

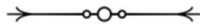
# Cycles of Connection

## From Reflex to Wisdom

Adam Gazzaley - Summer 2024

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Our species is desperately suffering. Despite extraordinary advances in science, technology, and medicine, humans ceaselessly harm one another and our natural world. Somehow, we seem uniquely unsuited to thrive in the very environment that we've created. We need to level up our minds to better live with each other and the rest of nature, as well as to effectively address the many crises that threaten our existence.



Breakthroughs can happen in the most unexpected of ways. For me, it was eight years ago, silently meditating in the presence of a majestic, old oak tree in the golden hills of Northern California. It was there that I experienced an expansion of my thinking that changed how I view myself in connection to the world around me. After 25 years as a neuroscientist, with countless hours spent peering through microscopes and analyzing neuroimaging data, it was startling to arrive at such a perspective-shifting insight about the mind, not via experiment, but by a transformative experience.

It was 2015, I had been invited to attend a 10-day Vipassana retreat by my dear friend, Jack Kornfield. Jack, a thought leader in the mindfulness field, was trained as both a Buddhist monk and clinical psychologist. He is also co-founder of Spirit Rock, the location of this silent meditation retreat. The truth is, I did not want to go. I was uncomfortable (even fearful) with the thought of being in silence and disconnected for so long. I also had no meditation experience at that time. But out of tremendous respect for my friend, and a genuine interest in the field, I agreed to attend.

Another challenge I faced, as I was preparing to leave for this extended time off grid, was putting the final touches on my book, *The Distracted Mind: Ancient Brains in a High-Tech World*. Although it seemed fitting to go on such a retreat after writing this book, attending to the details of submitting a final manuscript made breaking away difficult. However, in retrospect, I realize that it was the timing that engendered the breakthrough I experienced. You see, front and center in my thoughts was a deep concern about the fraught relationship we humans have with our environment. Notably, how destructively we engage with our technologies (a central theme of the book), but even more troubling to me was how egregiously we treat each other, the rest of nature, and our planet. The big question in my mind at the time was: Why?

I sat down on a floor cushion in the most elegant (yet simple), expansive (yet intimate), natural (yet intentional) chamber, perched on a hill in the woods. In every way, it was the perfect container for an extended inner journey. Surrounded by one hundred other voyagers, I began my first meditation session. I was instructed to focus on my breath, and when it wandered, to be aware of it and gently return attention to my breath without judgement. I quickly found that this was no easy task. In addition to being distracted by discomfort in my body, my mind kept drifting back to that big question. However, I took the charge seriously, and pushed myself to be present with my breath.

One approach that was suggested to help with meditating was to attend to the rhythm of breathing: inspiration > expiration > inspiration > expiration... This worked very well for me. I was able to quiet my busy thoughts and sink into the rhythm of my breath. But as the first two days slowly passed, the cyclical nature of respiration increasingly activated my thinking mind. I was struck, and not for the first time, by how rhythmic cycles are so fundamental and pervasive in nature. They exist externally (e.g., climate and lunar cycles) and internally (e.g., sleep-wake and menstrual cycles), and at astoundingly disparate timescales (e.g., Milankovitch cycles in our solar system occur once every 10,000 - 100,000 years, while gamma rhythms in our brain cycle 30-100 times every second). It is no exaggeration to view cyclical patterns as a fundamental aspect of the universe and all of life.

Most fascinating to me is the cyclical dance between the internal and external realms, from the large-scale exchange of elements between life and environment (biogeochemical cycles: e.g., carbon and nitrogen cycles), to vast ecosystems that emerge from the interaction of life and earth, fueled by nutrient and energy cycles (e.g., coral reefs and rainforests), to the powerful influences that abiotic factors exert on biological cycles (e.g., light and temperature modulate circadian rhythms). Breathing – my ever-present focal point – was a salient example of the criticality of these life-environment cycles. If the rhythmic exchange of elements between body and air halts for mere minutes, we die; this corporeal tether to the external world is so incredibly vital and fragile. With all this swirling around in my mind, it should be no surprise that I was once again struggling to focus on my breath.

