

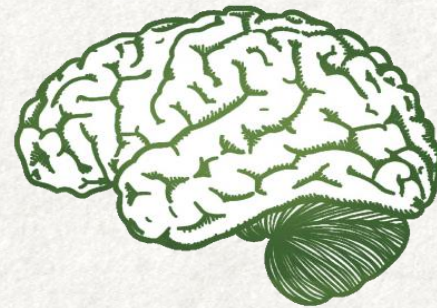


Know the mind.

Shape the mind.

Free the mind.

A Neurology of Awakening: Practicing with the Brain in Mind



Spirit Rock Meditation Center

February 6, 2021

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Foundations

A Meditation

Breathing while feeling your chest as a whole

Breathing while feeling caring

Breathing while feeling cared about

*Going down to a river
that is flooded and turbulent,
if you are swept away by the current –
How can you help others across?*

Sutta Nipata 2.8

A “Three-Legged” Stool of Practice

Loving – compassion, kindness (*metta*)

Knowing – mindfulness, clear seeing (*sati*)

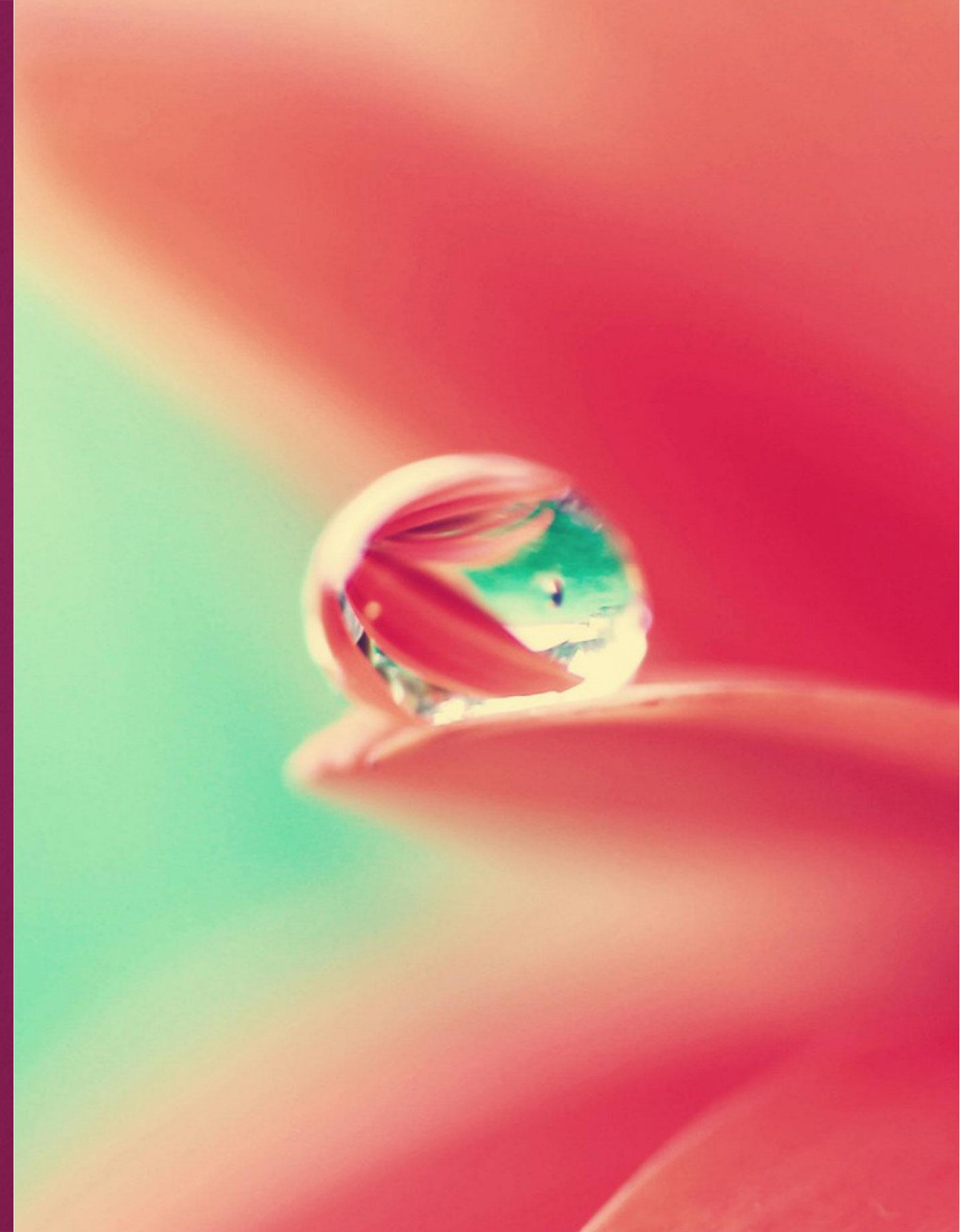
Growing – healing, developing, learning (*bhavana*)

