Train Your Brain #16

TENDING TO THE CAUSES

The days that make us happy make us wise.
John Masefield

Wisdom sees deeply into the nature of things – both inside the mind and outside, in the world[1] – to make connections between actions and their results. It sees what helps and what hurts. It values what causes, increases, and maintains helping, and it values what prevents, decreases, and ends hurting. The fulfillment of true wisdom is the effortless abiding of the mind, second by second, in what helps oneself and others, and the effortless abandonment, second by second, of whatever might arise that could hurt.

In particular, the deepest forms of wisdom see both the error in assuming that anything has an independent existence – including, most notably, the personal self: me, myself, and I – and the continuing need to wake up from the enchantments of the world and let go of all unhealthy attachments. And wisdom applies those insights to individual cases, adapting practices – as all the great teachers in the world have done – to the unique needs of each person.

Wisdom in the Animal Kingdom

In the nervous system, even the most primitive animals need to represent what helps and what hurts. For example, an earthworm can be trained to turn left (or right) at a junction to avoid an electric shock. The pairing of a reward or a punishment with a stimulus is called classical conditioning; such a pairing with a behavior (including inhibiting a behavior) is operant conditioning; the brain of a lowly pigeon is quite brilliant at each.

Rewarded conditions (events, behaviors) become goals to pursue, punished conditions become goals, too, just in the other direction. Of course, in most animals, these acquired

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[1] To be sure, wisdom also understands that the apparent world is constructed (by the brain) within the mind, so in a sense it sees the nature of things both inside the mind and . . . inside the mind. That said, we believe, like most scientists, that there is a material reality that exists independently of our perceptions – the universe existed long before the earth formed and life appeared upon it, and it will continue to exist long after the sun expands to become a red giant and swallow the inner planets – and that our perceptions must be a pretty close approximation of major aspects of material reality in order for us to survive within it.

behavioral mandates are completely unconscious, and they rest on top of hard-wired instinctual directions from the DNA manual.

Even in human beings, who consciously create lofty ideals, life purposes, and complicated action plans, and who have more freedom of action relative to their instinctual heritage than any other animal, this process of valuing the presence of the good and the absence of the bad happens mainly automatically, through associations made in the nervous system outside of awareness.

For every animal, whether it is acquired or instinctual, unconscious or conscious, valuing tells it what to approach and what to avoid so it may pass on its genes. This is an effective strategy for producing grandchildren, but one that also sows the seeds of self-against-the-world, and of fearful and often aggressive clinging. Most animals do not have a nervous system complex enough for these seeds to grow into significant distress, but the ironic result of our vastly more complicated brain is that it's fertile ground for a bitter harvest of suffering.

Human Views – Wise and Not So Wise

Only humans worry about the future, regret the past, and blame themselves for the present. And only humans do so within the richly layered framework (sometimes tacit) of me, myself and I - the personal self. Most of this activity happens in the back of your mind, even woven into the fabric of your dreams.

To be sure, some thinking things over is useful, helping you to learn from the past and plan for the future. But we rarely leave it at that: thoughts and feelings and wants and images proliferate in the mind's eye like tangled vines growing rapidly in a time-lapse movie of a jungle.

Since neurons that fire together during background mental activity wire together just as quickly as ever, this continual self-referential rumination gradually strengthens the circuitry of "me," what "I" identify with, and what "I" must hold onto – no matter how much it hurts.

So the challenge is to build on the brain's tendencies to make connections and establish rewards that are <u>wholesome</u> . . . and to manage and modify the brain's tendencies to make connections and establish rewards that are <u>unwholesome</u>.

Wise View and Wise Intention

Wise views go hand in hand with wise intentions. This synergy is expressed in the Chinese ideogram for Wisdom: which is a broom (at the top), held by a hand (in the

middle), sweeping out the heart (which is also the character for mind). Wisdom is not, in this image, the accumulation of knowledge, but rather it is the sweeping away of ignorance.

The take home for me here is that the pursuit of insight into the nature of my life and my vision will ultimately result in the decrease of my and others suffering, both from actions coming out of my view, and from actions on me from other's view. This is radical deconstruction.

Inventory of What Helps and What Hurts

Most of us have plans, and experiences with trying to make these plans real. We come to the moment with the baggage (or karma, if you will) of our history, our genetics, our present circumstances, our dreams, and our desires. How do we optimize our plans, how do we modify our views so as to maximize our happiness and minimize our suffering?

We start from the previous two sections, which give us spiritual and scientific support for the possibilities of change and amelioration. There is the 2500 year experience of Buddhist contemplatives that their suffering can be eased by altering View and Intention. There is the 150 year tradition of neuroscience supporting the plasticity of our thoughts and our reactions to events. All of that is support for our changes.