The first insight rushed into my awareness at the end of the second day: Our failure to thrive in terms of our external interactions – the harm we inflict upon the planet (e.g. climate), other humans (e.g., war), and the rest of nature (e.g., biodiversity) – was somehow related to another fundamental cycle that connects life and environment, the *perception-action cycle*. This neuroscientific concept, coined by Joaquin Fuster three decades ago, describes the flow of sensory information into the brain from the environment to form perceptions, followed by actions that occur as a response, leading to changes in the environment that result in new perceptions, which in turn drive new actions, and on and on. This circular flow between reception (from outside in) and expression (from inside out) is the foundation of all animal behavior: perception > action > perception > action.

And so, this is where I found myself on day three, sitting in silence, trying to focus on my breath, with a nagging intuition that I had a clue to answer the big question in my mind, but was missing the “aha” to pull it all together. I was also confronted with the very real struggle I was having with meditating. I just could not attend to my breath for very long, especially now that my imagination was stimulated.

Day four; I considered leaving the retreat. But a consultation with Jack impressed upon me the importance of pushing through this hurdle and getting over the midway hump, a time when many others were also struggling. He suggested that I try to find a way of meditating that worked better for me, and he encouraged me to leave the building and spend time outdoors during some of the sessions.

So, I took off alone, in silence, into the forested hills of Spirit Rock. It suited me well, being immersed in nature, smelling the foliage, hearing the birds, seeing the wind-blown patterns in the long, golden grass, and feeling the warmth of the sun on my face. My frustrations evaporated, I felt calm and clear. I soon came upon the most

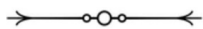
glorious oak tree I had ever encountered and settled down on the ground in front of it. I decided to make this tree my meditation. It would be the sole focus of my attention, with my breath present as a silent companion and constant reminder of the elemental exchange between humans and trees.

This changed everything; I went on to spend many hours over the next two days deeply meditating for the first time in my life. It felt like I was adrift on a vast sea, gently rising and falling with the rhythm of my breath, yet firmly anchored to the Earth by the grounding presence of this ancient giant. Occasionally my mind wandered, but mostly I surrendered to perception without analysis, judgement, or decision. I experienced a unique sense of awareness-sans-thought embraced in those powerful branching arms, with sinewy roots bursting through the earth around me, moss-covered, wizened bark filling my gaze, and delicate branches gently beaming down on me with bright, green leaves.

It was day six, and I was over the hump. The passage of time became smoother, gentler, even routine. I was in flow; I had found my muse. And then after hours of focus it happened, when least expected, an experiential breakthrough. My perception of this magnificent tree evolved, first to a deeper sense of awareness than I thought I was capable of, and then beyond to a feeling I am inclined to call love, but that fails to capture the pure, unconditional, boundless, empathy and compassion I experienced. For the first time on the retreat, tears streamed down my face.

Over the remaining days, my mind felt like it was on fire as I experienced a connection with the same subject, at different levels, at the same time. I saw first-hand with increasing clarity that the perception-action cycle was just one level of a progressive hierarchy of reception-expression cycles. And that an answer to the big question might be found by better understanding these cycles. To be clear, I hold the concepts that define the perception-action cycle as foundational neuroscientific principles, and Fuster's scientific contributions to understanding its neural network basis in the highest regard. But this experience revealed to me the limitations in viewing this cycle as *the* connection between brain and environment.

My perspective now is that a conceptual framework can be constructed around the perception-action cycle, with a more primitive cycle at its core and two higher levels of cyclical exchange between brain and environment accessible beyond it. To share this framework with you, and to capture a flavor of its experiential origins, I will present it through guided imagery. Please attempt to generate in your mind's eye the environment that I describe, and to feel in your mind's heart the emotions that I convey. You can also listen to an audio-only version of this story presented as an [eyes-closed meditation](#).