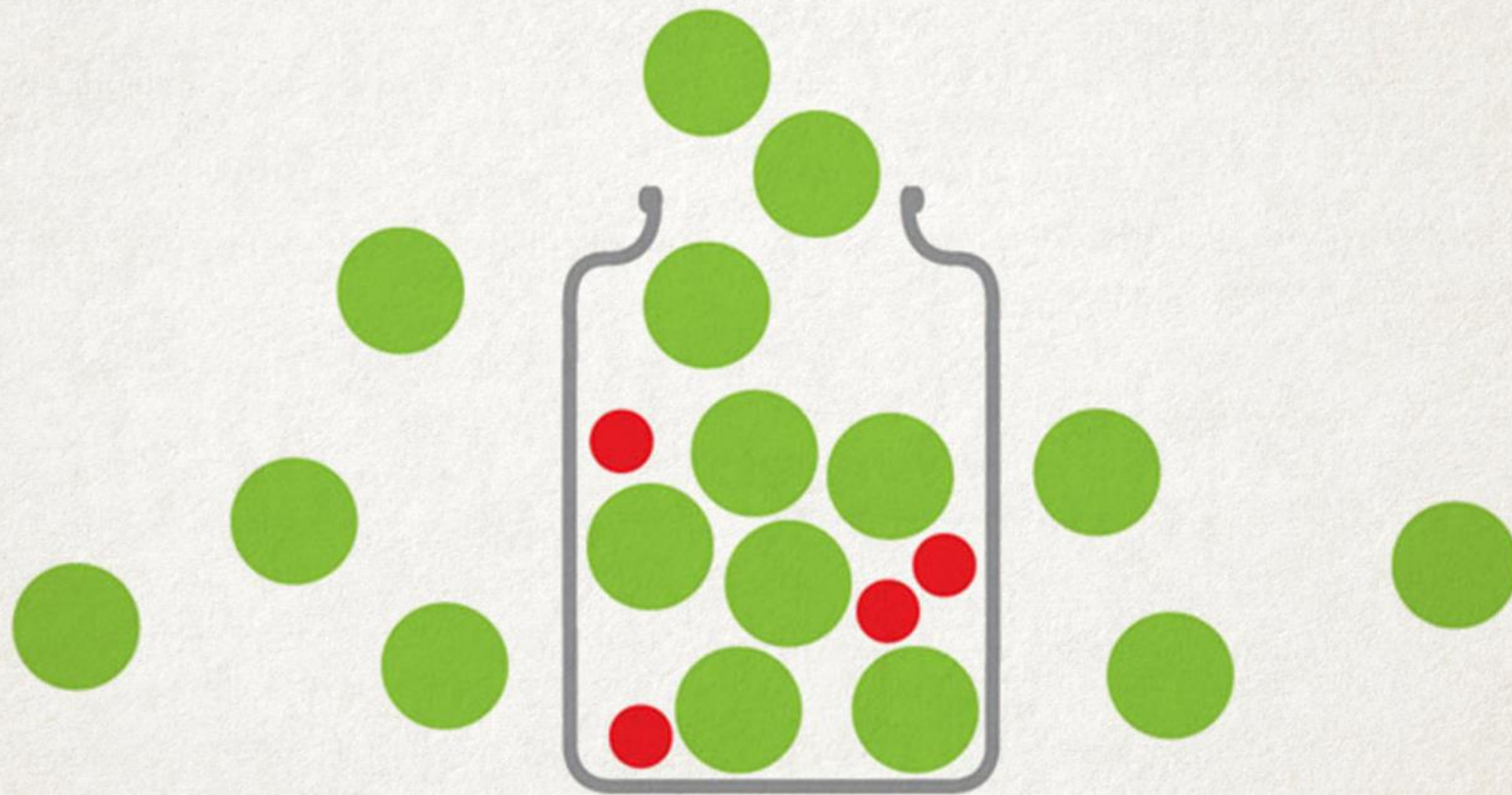
*Think not lightly of good,
saying, “It will not come to me.”*

*Drop by drop is
the water pot filled.*

*Likewise, the wise one,
Gathering it little by little,
Fills oneself with good.*

