectric rhythm fluctuates even more slowly than does our breathing rate of around eighteen times a minute. Its complex origins are still under study.

The implications of triggering events

Zen Master Ikku emphasized attention. When he was 26, what precipitated his sudden breakthrough into a non-dual experience of selfless insight? The auditory trigger for Ikku was the unexpected "caw" when a crow flew overhead. Zen annals record many similar episodes when a triggering stimulus abruptly captured attention and precipitated *kensho-satori*.

When did Siddhartha finally become enlightened? Legends tell us that it was when he *looked up* into the pre-dawn sky and saw the planet Venus. (Often overlooked is the way that six earlier years of rigorous spiritual training were the prelude to the Buddha's supreme awakening by this "morning star.") The triggering stimulus serves only as the "last straw" on an already overloaded (and sensitized) camel's back.

We wonder: What makes an otherwise commonplace stimulus so effective, and *only* at a particular time? One plausible working hypothesis returns us to the brain's reciprocal shifts between two of its modes: attentiveness and Self-centeredness. Let the amplitudes of attention become enhanced and sensitized by long meditative training, and then suddenly captured by an unexpected fresh stimulus.

Now, finally, the personal Self can drop out of the mental field of consciousness.

That alone would not suffice. Simultaneously, attentive mechanisms need also to react selectively, in ways that liberate bottom-up attention as the vanguard of allocentric processing. Unleashed from their subordinate role, these lower networks can resonate in harmony with the whole outside environment. Allocentric perception (now heightened) can perceive its outside setting as a world both transformed and transfigured, as an environment manifestly "realer than real." Finally, vision and hearing can register direct, selfless, impressions. They are interpreted as absolute perfection. No limbic-driven fears or other *I-Me-Mine* intrusions distort this timeless state.

Thalamic roots of selfhood

How could *kensho-satori* also dissolve every last personal trace of fear, perceive all things afresh, as *THEY REALLY* are? To answer, we need to ask why those normal hot spots in our cortex stay so highly active, even at rest, and understand which circuits drive all our monkey-mind wandering. Much of this usual internal dialogue is driven by deep connections with our limbic system. These limbic circuits keep transmitting their legacy of ancient instinctual angst in ways that over-condition our Self.

Yet, wouldn't consciousness itself drop out if the Self and all its limbic overtones suddenly dissolved? No. Consciousness emerges transparently clear, fresh, stabilized. What does drop out in this state is the clutter referable to our Self-centered *I-Me-Mine* and its past accumulations of narrative trivia.

Let's now pursue many of the questions raised above to their deeply rooted answers farther down in the dorsal thalamus.

- Three limbic nuclei reside in this upper tier of the thalamus. Not only do they connect with the limbic system, their circuits also transmit its affective biases up to drive the larger, Self-referential cortical hot spots.

Extraordinary things can occur when certain sequences of events all happen to fall into place at just the right moment.

- The lateral posterior nucleus is another key nucleus in this dorsal thalamus. It connects intimately with the cortex of the superior parietal lobule. This is our somatosensory association cortex. It helps create the schema that integrates separate parts of our soma (our physical Self) into a functioning body image.
- The large dorsal pulvinar resides at the back end of the thalamus. Its vital associations contribute the normal sense of salience to our blend of Self-centered perceptions. It also interacts with both the large medial parietal *and* smaller angular gyrus hot spots of the parietal lobe.

What role could the *ventral* pulvinar and its projections play during *kensho-satori* as their messages continue to stream forward through networks in the temporal lobes? These pathways—now unleashed from inhibition—remain to sponsor the enhanced sense of values associated with insightful bottom-up, attentive allocentric processing.

GABA inhibition

How can a brain be so selective about what it activates and deactivates? The reticular nucleus of the thalamus is crucial in this regard. It embraces the whole thalamus, acting like a shield. It is composed of a thin gauze network of GABA nerve cells. (GABA stands for gamma aminobutyric acid.) GABA is our brain's major inhibitory neurotransmitter. Its role is to stop over-active nerve cells from firing excessively. Each time the reticular nucleus detects too much activity in the circuits that normally oscillate between thalamus and cortex, it releases its GABA to check this imbalance.

These pages emphasize the normal excitatory and inhibitory interactions between the limbic system, thalamus, and cortex. Their oscillations are not something esoteric just for mystics to tap into. Similar shifts go on each time you and I lie down at night and start dropping off into our normal slow wave sleep. At this time, as the reticular nucleus fires, its GABA shuts down the sensory transmissions relating to Self, and our monkey-mind finally stops.