### **Dance in the Meadow.**

Imagine yourself lying on the grass in a glorious meadow just before sunrise. You are surrounded by beautiful wildflowers of every color, visible but still muted by the pre-dawn light. Turn your mind's eye toward the sky above you. Picture the gradient of color, from the warm glow of golden-red near the horizon, up into the heights where blue blends into indigo and then to pure black. Turn your mind's ear toward the meadow around you and hear the buzzing insects, but also notice the quiet and tranquility. Direct your attention to the varied smells: the fresh grass, sweet flowers, fragrant lavender. Feel the coolness pressing against the back of your legs and the

palms of your hands as they rest upon the earth beneath you. Bathe in the totality of these sensations and be immersed in the meadow.

This is *perception*, a complex integration of information flowing into your brain from your sensory receptors. It is a construct, your personal interpretation of reality. It is represented in the back half of your brain, with each sensation having its own specialized area. But the signals merge to create a unified percept of you being in a place.

As the sun rises above the horizon, imagine standing and lifting your arms to stretch your body in the early morning light. Take a few steps toward sunrise, and then stop and stand still. Inhale a deep breath of cool air, and slowly exhale.

This is *action*, a complex integration of movement commands from your motor system. It is represented in the front half of your brain. And although each movement occupies its own specialized territory, the signals merge together to generate cohesive and coherent actions.

Turn around so that you face away from the sun and notice the temperature drop on your skin. Walk slowly through the meadow, observing your long shadow gently dancing on the earth. Lightly swing your arms and feel the tall grass brush against your fingertips as you drift past. Notice that you have come upon a lavender bush; kneel and inhale deeply, smelling its rich, earthy scent.

This is the *perception-action cycle*, a continuous, rhythmic exchange between perception and action that connects you to the world around you. Your perceptions guide your actions, these actions in turn alter your perceptions, and round and round it goes. This is the basic function of your brain, to transform sensory input into motor output, and then back again to new input. This cycle between the environment and brain is the foundation of all animal *behavior*.

It becomes clear how fundamental this cycle is for life if we turn back the evolutionary clock and consider a more primitive version: the *sensation-movement cycle*. This cycle is central to how all organisms interact with the environment; it evolved for survival. It does not require higher-order brain functions needed for perception and action. It does not even require a brain or a nervous system. Even single-celled organisms, like bacteria, sense environmental stimuli such as nutrients or toxins, and either move toward or away from them. A young sunflower in the meadow senses the dawn light and steadily turns to follow it on its path throughout the day. All animals, including humans, retain sensation-movement cycles as part of their basic biology. These are known as *reflexes*. A sharp thorn leads to withdrawal of your hand, a bright light leads to constriction of your pupils. Automatic couplings between sensation and movement are still critical for our functioning and survival.

Appreciate how far interactions between life and environment have advanced as the brain evolved, from basic sensation-movement cycles to complex perception-action cycles. Although the latter can still present somewhat reflexively, i.e. actions without decision-making (i.e., habits), it is from this cycle that goal-directed behavior emerged throughout the animal kingdom. But humans engage in reception-expression cycles at a higher level than this one.

**Taste the Berries.**

Now picture yourself walking through the meadow and coming upon a bush full of succulent blueberries aglow in the midday light. Your perception-action cycle engages when you see these tasty berries and you reach to pluck them. But, please, pause before you eat the blueberries. Take a moment to appreciate the rich blue color and smell its tart sweetness. Feel the smoothness of its skin between your fingertips. Now turn your focus inward to other perceptions that are present in your mind: Are you hungry? Are you curious? Are you excited? Are you bored?

This is *awareness*, a higher-level of perception that integrates externally-generated constructs with those in your internal milieu: thoughts, feelings, perspectives, biases, and judgements. The brain networks at play here are even more extensive. They involve connections between areas located on the sides of the front and back of your brain, guiding attention to the external world, and areas in the middle of your brain that enable introspection.