Dhammapada 9.122





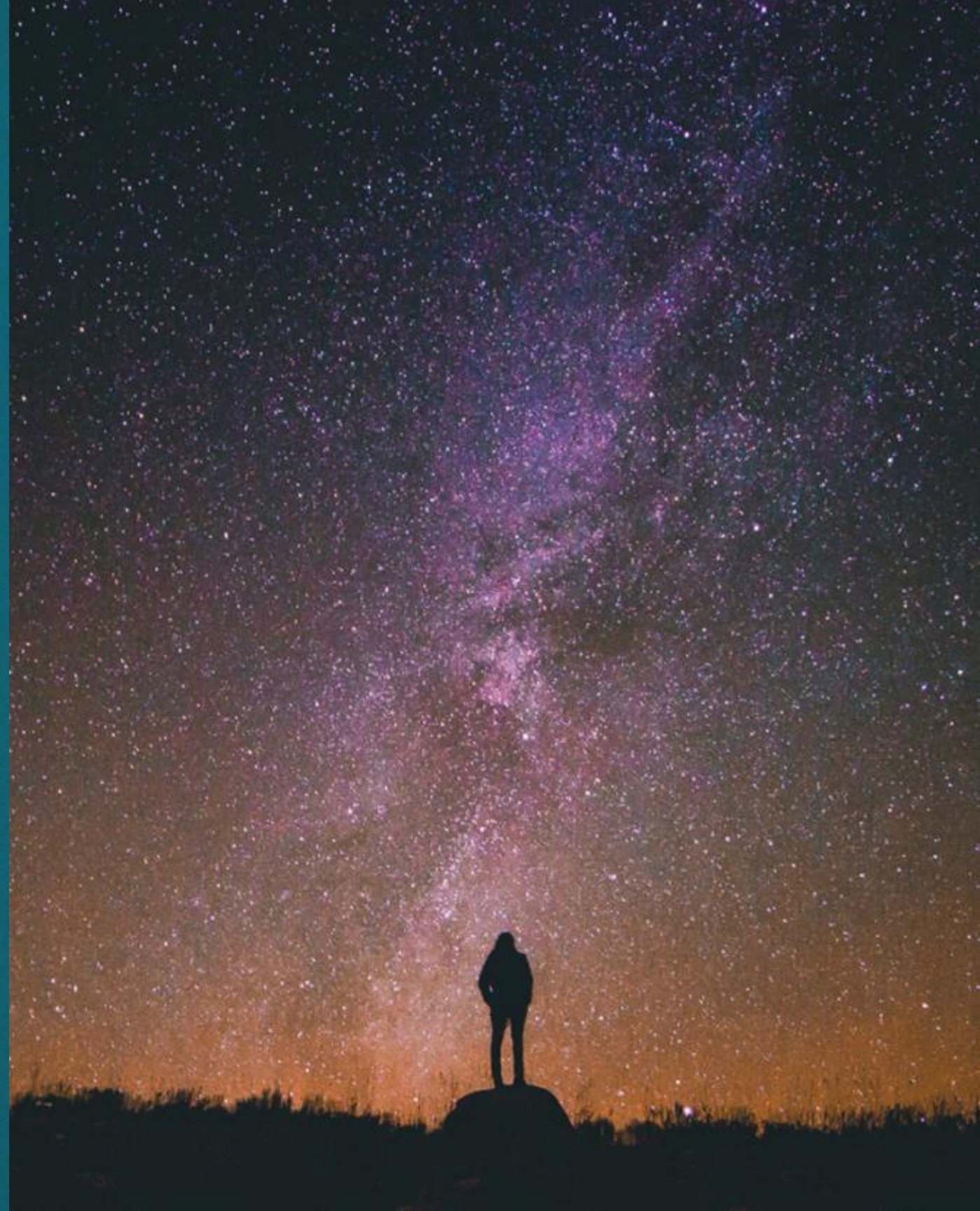
Have It, Enjoy It

*In the beginning,
nothing came.*

*In the middle,
nothing stayed.*

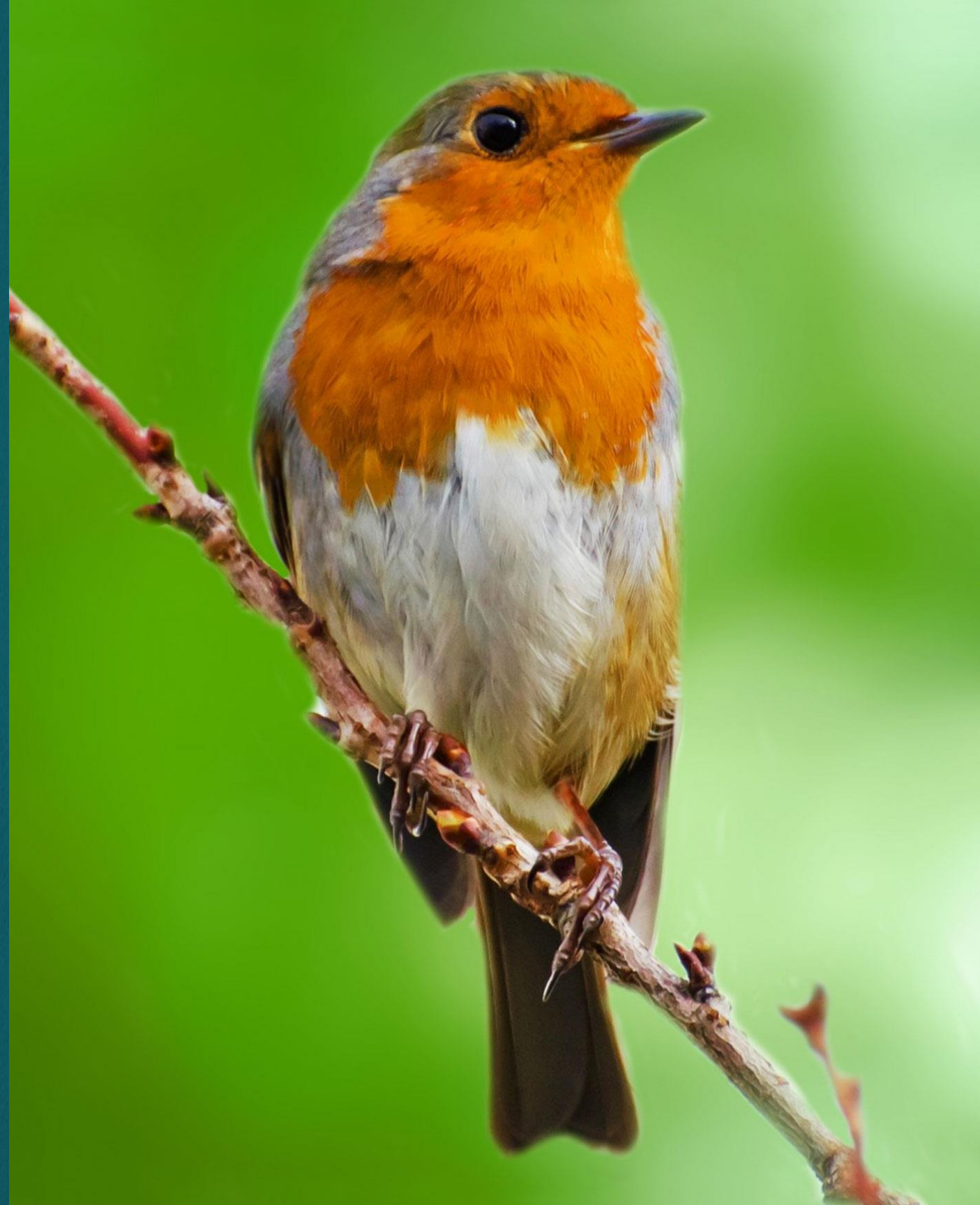
*In the end,
nothing left.*

Milarepa



*Keep a green bough
in your heart,
and a singing bird
will come.*

Lao Tzu



Fields of Practice

Virtue – restraint, morality, character (*sila*)

Concentration – absorption, purification (*samadhi*)

Wisdom – insight, disenchantment (*panna*)

*Concentration is
the proximate cause of wisdom.*

*Without concentration,
one cannot even secure one's own welfare,
much less the lofty goal of
providing for the welfare of others.*

Acariya Dhammapala

*Penetrative insight
joined with calm abiding
utterly eradicates
afflicted states.*

Shantideva

Seven Steps of Awakening

Steadying the mind

Warming the heart

Resting in fullness

Being wholeness

Receiving nowness

Opening into allness

Finding timelessness

Gradual cultivation

Sudden awakening

Gradual cultivation

Sudden awakening

Gradual cultivation . . .



Steadying the Mind

Fundamentals of Meditation