In closing

This working hypothesis suggests how the meditative training of attention influences events down at the thalamic level that set the stage for the sudden breakthrough into the selfless insight of *kensho*. The resulting deactivations briefly dissolve both the egocentric overconditionings of the psychic Self and their links referable to the body schema of the physical Self. Liberated simultaneously, and selectively, are many functions of the allocentric pathway that stream forward through the temporal lobe.

Rarely, after the long and regular practice of training attention, you too might have occasion to look up and glimpse a bright, distant star, or perhaps to hear the penetrating sound of a bird call. Extraordinary things can occur when certain sequences of events all happen to fall into place at just the right moment. Yet, all too often, wandering thoughts and unbidden images clutter our minds. Covert influences from an overconditioned limbic system distract us with all their excess baggage.

A useful old Chinese Zen phrase is *wu shin*. It points toward our becoming empty of all such counterproductive interactions between heart and mind. It means neither being swept away by excess limbic baggage nor captured by cognitive concepts.

Does contemporary Zen include a prescription comparable to *wu shin*? If so, perhaps it might begin something like this: Just sit quietly. Be very patient. Learn how to *let go*. Allow your disquietudes to drop off. Open up into your receptive and inherently intuitive modes of meditation. Observe what happens. Remain so open that when thoughts come in the front door, they soon leave out the back door. Following Master Shunryu Suzuki's advice, "Just don't serve them tea."

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Buddhism, Body, Mind–Problem?

By Rajesh Kasturirangan

Many of the key questions scientists will be trying to answer in this century revolve around the mind and its relation to other entities. Is the mind the brain? Is the mind the body? Is the mind the body in the environment? Or is the mind some abstract entity that lives outside space and time altogether? I believe that Buddhist philosophy can help the process of reconciling these issues.

Science is based on the assumption that there is a single “real” reality that we each see through different lenses. If there is no systematic correlation between the state of the world and what we are measuring, there would not be much point in doing science. Quantum mechanics, of course, shows that what and how we measure are much more complicated than we ever thought. Newtonian scientists can describe the motion of the planets, or how to avoid being eaten by a lion. But reality, as it turns out, is far more complicated than that.

This has made the study of the mind particularly challenging. For science, of course, the first question before you begin to study something is to define what it is. But cognitive science—the branch of science particularly interested in understanding the mind and the nature of consciousness—is still struggling to define the mind and the brain and how they relate to each other.

There is a tradition within cognitive science that treats the mind as an abstract kind of entity. It says there is something about concepts and percepts that is somehow divorced from the world of matter. When people say the mind or the soul is somehow utterly unlike the body, they are not always doing it for purely dogmatic reasons. Whether you approach it from Buddhism, science, Freudian psychology, or cognitive psychology, the fact remains that there is a disconnect between the way we experience our lives from the inside and the way both ancient and modern sciences describe the nature of reality.

Classical Western science says that the objective point of view is the key. Look at all the objects that appear to exist without any subjects

to experience them. All the subjective beings we know about appear to be only a tiny fraction of everything that is: The history of life on this planet is so small, on a world peripheral to a solar system on the edge of the Milky Way, one galaxy of about 100 billion in the observable universe!

If you take the mind and the body as two poles, the biological and neurological sciences have progressed very far in the understanding of the body as matter. Meanwhile the newer cognitive science, which comes from a tradition in which the mind is an abstract entity that does not necessarily have anything to do with brains or bodies or physics—or even matter in any form—has also gone some distance in understanding the mind as mind. But the conflation of the two, which is standard practice, is unskillful.

To give you an idea of how far apart traditional science and cognitive science are, for example, consider that science wants to know first of all where a phenomenon is taking place before studying it. I’ve had some serious arguments with other scientists over just that issue. Where exactly is the mind, they want to know.

Cognitive scientists observe certain regularities in human behavior that aren’t easily explained. Children, for example, learn certain language categories in ways we don’t understand. A child learns “dog” and can pick out other four-legged creatures that fit the category. Any mistakes, such as thinking a skunk is a dog, are quickly corrected. This is quite remarkable.

This is the same sort of phenomenon that the philosopher, cognitive scientist and linguist Noam Chomsky and others say argues for innate knowledge of language in humans.

If this is really true, it runs into a hard problem concerning the mind/brain interface. If there are genes that encode this abstract knowledge, such as “dogs have four legs,” then there must be a category, “dogs,” that is independent of space and time. How can that happen? The structure of this knowledge is so different from anything else biology produces. We don’t understand how that can happen.



dog?



dog?

While the traditional approach of the materialist scientist works from the premise that third-person points of view, exemplified by classical experimentation, are the only way to find these things out, there have been some more recent movements to modify this. People like Francisco Varela, Richard Davidson, and Alan Wallace have advocated what is sometimes called neurophenomenology, wherein the first-person subjective reports of experienced meditators are compared with the data generated by such third-person techniques as fMRI (functional magnetic resonance imaging—brain scans). This is on the right track, but it seems to me these two frames of reference are so far apart that bringing them together is a much harder problem than neurophenomenology imagines.