Neither of those traditions says that this is easy or that this is quick. Both of these traditions support that it is possible. A freedom here is knowing that we can change the frames of our lives. Two months ago we had a class on the power of intention, discussing how everything rests on the tip of motivation. Intentions have the power of reshaping behavior, of changing the course of our actions based on the experience of our behaviors in the past.

To tend the causes here is to be willing to explore our purposes and our plans, to look at what is feasible, what can be accomplished, and what needs to be discarded. Taking an inventory involves a clear eyed investigation of what you have set out to accomplish with your life. Plans you have had in the past can be looked at for their current relevance. Perhaps they are still meaningful, with juice and sweetness and energy. Perhaps they are possible only with effort and sincere dedication to true change. Perhaps they need to be laid down and put to rest.

"If you let go a little, you will have a little happiness.
If you let go a lot, you will have a lot of happiness.
If you let go completely, you will be completely happy"

--Ajahn Chah

Our points of intervention are limited in regards to our environment, since so much of it is outside our control. We have greater resources in changing our internal expectations, our reactivity to stimuli (dampening frontal lobe/limbic circuit reactivity). We can set the frame of our picture to the most positive dimension possible.

- Appraising the plans we have for our lives is the same as appraising the significance of any single incoming stimulus.
- What do we focus on out of the larger mosaic of stimuli and possibilities?
- What meaning do we give the events in our lives in relationship to our plans?
- What intentions do we attribute to others and their influences on our lives—are they actively for us or against us, or are they more neutral when their actions are closely examined?
- What are the embedded beliefs about the world, the past, the future?
- What is the sense of "I" that is present within the plans and views present in my awareness?

This appraisal needs to be gentle, as we all have vulnerabilities, especially around plans that have deep personal meaning. Places of vulnerability (physical, temperamental, and psychological) allow events to penetrate and control us. Evaluating our life plans needs to allow for those areas of vulnerability and to increase our compassionate and loving self protection and nurturance around those areas.

The Neurology of View

A View can be understood as a habitual pattern of neuronal activation, so that an environmental stimulus will trigger a hopefully effective response. Since we are talking about View, I'll use an excellent book by Christof Koch - The Quest for Consciousness, which largely deals with the consciousness revealed in the exploration of the visual system.

1) Any phenomenological state of awareness/consciousness depends on a corresponding brain state. Neuronal correlates of consciousness are the minimal set of neuronal events sufficient for that percept or brain state.

2) Zombie Agents and Consciousness - Most of motor actions in response to events are rapid, stereotyped and non-conscious—cortical reflexes. Consciousness deals with more complex responses or more complex imagery, necessary for planning and choice of many potential actions. With enough repetition, specific sensory-motor behaviors that initially require slow conscious processing can be carried out by less effort-laden "Zombie" agents—hitting a backhand, playing piano, etc.

3) The function of consciousness is to summarize the current state of the world in a compact representation and make this 'executive summary' accessible to the planning stages of the brain….The content of this summary is the content of consciousness.

4) Nonconscious Homunculus - Overall behavior of the cerebral cortex is that the frontal lobes are looking backwards at the parietal/occipital/temporal regions (what we experience as our internal homunculus is driving the truck, but he/she's looking backwards.) Ergo, action is based on view, but the visual consciousness may not have direct access to the planning, decision-making higher cognition systems. Thoughts about the visual input are only accessible as inner speech and imagery.

5) The visual system has two main projection pathways forward, a vision-for-perception stream to the temporal lobe (ventral path) which handles form and object recognition (naming on L, emotion on R). The second is a dorsal vision-for-action path to parietal cortex, which handles spatial information for locating targets and informing motor actions and execution. Both paths then project to the frontal lobes. Visual consciousness, the "I see that" is probably located in the inferior temporal cortex and its post-synaptic structures.

We Can Know Where, But Not What, or Vice Versa

Attributes of some stimulus (color, orientation, shape, movement) are detected by a specific set of neurons (a column in the cortex—think of a cell in the honeycomb) that note that feature without processing it, then pass it along. If this "node" is destroyed, the feature is not available—some strokes can eliminate color or orientation, but leave the rest of the visual input. We can be blinded, yet still "see".

Higher levels stimulated first—new visual scene leads to a visual system projection to the prefrontal cortex and relevant motor structures, then a back relay to allow further processing of detail. This is experienced as seeing the entire field of view at once, seeing everything—either an illusion or a sense of the gist of the vision. Forward projections from posterior neurons are driving and excitatory. Connections from the front to the back are modulatory. How much of the frontal lobe is stimulated by a novel view is dependent on expectation and selective attention.