- Good will toward yourself
- Posture that is comfortable and alert
- In the present; aware and letting go
- Stable mindfulness
- The mind settling and coming to rest

Some Mental Factors of Steadiness

- Establishing intention
- Relaxing body and breath
- Opening the heart
- Feeling basically alright right now
- Opening to positive emotions

Neural Factors of Steadiness

- Intention – Top-down and bottom-up
- Relaxation – Parasympathetic NS
- Heart opening – Social engagement sys.
- Allrightness – Calms sympathetic NS
- Positive emotions – Steadies attention,
reduces “craving”

Body-Full of Mind

*We ask,
“What is a thought?”*

*We don't know,
yet we are thinking
continually.*

Venerable Tenzin Palmo



A Framework

There are **experiences**: thoughts, feelings, memories, awareness.
In squirrels and people alike. Experiences are **natural** phenomena.

There is **matter** (and energy): water, light, trees, bodies, brains.

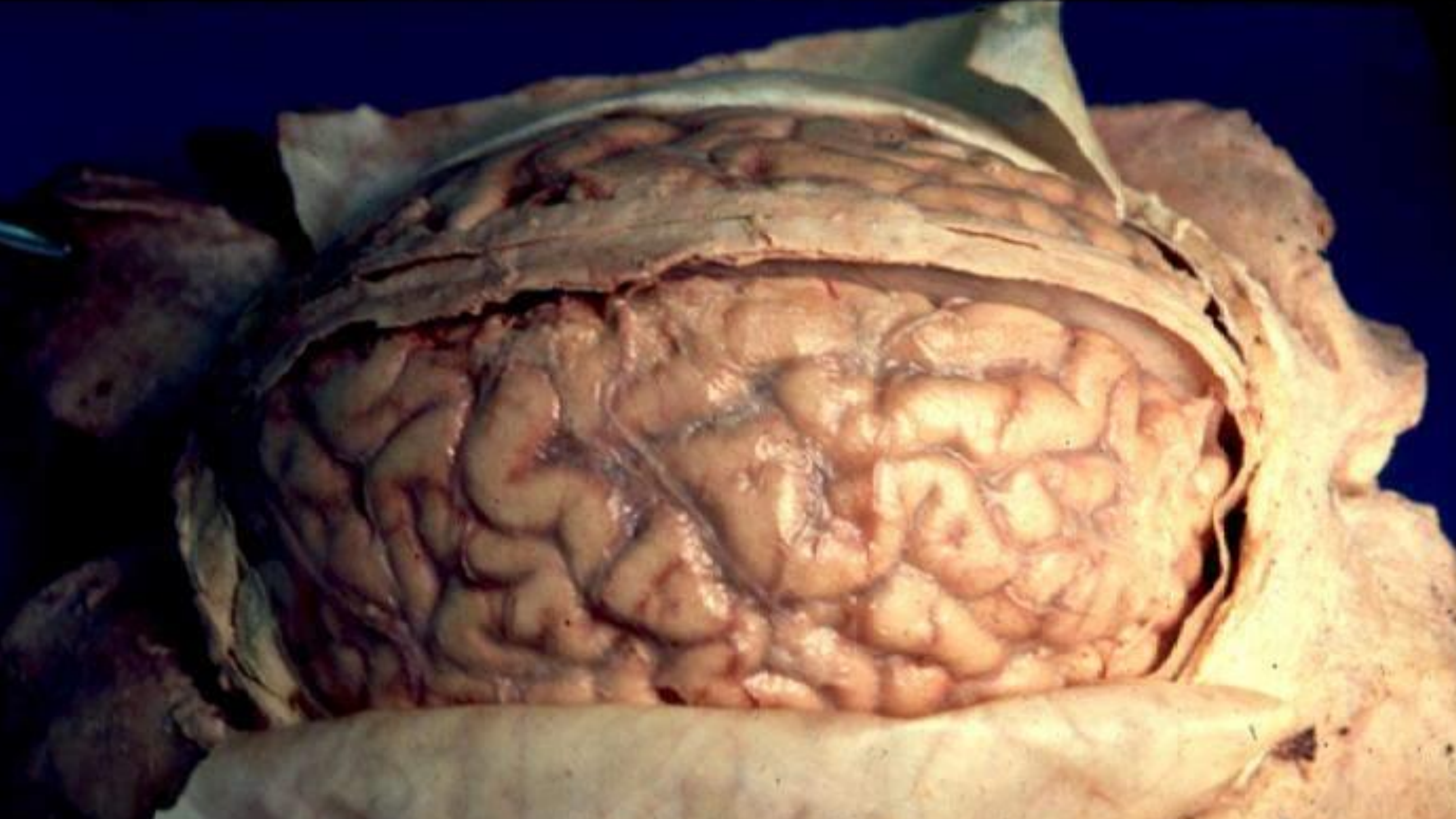
There is **information**: signals, meanings, instructions.
The function of the **nervous system** is to process information.