Chomsky says our understanding of these things is similar to where physics and chemistry were in the nineteenth century. Chemists were discovering regularities in chemical reactions that seemed to relate to Mendeleev's periodic table of the elements. But the physicists of the day said that these could not be right, based on what physics understood at the time. But it turned out that it was physics that needed to change, not chemistry. It was not until the period between the 1930s and the 1950s that physics went through its own internal explosions and the chemical facts could get integrated.

In the first sutta in the *Majjhima Nikāya* (Middle Length Discourses), the *Mūlaparāyāya Sutta*, “the root of all things,” the Buddha compares the understanding of an “untaught, ordinary” person (one without practice in his teachings) with that of “a bhikkhu in higher training.” The untaught person “perceives earth as earth,” and then “conceives earth to be ‘mine.’” This might be seen as the same as the materialist scientist's point of view. (Let's not assume all scientists are strict materialists.) The “bhikkhu in higher training,” however, “having directly known earth as earth, . . . should not conceive himself as earth.” But he also should

not “conceive himself apart from earth.” The Buddha seems to be saying that the truth is somewhere between these two points of view, and that clinging to either point of view will prevent us from seeing things as they are.

So how do we find the truth between “the mind is the mind” and “the brain is the brain”?

I would like to show that Buddhist philosophy offers a glue to hold these two approaches together. Perhaps the psychological virtue pointed out by the Buddha in the *Mūlaparāyāya Sutta*, to see clearly but not become identified with what we see, can also be an intellectual virtue, not being identified with one side of the issue or the other. This is what I mean by Buddhist philosophy allowing us a way to hold both extreme views of this issue at once without identifying with either one. Ultimately, of course, we want to take those technical insights from both Buddhism and cognitive science and see how they can inform our own lives.

Buddhist epistemology

I think Buddhist understanding of how we know what we know—what philosophers call epistemology—can help us here, at least as far as using this understanding in our daily lives is concerned. Not only are our brains capable of making distinctions such as “true” and “false,” our minds operate as “normative” entities, that is, we also have senses of right and wrong, beautiful and ugly, and so on, that operate in parallel. We are not just physical creatures, but are also evaluative creatures. We experience our bodies as fleshy things that have desires. Chomsky said that the reason the mind/body problem is so difficult is not because of the mind but because we do not understand what the body is. Desires are not just in our heads.

A Buddhist intellectual virtue can allow us to hold all this in a useful way. It suggests that maybe the origin of the mind/body problem lies in trying to constitute two worlds as given in the first place. This separation is a relatively new idea. It was not taken for granted in either ancient India or ancient Greece. Its most extreme form comes to us through the Christian Scholastic tradition, which rediscovered ancient Greek ideas but wanted to make them coexist with Christian spiritual teachings. The solution, in a nutshell, was to separate the realm of

Maybe the origin of the mind-body problem lies in trying to constitute two worlds as given in the first place

the spirit from the material realm, so the emerging realities of science didn't conflict with the teachings of the religious authorities. Science stayed on the material side of the line; human consciousness, free will, and so on, on the other side.

The Buddhist notion of conditioned experience proves helpful here. Our experience in *samsāra* is driven by *karma*, or volition. Our volitional actions lead to desires, which in turn cause suffering—in fact, our whole experience. This is very different from a modern material-only world driven by impersonal physical forces. Karmic theory is also impersonal in the sense that it doesn't depend on you or me as individuals; it is only the working out of conditions, even though it can be influenced by our intentions. This intentionality can be thought of as embedded in a material world.

In the Buddhist view, we are conditioned beings in *samsāra*, where *dukkha* is part of the furniture of the universe, if you will. But *dukkha*, suffering, our everyday experience, is neither exclusively subjective nor objective. It is not either just material or just mental. This is central to the mind/body problem; it is saying that concepts appearing to fall squarely on the mind side or the body side can actually be somewhere in the middle—the middle way.

To be human is to be conditioned this way, and cognitive science has a hard time accepting its own discoveries about this. If we combine this with the Buddhist idea of the lack of a substantial self, then any existence in any form whatsoever implies that it is conditioned. That yields fresh insight into the mind/body problem.