Selective attention has two forms. Bottom up attention is rapid and automatic, saliency driven, and undirected. Top down is task-related, can be directed to location, attribute, or object, and can bias attention in situations of competing stimuli. Top down attention is closely allied to the focus of attention, probably has a different basic neuronal process, and there may not always be a one-to-one relationship between the focus of attention and the current content of consciousness.

Perceptual awareness may correspond to a sequence of static images with motion painted onto them. These epochs have variable duration of 20-200msec. (seen in the 4-12 Hz firing rhythms of neurons). The variation in epoch length depends on saliency, eye movements, habituation, and expectancy. Visual epochs may not have the same length as other sensory systems, and particular attributes of a visual stimulus may not have the same time duration. Note how this relates to our perceived variation in time – some things, like car accidents, appear in slow motion, while other events whiz by.

Forebrain processing of vision involves the competitive interactions and winner-take-all dynamics of many coalitions of neurons. A coalition of neurons has a mutually reinforcing activity, induced by synchronization of the neurons spiking discharge in the gamma (30-60 Hz) frequencies, which increases the postsynaptic impact of the neuronal coalition and suppresses the competing coalition. At any one moment, the winning coalition will be sustained, and will be the content of conscious awareness at that moment. A winning coalition comes from neurons in cortex, thalamus, basal ganglia and other allied neuronal networks. It therefore influences a large number of other neurons, a penumbra, which influences the subsequent contents of consciousness and the 'aboutness' or qualia of the experience.

So what do we make of all this? Clearly, the composite nature of vision in the simple perception of an apple or a flying baseball is clear. Causes and conditions, lack of any intrinsic nature, and the susceptibility to influence are all here. It's not such a great step to go from the view in front of your eyes at this moment to the View you have of the image of your loved one, your relationships, your occupation, your life. The nervous system is organized around these principles, both at the primary sensory processing and the higher order processing.

Similar insights are seen in the somatosensory system. In Oliver Sacks' book, A Leg to Stand On, he describes an injury to his quadriceps tendon sustained when he was running away from a bull in an Italian farm field. He then lost the use of the leg, and even the sense of the leg, for some time, although there was no nerve injury involved. Clearly, the simulation circuitry in his brain, and in the brains of multiple other patients with similar disorders, restructured the body representations in a dynamic way. There can be somatosensory neglect, just as there can be visual neglect.

In Ramachandran's book, Phantoms in the Brain, he describes visual, somatosensory, emotional, and memory examples of the composite quality of experience. As he says:

> *"Everything I have learned from the intensive study of both normal people and patients who have sustained damage to various parts of their brains points to an unsettling*

notion: that you create your own 'reality' from mere fragments of information, that what you 'see' is a reliable—but not always accurate—representation of what exists in the world, that you are completely unaware of the vast majority of events going on in your brain….the circuitry that embodies the vivid subjective quality of consciousness resides mainly in parts of the temporal lobes (…amygdala, septum, hypothalamus and insular cortex) and a single projection zone in the frontal lobes—the cingulate gyrus."

Finally, there is the effect of memory on experiences and views. Any recollection of memory is an active recreation of the prior event from certain key recollections coupled to an active re-simulation of the brain state at the time. It requires a new re-imaging, and when the memory is laid back down, it includes elements of the current state in which the memory is recalled. This is a window for restructuring the effects of prior events to the service of future action.

The message here is that the structures that make up View can be modified. The anatomy, physiology, and biochemistry allow us to intervene in the process. If I can influence the coalitions of neurons in my frontal lobes, I can vary the top down attention processes and have some sense of controlling the reactivity to the bottom up stimuli calling out for me to pay attention to them. The anatomic structures exist to do what the Dharma said is possible.

Taking Refuge

A calm and compassionate appraisal requires the safety of a personal sanctuary, in order that the necessary work is accomplished with minimal suffering and as much chance for success as possible. In doing this "soul-searching" work, we need to be mindful of the whole, the universe. We need to be mindful of the meanings and framings of what we think or thought possible. For any aspect of the plan, we need to as the question, "Am I Sure?", and allow the answer to emerge from the process. We need to look carefully at our explicit and implicit attributions about other people in our world.

We may need to use cognitive/behavioral therapy methods to challenge our more embedded but inaccurate and negative beliefs. We need to increase the top-down executive control over our awareness by actively slowing down, by cultivating steadiness of mind, by verbally noting what is arising. Actively enlist internal and external resources to assist you in changing outmoded plans and incorrect View. Watch how these explorations and changes manifest in the body, both as a way of monitoring health and as a way of dampening reactivity to stimuli that might derail your efforts.