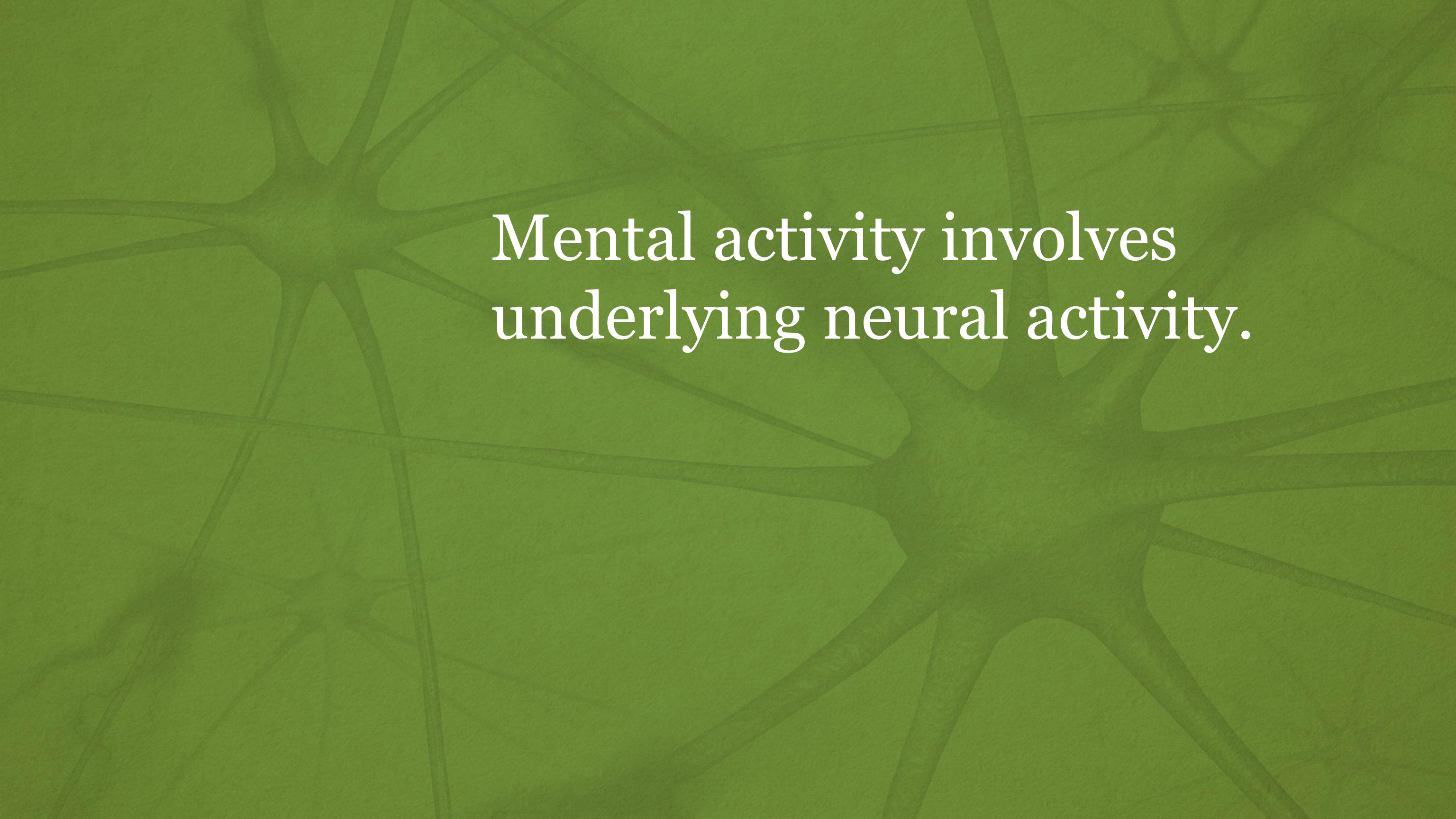
Our experiences **depend upon** flows of information represented by flows of neural activity.