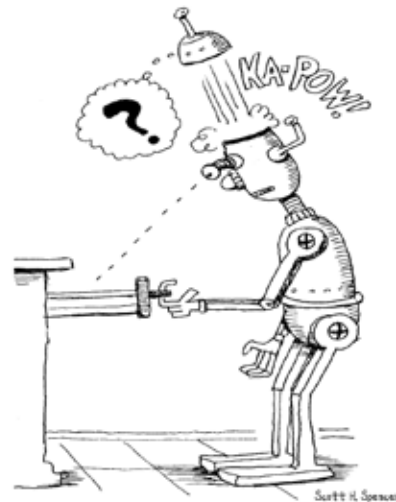
Accepting exceptions

But back to the other extreme position, that the world of human experience is not the universe as a whole. We have to work with that, without getting rid of the livingness of the world we know or making outlandish claims that even atoms and molecules are sentient. This is really tough, and I think the model that we should adopt is the situation with chemistry in the nineteenth century. We start with the living human world in front of us, which is what cognitive science and biology do. We also know a lot about the mind; we just don't know how to make that consistent with what we know about matter.

One possibility is that the mind in its empirical manifestation—that is, the actual human behav-

ior, not the idealized mind of the extreme material position—just is not how we think it is. It does not operate by theories of logic. So even though we think “dogs have four legs,” we are willing to accept that it is not true of every dog. Logic has a problem with that, but we do not, really.

Common sense, as opposed to scientific notions, has always been willing to accept exceptions. That's just the way it is. We arrange things in our kitchen drawer in some logical way, with knives here, forks over there. But if one day a knife ends up somewhere else, our heads don't explode. A robot, on the other hand, programmed to find a knife in a certain place, would be stymied if it couldn't find it there.



A living organism trades off faulty behavior for robustness. We know to stay away from tigers, but we also have cognitive space to sense new dangers and avoid those too. Human beings evolved to be open-ended thinkers because that helped ensure survival. The scientific method, on the other hand, is designed to change slowly and eliminate exceptions—all outcomes must be predicted or the theory is wrong.

Embracing opposites

Cognitive science began as a reaction to the behaviorism that psychology had become following the rise of Newtonian science. Living things were treated as black boxes: inputs and outputs were all that mattered. As such, cognitive science is already a step toward a Buddhist science of mind from where

we were fifty years ago. But cognitive science has also gone to the other extreme, saying that mental activity is reasoning and abstract functioning, and that is fundamentally immaterial. Buddhism is a placeholder, at least, between those extremes.

Continuing with the idea that our problem starts with conceiving different worlds, consider how cognition is embodied in our language. Words like “left” and “right,” “in front of” and “behind,” have meaning only in relation to our bodies. We are conditioned as beings with two arms, two legs, a front and a back, and this shows up in our cognitive acts. Things are very different for a fish, for instance, whose eyes look only to the sides.

So it's not as if mental activity is in a layer that happens in this special region called the brain that is somehow grafted onto our bodies. A cup has meaning to us because of how we see it and pick it up with our bodies. To an ant, it's probably just a large rock. Our immune systems key on certain chemical signatures of bacteria; our visual systems do not. You could argue that our immune systems perform a certain kind of cognitive act; they *know* something.

All these individual pieces of the cognitive puzzle can add up to a process we call a conventional self in Buddhism, recognizing that it has no ultimate essence, that it's just a collection of processes. Going back to intentions, we know it's absolutely crucial for the Buddhist framework that intentions are part of the human world. We don't need to decide whether collectively they have some ultimate purpose. Each intention creates its karma; there's no universal accountant keeping track of it all. The morally complex ecosystems we see are simply the result of individual forces working themselves out.

In the Western scientific tradition, you can have patterns that humans impose on the world due to the kind of beings we are (what our senses are capable of, for instance), and you can have patterns that “seem to really be there.” For science, they must be one or the other. But Dependent Arising in the Buddhist analysis implies that all these patterns are both just out there and also just arising in our minds when we observe them; they are all co-conditioned. Once again, science wants to force a choice where Buddhism is content to hold all things at once.

My claim is that the Buddhist path is gener-

alized, not just subjective. If scientists can learn to be reflective about their intellectual practice—Buddhism as an intellectual virtue—they can be better scientists. And the general message for all of us is that we shouldn't take those aspects of human life as somehow separate from our personal lives. The Buddha's message applies to all domains of human behavior.

A new cognitive science

The newest developments in cognitive science go by the name embodied cognition. Some of the leading thinkers, such as Varela, were influenced by Buddhist thought, but the ideas can be described in purely scientific terms. These theories try to bridge the gap between body and mind. Embodied cognition assumes that the only way we can be cognitive beings is because we have certain kinds of bodies.

Consider perception. The dis-embodied cognitive theory would say there is a soul (or some essential thing like that) in your head that gets input from the world and faithfully represents it. This is the pinhole-camera view of perception. The purpose of sensation and perception is to recover the exact shape of the object. David Marr, who is in some sense my intellectual ancestor, wrote the classic book on this approach, in which he said “vision is the process of knowing what is where by looking.”