Go ahead and pop a blueberry into your mouth. As you go about eating it, turn your focus to the source of your actions in this moment: Do you really want to eat this blueberry? If so, do you want to slow down and savor it, or speed up and devour it?

This is *intention*, a higher-level of action that imbues behaviors with deeper meaning and purpose. There is, of course, still an influence of base urges, desires, yearnings, repulsions, and aversions, but actions in this cycle are guided by deliberate reasoning and decision-making.

Eat another blueberry with awareness heightening your perceptions and intentions guiding your actions. Notice the firmness of its skin on your tongue, the mix of sweetness and tartness that spreads across your palate, and the crunch of seeds between your teeth. But also, be mindful of the richer experience of awareness induced by your intentions to eat this berry, and your intentions to be aware of the ensuing perceptions from eating the berry. This higher-level cycle beyond perceiving and acting connects us in a deeper and more meaningful way to the environment.

This is the *awareness-intention cycle*. It is a far throw from the reflexive and habitual responses of lower-level cycles, spanning a spectrum from deliberate, goal-directed behaviors to *mindfulness* at its highest extents. From this cycle, constructs emerge of *self, mind, identity, and consciousness*. It is engagement in this higher-level reception-expression cycle that has enabled our species to accomplish remarkable feats of creating global societies, art, music, and technology.

There is a lot to celebrate here, but it is critical to recognize the significant cost incurred with the emergence of self and mind. It often manifests as a delusion that we are self-contained entities, perceiving with awareness and acting with intention, but as islands disconnected from others and the natural world – the island of I. This is the source of our desperate suffering. But fortunately, we humans have the potential to go higher still, beyond awareness and intention.

**Embrace your Love.**

Imagine yourself in this beautiful meadow at sunset, relaxing in post-blueberry bliss, when you see a love approaching – a spouse, a dear friend, a sibling, or a parent. When they get close, you see they are crying. You remember that their mother is sick, and you suspect that this is the source of their despair. Engage your awareness of their state. But now push beyond to discover that you are sad with them. Embody their grief as if it was your own. Sense the dissolution of the boundary between you.

This is *Empathy*.

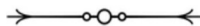
Now reach beyond your intentions to comfort them and embody a deeper desire to relieve them of their suffering as if it was your own. Extend your care to them as an action and radiate your love.

This is *Compassion*.

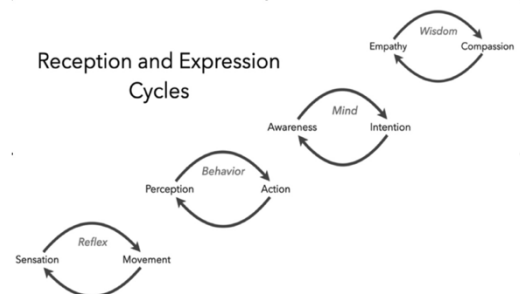
Give them a tender, loving hug. Feel them in your arms, see tears flowing down their face. Notice how this highest-level of reception and expression naturally flows in a circular pattern: empathy > compassion > empathy > compassion. Also appreciate that the *empathy-compassion cycle* is not solely engaged for suffering, but for joy; and that it is not only achievable with other people, but with all of nature.

For thousands of years, societies around the world have recognized empathy and compassion as essential to cultivate for both personal and societal well-being. Notably, the *brahmavihāra*, rooted in ancient pre-Buddhist philosophies, taught of the central virtues of loving-kindness (*mettā*), compassion (*karuṇā*), empathetic joy (*muditā*), and equanimity (*upekkhā*) (fittingly, these are the names of the Spirit Rock residence halls; I spent nine silent nights in *Karuṇā*). *Brahmavihāra*, while integral to practices of Buddhism, Hindu, and Jainism, are regarded as universal and fundamental truths that extend beyond any specific religion, tradition, or culture.