There's probably **more to it** than this.

*The Brain – is wider thant the Sky –
For – put them side by side –
The one the other will contain
With ease – and you – beside.*

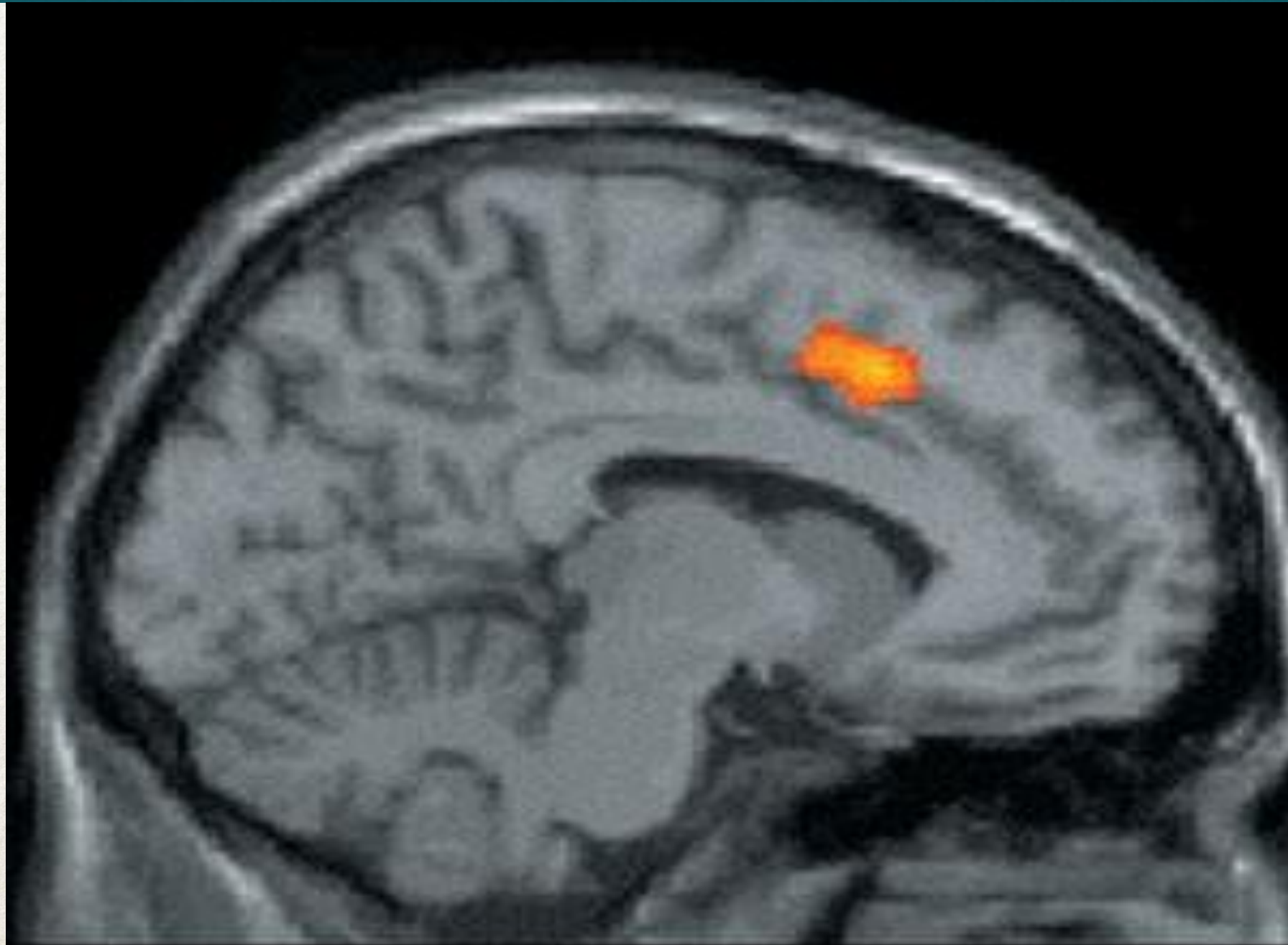
Emily Dickinson



The background of the slide features a repeating pattern of stylized green neurons. Each neuron consists of a central cell body with several long, thin, radiating processes, resembling a star or a web. The pattern is dense and covers the entire background.

Mental activity involves
underlying neural activity.

Ardent, Resolute, Diligent, Mindful





Repeated mental activity involves repeated neural activity.