While this sounds straightforward, in practice it's a very hard problem. Take the simple image of two parallel lines. According to the theory, light impinges on your retina in a certain way such that you can use the photons to recover the shape and location of the lines. But there are an *infinite* number of different positions in the world of two lines relative to each other that give the same projection on the retina.

The way we solve this problem is that we move. Because things that are farther away from us move more slowly than things that are closer (a phenomenon called motion parallax), we can correctly interpret, for example, whether two objects are on the same plane.

Marr and others showed how we need these additional hard-wired constraints to interpret the world accurately. Despite this, embodied cognitive scientists say we're still not as good at representing the world as we think we are. The pinhole-camera model assumes we can look out and get a 3-D, enriched Technicolor represen-

There's no pure understanding of time which is independent of space.

tation. But many experiments show we're not doing that at all. Change blindness is one well-known example. You can show subjects an image and ask them to press a lever when they notice a change. But it turns out that some seemingly obvious changes, such as an image of an airplane whose wings slowly disappear, or a basket with an apple in it that changes color, aren't immediately obvious to the viewer.

So we just don't have a constant, perfectly accurate view of things in our heads. In truth, we only need to know about where things are, just enough to know if we should get farther away from them or move in closer to pick them up. Movement gives us clues about what to do next.

If you think about it, this is perfectly consistent with the idea that we are evolved, conditioned beings. You do not need to know every detail of how to get from here to Boston. You know a few things, and the world gives you cues along the way, such as when to take the right exit. The entire highway map is not in your head.

Metaphor and the limits of thought

The ultimate implication of this for cognitive science is that there's no such thing as pure free thought. The body limits our thought. We can't think what it's like to live in a seven-dimensional universe, for example, even though physicists have some math that shows there may be at least that many dimensions. Related to that is a very influential account of the nature of thought which says that a lot of thought is metaphorical.

Until relatively recently, thought was usually understood as a kind of reasoning, some form of "A implies B implies C, therefore A implies C." George Lakoff and others have shown that while that sort of thinking is certainly real, most thought isn't like that. Most thought is a kind of metaphorical free association.

We understand the world through metaphor, so we say, "time is like a river." That's actually the only way we can understand time. We don't have a direct experience of time. We experience motion and change, and through metaphor we have an indirect experience of time. There are basically two kinds of time, or change, in our experience: motion, and growth and decay. Since time and space are so closely related for us, we have to spa-

tialize time to understand it. It's a strong claim, but there's no pure understanding of time which is independent of space.

The more you look at everyday language, the more you see metaphors at work. We say "the salesman pressured me into buying the car," the same language we would use for a physical process. The same cognitive architecture describes mental processes and physical processes.

It's as if we are intuitively Buddhists: Intellectually, we want to make this distinction between matter purely as matter and social, emotional, experiential events as purely consciousness. But the way we talk and perceive and reason in the world is by intuitively packaging the two together—it's built into the structure of our minds.

This is a very strong claim. It's saying our common sense packages our mind and body together. We may speak of the two as if they're separate from time to time, depending on the metaphor we're using, but unconsciously things are mostly very different from that. The metaphors that experts such as scientists use to clearly separate mind and body are secondary metaphors, according to this point of view.

But we live in a culture increasingly influenced by metaphors that come from science. Once we've got these in our cultural DNA, it might take years of sitting meditation to sort out their effects from our thoughts!

Of course, it may turn out to be a fad, using ideas from Buddhism to point toward a solution to the mind/body problem. On the other hand, progress in the mind sciences will be one of the most important areas for science during the entire twenty-first century. These ideas are important enough that they should be known by scientists everywhere, regardless of what is eventually done with them. If somebody's able to make a strong case as to why we should take the middle path as a general attitude toward the mind/body problem and not get attached to one extreme or the other, we may actually end up making tremendous progress.

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Mindfulness of Breathing

Ānāpānasati Sutta

Majjhima Nikāya 118

How is mindfulness of breathing developed and cultivated, so that it is of great fruit and great benefit?

Here a person, gone to the forest, or to the root of a tree, or to an empty hut, sits down.

With the legs folded crosswise, the body set erect, and the presence of mindfulness established:

Mindful, one breaths in. Mindful, one breaths out.

FULFILLING THE FOUNDATIONS OF MINDFULNESS

Breathing in long, one is aware: "I breathe in long."
Breathing out long, one is aware: "I breathe out long."

Breathing in short, one is aware: "I breathe in short."
Breathing out short, one is aware: "I breathe out short."

One practices: "I will breathe in experiencing the whole body."
One practices: "I will breathe out experiencing the whole body."

One practices: "I will breathe in calming bodily activity."
One practices: "I will breathe out calming bodily activity."