The empathy-compassion cycle is a path to *wisdom*, a deep understanding that everything is truly connected; that we do not exist as an island of I, but a world of we – integrated elements of a vast, interconnected, dynamic network. With practice, the circular exchange of empathy and compassion between you and everything around you weaves an intimately interwoven tapestry of connection. This is what I experienced in the presence of that ancient oak tree after days of singular focus. This is why I was moved to tears.



Cycles of connection between reception and expression are a fundamental basis of being. Every lifeform engages in this circular flow between the internal and external. Humans have the privilege to access the full breadth of cyclical exchange, from *sensation-movement* (track the rising sun - the base of reflex), to *perception-action* (dance in the meadow – the land of behavior), to *awareness-intention* (taste the blueberries – the domain of self and mind), to *empathy-compassion* (embrace your love – the realm of wisdom).



It has been 8 years since the Spirit Rock retreat. I have revisited the ideas born there in silence many times in many ways. With this conceptual framework as an instrument for enquiry, an answer emerges to the big question of why we treat each other, the rest of nature, and our planet so poorly: We allow ourselves to stagnate in levels of reception-expression that serve the self and immediate outcomes, but do not foster meaningful and sustainable relationships with the external world, and thus it will ultimately fail to support our long-term survival on this planet (i.e., perception-action and low-level awareness-intention cycles). Importantly, it also suggests that a path toward a healthier future with others and the natural world may be achieved by learning how to engage higher cycles of reception and expression (i.e., high-level awareness-intention and empathy-compassion cycles).

One does not advance through cycles of connection like a student passing through grades of school. We continue to activate lower levels of reception-expression concurrently with higher levels. Reflexes and habits are ubiquitous in our daily lives, even for the most enlightened amongst us. But we do have agency to influence the composition of our interactions. Thoughtful and consistent engagement in certain experiences, like meditation and nature immersion, facilitate more frequent access to higher levels, which in turn fosters wisdom that potentiates the underlying cyclical process.

Spending more time, with each passing day, in connections that activate the highest levels of awareness-intention and empathy-compassion is a route to a better existence on both a personal and universal level. We lead more meaningful and impactful lives by dissolving the delusion of separation between ourselves and the rest of nature, while simultaneously supporting our species' long-term survival by caring for our planet. There is a sort of cosmic harmony in this approach to alleviating collective suffering, in that these cycles of connection, the very fuel of our evolutionary journey from reflex to wisdom, are cousins to the vital, vast cyclical exchanges of matter and energy between life and environment that envelope the Earth.

This is a personal reflection. I am grateful to have arrived at a framework through my science and experience that has resulted in a deeper understanding of myself and my place in nature. It has given me structure to more firmly decide how I want to live and the person that I want to be. These perspectives have been invaluable, especially as we introduce our young daughters to a world that we share with millions of other species. I revel in our family discovering imaginative ways to unlock fresh perceptions, awareness, and empathy for trees that we meet on our wanderings – redwoods, sequoias, banyans, pines, willows, eucalyptus, elms, and, of course, oaks – and learning how to better engage with them through action, intention, and compassion. The benefits of these nature practices effortlessly extend themselves to all our other interactions.

This journey of discovery has been humbling. It takes time, effort, and patience to expand how we experience ourselves in connection with the rest of nature. I recognize that I do not spend as much time in the highest levels of reception-expression cycles as I wish I did. Working towards this objective will be a joyful pursuit for the rest of my life. My own limitations have motivated me to devote myself to developing and studying novel approaches to help others travel this path.

I dream of a future for my girls where empathy-compassion are as automatic for everyone as inspiration-  
expiration, present every day, and engaged for all of nature. Even shifting the currents slightly in the direction of  
this idealized vision, would be a meaningful step towards reducing our current state of desperate suffering. But  
such a shift does not take place via policies at the societal level, rather it must occur for each person, in their own  
way, and in their own time.

It is my sincere hope that your perceptions are bathed in loving awareness, that your actions are guided by kind  
intentions, and that you practice the dance of empathy and compassion, growing in wisdom each day. Humanity  
needs this, the earth needs this, all of nature needs this.