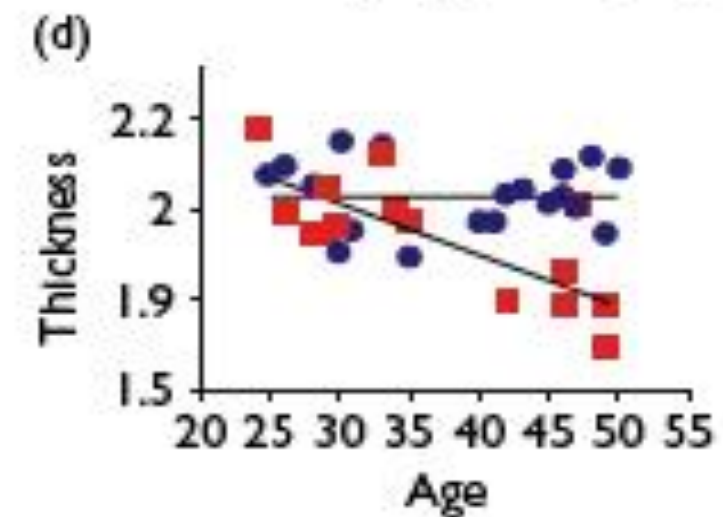
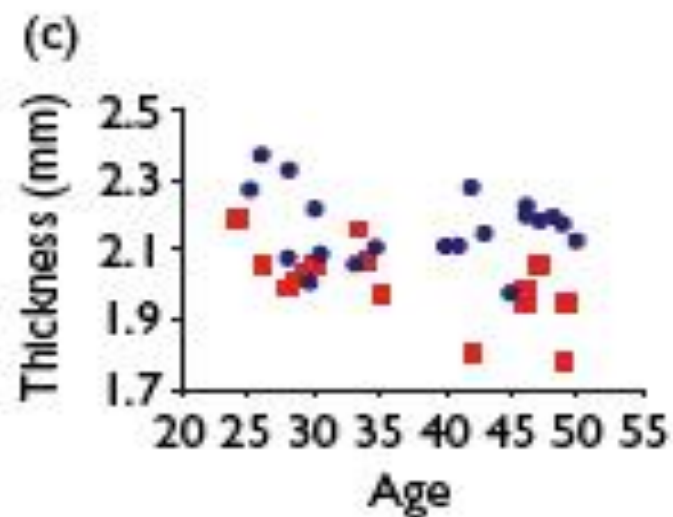
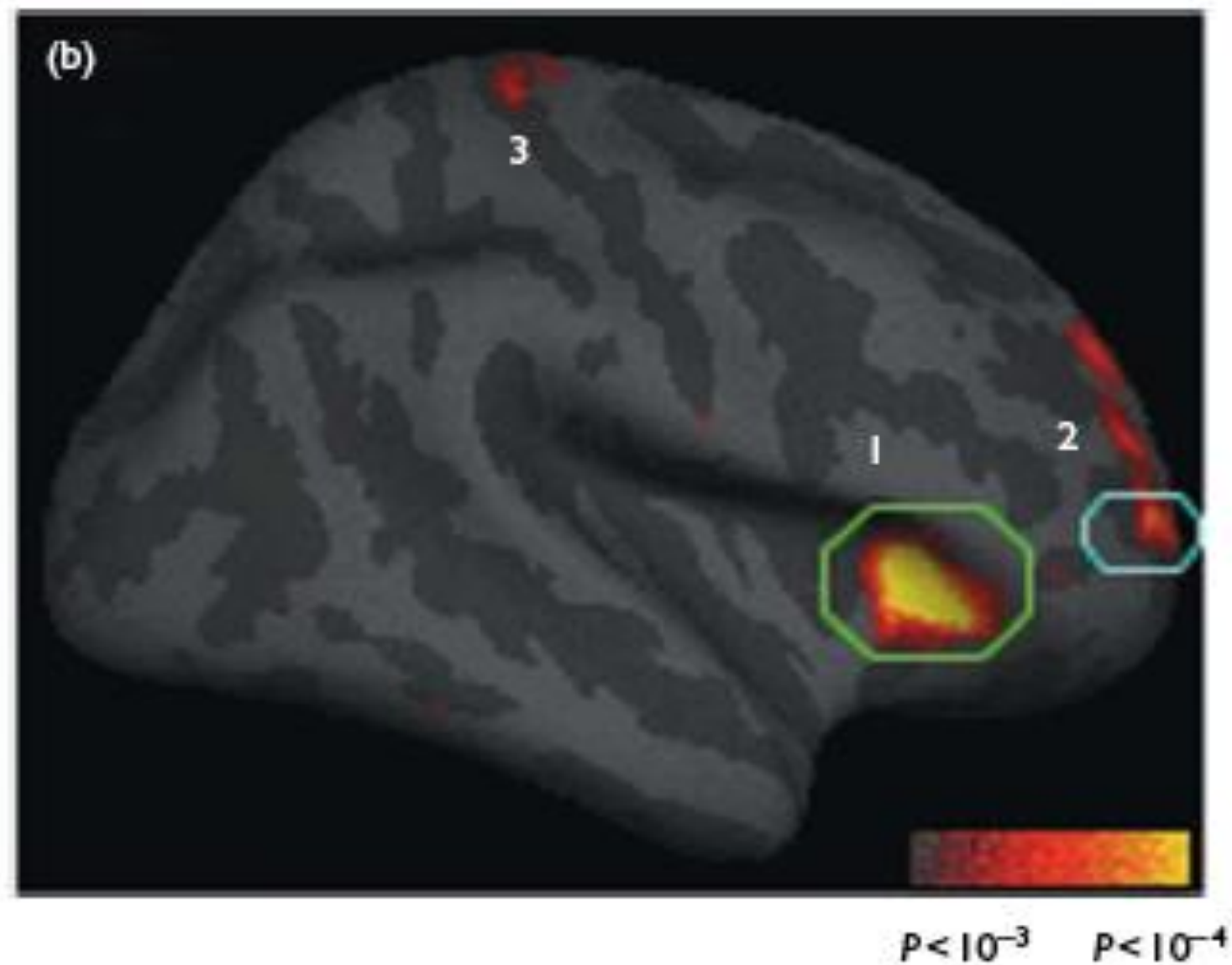
Repeated neural activity can alter neural structure and function.