FIRST FOUNDATION

On whatever occasion a person [does this], on that occasion one abides observing **body as body**, ardent, fully aware, and mindful, having put away covetousness and grief for the world.

One practices: "I will breathe in experiencing joy."
One practices: "I will breathe out experiencing joy."

One practices: "I will breathe in experiencing happiness."
One practices: "I will breathe out experiencing happiness."

One practices: "I will breathe in experiencing mental activity."
One practices: "I will breathe out experiencing mental activity."

One practices: "I will breathe in calming mental activity."
One practices: "I will breathe out calming mental activity."

SECOND FOUNDATION

On whatever occasion a person [does this], on that occasion one abides observing **feelings as feelings**, ardent, fully aware, and mindful, having put away covetousness and grief for the world.

One practices: "I will breathe in experiencing the mind."
One practices: "I will breathe out experiencing the mind."

One practices: "I will breathe in gladdening the mind."
One practices: "I will breathe out gladdening the mind."

One practices: "I will breathe in composing the mind."
One practices: "I will breathe out composing the mind."

One practices: "I will breathe in freeing the mind."
One practices: "I will breathe out freeing the mind."

THIRD FOUNDATION

On whatever occasion a person [does this], on that occasion one abides observing **mind as mind**, ardent, fully aware, and mindful, having put away covetousness and grief for the world.

One practices: "I will breathe in observing impermanence."
One practices: "I will breathe out observing impermanence."

One practices: "I will breathe in observing dispassion."
One practices: "I will breathe out observing dispassion."

One practices: "I will breathe in observing cessation."
One practices: "I will breathe out observing cessation."

One practices: "I will breathe in observing letting go."
One practices: "I will breathe out observing letting go."

FOURTH FOUNDATION

On whatever occasion a person [does this], on that occasion one abides observing **mind-objects as mind-objects**, ardent, fully aware, and mindful, having put away covetousness and grief for the world.

Understanding Key Terms

developed: *bhāvītā*

This word is simply the causative form of the verb "to be," and thus means "causing to be," from which we get "development." It is a word used often for meditation in general, and for certain kinds of meditation in particular, such as the development of loving kindness (*mettā-bhāvanā*).

cultivated: *bahulākatā*

Used often beside development as a synonym, this term literally meant something that is done (*kata*) a lot (*bahuli*). The way we develop a particular skill or a new habit is by constant practice and repetition—by "doing it alot."

presence of mindfulness established:

parimukhaṃ sati upaṭṭhapetvā

This phrase is idiomatic both in Pali and in English. Literally it calls for the establishment—standing or setting (*-ṭṭhapetvā*) up (*upa-*)—of mindfulness around (*pari-*) the mouth or face (*-mukhaṃ*). Sometimes this has been taken to specify placing attention on the breath just where it enters the nose, but usually it is seen as a metaphor of intimate presence, as we might say something is "in your face" or we come "face to face" with something we scrutinize carefully.

mindful: *sato*

Mindfulness (*sati*) as a key term of Buddhist meditation has been construed in many different ways in recent usage, from the very broad (almost any degree of attentiveness or awareness), to the very narrow (a special mental factor arising only under very specific conditions). It is used here as an adjective of the meditator, and is defined functionally by what follows.

one is aware: *pajānāti*

Based on a verbal root meaning simply "to know," it is the pivotal word in this text. What is the difference between breathing with awareness—consciously, deliberately, attentively, intently—and the breathing that occurs automatically at all times? Mindful breathing means knowing that you are breathing, not in an abstract or conceptual way, but immediately, viscerally, and uninterrupted—moment by micro-moment.

"I breathe in...": *assasāmī ti*

The immediacy of this experiential knowing is brought home by the grammatical construction of using the first person present tense set in quotation marks. The fragment "*ti*" or "*iti*" is simply a way of indicating that what precedes it is to be considered direct speech. The meditator's direct knowing of her breathing is demonstrated again and again in this phrase, silently understood if not actually uttered to oneself.

one practices: *sikkhati*

In all that follows the verb is significantly altered from "to know" to "to train," "to learn," or "to practice." This phrasing shifts the emphasis slightly from following what is already happening to taking some intentional stance toward, or participating creatively with, what now unfolds. It marks a subtle shift from an entirely passive to a somewhat more active or directed way of knowing the breath.

"I will breath in...": *assasissāmī ti*

This movement is emphasized by a change in the tense of the verb, from present to future. It is still in the first person, and is still in direct speech, but now it points, at least figuratively, to what will occur in the next moment rather than in the present moment. Again, this brings a gentle sense of guiding the practice through the curriculum that follows.

experiencing: *paṭisaṃvedī*

Another important word in this text, this one is rooted in a word for "to know" that tilts strongly in the direction of "to feel." In contemporary idiom these seem to be antithetical verbs, but in Buddhist thought the sensations of pleasure and pain are treated as a sort of direct knowledge. The prefixes amplify the feeling: "*paṭi-*" suggests falling back upon or getting in touch with something, while "*saṃ-*" brings a sense of totality or completion. This is a word for direct encounter or intimate contact with what arises in experience.

observing: *anupassī*

This is another word of great importance in mindfulness texts. At its core is the verb "to see" (*pass-*), and the prefix *anu-* means "following along" or going along with the way something naturally unfolds. Together they conjure a sense of observing, viewing, or watching what is happening. The term is sometimes rendered as "contemplating," which works in some of its senses, but not when it suggests "thinking about" a problem. Like the words for "one is aware" and "experiencing," the sense intended here has to do with a direct and experience-near, rather than a conceptual, mode of observation.

ardent: *ātāpī*

This adjective is based upon the word for "heat" (*tapas*). In ancient India all spiritual practice, and ascetic practice in particular, was viewed as a kind of "burning" or "heating up." Much as a chemist might heat substances in a crucible to study the transformations that occur as it breaks down, the yogi or meditator would subject his mind and body to certain disciplines and examine the experiences that ensued. The image here is of intensive applied energy, such as one might exert while rubbing two sticks together to generate heat.

fully aware: *sampajāno*

Based on the root "to know," like *pajānāti* above, the term is amplified here with the prefix *saṃ-* to suggest fullness or completeness. If *pajānāti* means "to know," *sampajāno* means to know fully, to know comprehensively, to know in its entirety without interruption. It is often combined with the word for mindfulness (*sati-sampajāno*), in which case the former term refers to detailed, micro-awareness while the latter indicates a broader, more global awareness of an object as it is viewed in its wider context.

having put away: *vineyya*

The gentle "leading away" of the reflex to hold on to or push away from the objects of experience, resulting in the mental attitude of benign equanimity characteristic of mindfulness.



Barre Center for Buddhist Studies

2009 Courses Remaining			
September	6-11	John Peacock	Desire in Buddhist Thought & Practice
	12	John Makransky	Compassion Beyond Fatigue
	25-27	David Loy	Personal & Social Transformation
October	2-6	Martine & Stephen Batchelor	Buddhism, Agnosticism & Atheism
	9-14	Andrew Olendzki & Gloria Taraniya Ambrosia	Integrated Study & Practice (Application Only)
	17	Joseph Goldstein	Buddha's Song of Enlightenment
	18-23	Andrew Olendzki & Gloria Taraniya Ambrosia	Buddhist Psychology
	25	Narayan & Michael Liebenson Grady	Anattā (not-self) in Everyday Life
	30-Nov 8	Gregory Kramer	Insight Dialogue
November	13-15	Chip Hartranft	Patañjali, Yoga Sutra & Insight Practice
	22	Carol Wilson	Muditā: Practice of Joy & Gratitude
	27-29	Mark Hart	Identity, Personality & Freedom
December	4-9	DaeJa Napier	Brahma Vihāras (Bhāvanā Program)
	11-13	Mu Soeng	Restlessness, Narcissism, Ignorance
	19	Myoshin Kelley (assisted by Edwin Kelley)	"It's Not About Me!"
2010 Courses —REGISTRATION BEGINS SEPTEMBER 14, 2009			
Jan	8-10	David and Caroline Brazier	Buddhist Psychology & Therapy in Action
	17-22	Andrew Olendzki	Abhidhamma: Classical Buddhist Psychology
	29-31	Claire Stanley & Jack Millett	Mindfulness for Educators
Feb	4-7	Paul Fulton, Gloria Taraniya Ambrosia	Mindfulness & Psychotherapy (by application)
	20-27	Andrew Olendzki, Gloria Taraniya Ambrosia	Seven Factors of Awakening
Mar	5-10	Ajaan Thanissaro	Becoming & the End of Becoming (ASPP/ ISPP prior students)
	12-15	Ajaan Thanissaro	Exploring Dependent Co-Arising
	19-21	Rick Hanson, Bill Waldron	Self & No-Self in Buddhism & Neuroscience
Apr	3	Arnie Kozak	Metaphors, Meaning, Language & Mindfulness
	9-11	Susan Kaiser Greenland	Mindfulness & Children (for Professionals in the Classroom & Healthcare)
	17	James Austin	Meditating Self-lessly toward Insight-Wisdom
	18	Christopher Ives	How to Do Buddhist Ethics
	23-25	Roshi Pat O'Hara	Universal Wisdom of the Householder
	30-May 2	Jan Willis	Entering Into the Bodhisattva Path
May	7-9	Paul Simons	Working with Addiction: Spiritual Self-Schema Therapy
	14-16	Ajahn Amaro	Upekkhā: Being at Peace in the World
	19-23	Gregory Kramer & Jan Surrey	Insight Dialogue for Psychotherapists
Jun	13-18	Andrew Olendzki, Gloria Taraniya Ambrosia	Buddhist Psychology
	26-Jul 3	John Makransky	Unity of Love & Wisdom in Dzogchen Practice
Jul	9-14	John Peacock	Awareness & the Structure of Experience
	16-25	Leigh Brasington	Jhānas & Wisdom Practices
Sep	4	Phillip Moffitt	Insights from the Four Noble Truths
	5	Joseph Goldstein	(title forthcoming)
	24-26	Rebecca Bradshaw	Brahmavihāras for Psychotherapists
Oct	1-3	John Makransky	Knowing Persons in their Deepest Goodness
	16-23	Andrew Olendzki, Gloria Taraniya Ambrosia	Ignorance & Wisdom
	24-28	Christina Feldman	Dependent Arising (ASPP/ISPP prior students)
	31	Mark Epstein & Joseph Goldstein: Dialogue	Thinking About the Buddha's Inner Life
Nov	5-14	Gregory Kramer	Dependent Arising: Insight Dialogue

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About the Barre Center for Buddhist Studies

The Barre Center for Buddhist Studies is a non-profit educational organization dedicated to bringing together teachers, students, scholars and practitioners who are committed to exploring Buddhist thought and practice as a living tradition, faithful to its origins and lineage, yet adaptable and alive in the current world. The center's purpose is to provide a bridge between study and practice, between scholarly understanding and meditative insight. It encourages engagement with the tradition in a spirit of genuine inquiry and investigation.

Located on 96 acres of wooded land in rural, central Massachusetts, just a half mile from the Insight Meditation Society, BCBS provides a peaceful and contemplative setting for the study and investigation of the Buddha's teachings.



A 225-year-old farmhouse holds a library, classroom, and dining room that create a comfortable setting for classes and workshops. A meditation hall holds space for practice. On-campus housing is provided by a dormitory under the meditation hall, rooms in the farmhouse, and three cottages.

The study center offers a variety of study and research opportunities, lectures, classes, seminars, workshops, conferences, retreats and self-study programs. Its program is rooted in the classical Buddhist tradition of the earliest teachings and practices, but its vision calls for dialogue between different schools of Buddhism and discussions with other religious and scientific traditions. All BCBS courses involve some level of both silent meditation practice and conscious investigation of the teachings.



The Greatest Happiness

Udana 2.1

sukho viveko tuṭṭhassa
sutadhammassa passato

Happiness is solitude, for one who's content,
For one who's heard Dhamma, for one who can see.

avyāpajjhaṃ sukhaṃ loke
pāṇabhūtesu saṃyamo

Happiness is hurting nothing in the world,
Showing restraint among all living creatures.

sukhā virāgatā loke
kāmaṇaṃ samatikkamo

Happiness is non-attachment to the world,
Having overcome all sensual pleasures.

asmimānassa yo vinayo
etaṃ ve parama sukhaṃ ti

But getting free of the conceit that 'I am'
—This is the greatest happiness of all.



*Dvaravati art - Buddha, protected by Naga.
Thailand, 8 - 11 th century A.D*

These verses are said to have been uttered very soon after the Buddha's awakening to Mucalinda, the Nāga (Serpent) King, after he coiled seven times around his body and spread his hooded head to protect the Awakened One from rain. This mythical imagery aside, the poem offers a cogent definition of happiness at four different, gradually intensifying, levels of scale.

The ascetic monk finds happiness in dwelling alone in the forest, far from the web of social responsibility, immersed in nature, and no longer hankering for the alluring things of the world. Such contentment is aided by having heard the Dhamma, the teachings of the Buddha, which praises the value of being content with very little.

When this simple lifestyle is further augmented by a deep commitment to ethical restraint, non-violence, and an attitude of loving care toward all living beings, the happiness deepens to encompass the heart. The experience of kindness itself, as a wholesome mental state, is a source of great joy and well-being.

Even greater levels of happiness are accessed by fundamentally uprooting the primal compulsions of desire: the urge to acquire, consume, or grasp what is gratifying; and the impulse to ignore, reject or destroy what is regarded as hateful. The overcoming of this craving constitutes the cessation of suffering.

The last and final obstacle to the highest happiness of all is the unconscious reflex of concocting a view of self that stands at the center of all that one thinks, says, and does. The Buddha here describes, no doubt for the first time, the experience of insight that stands as the culmination of the ascetic path and is the unique defining feature of his teaching.

—A. Olendzki