Neurons that fire together,

wire together.

Lazar, et al. 2005.
Meditation
experience is
associated
with increased
cortical thickness.
Neuroreport, 16,
1893-1897.



Key Mechanisms of Neuroplasticity

(De)Sensitizing existing synapses

Building new synapses

Building and integrating new neurons

Altered gene expression

Altered activity in a region

Altered connectivity among regions

Changes in neurochemical activity (e.g., dopamine)

Changes in neurotrophic factors (e.g., BDNF)

Modulation by stress hormones, cytokines

Information transfer from hippocampus to cortex

Slow wave and REM sleep

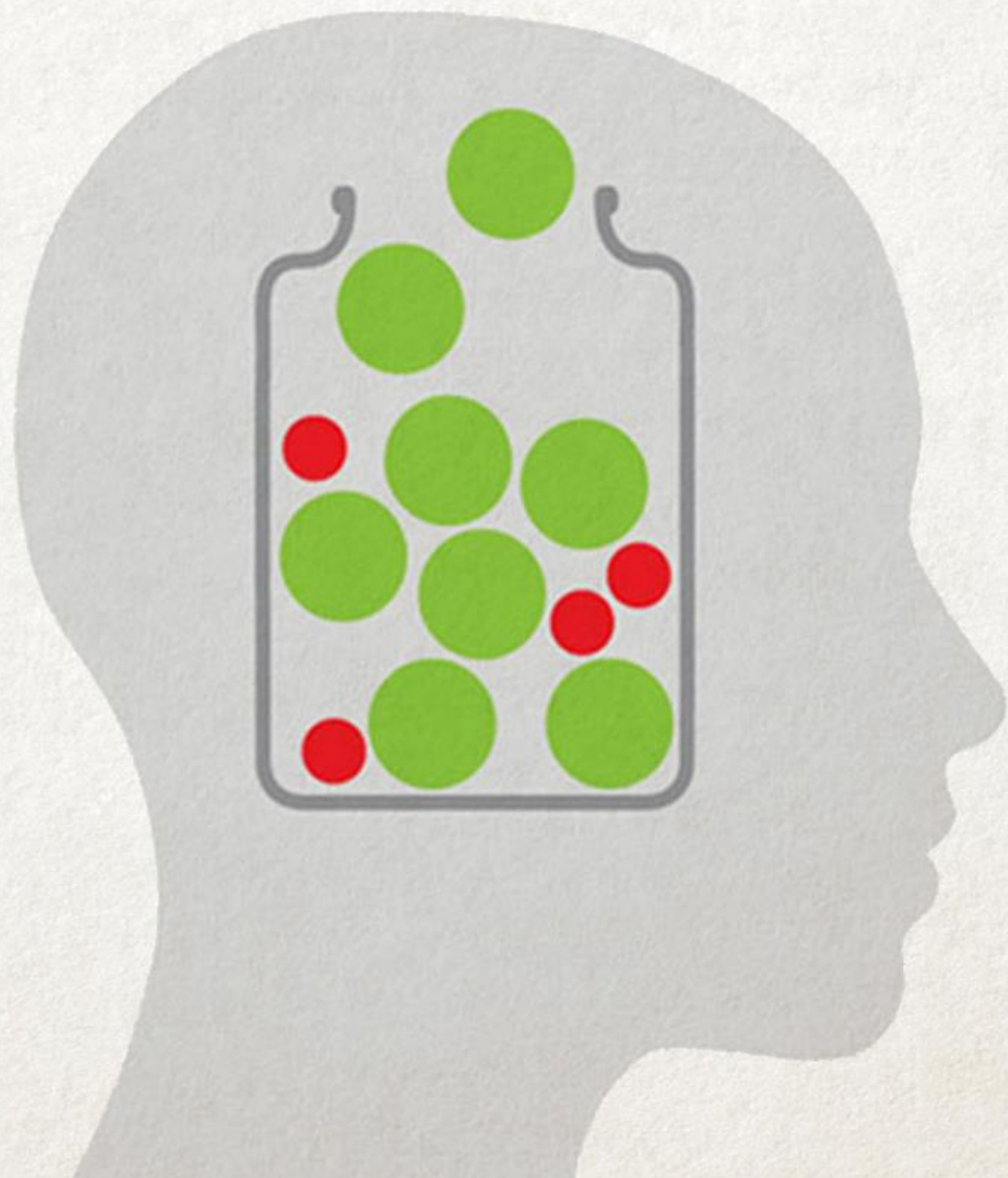
From States to Traits

States come and go, **traits** endure.

We acquire traits by having experiences
— states — that we **learn** from.

Positive traits foster positive states.

State → Trait → States → Deeper trait



We can know ourselves in two ways:

- From the outside in, objectively, informed by science, particularly by neurobiology
- From the inside out, subjectively, informed by modern psychology and perennial wisdom

“Neurodharma” is where these two meet.

The Opportunity

We can use the mind
to change the brain
to change the mind for the better
to benefit ourselves and other beings.



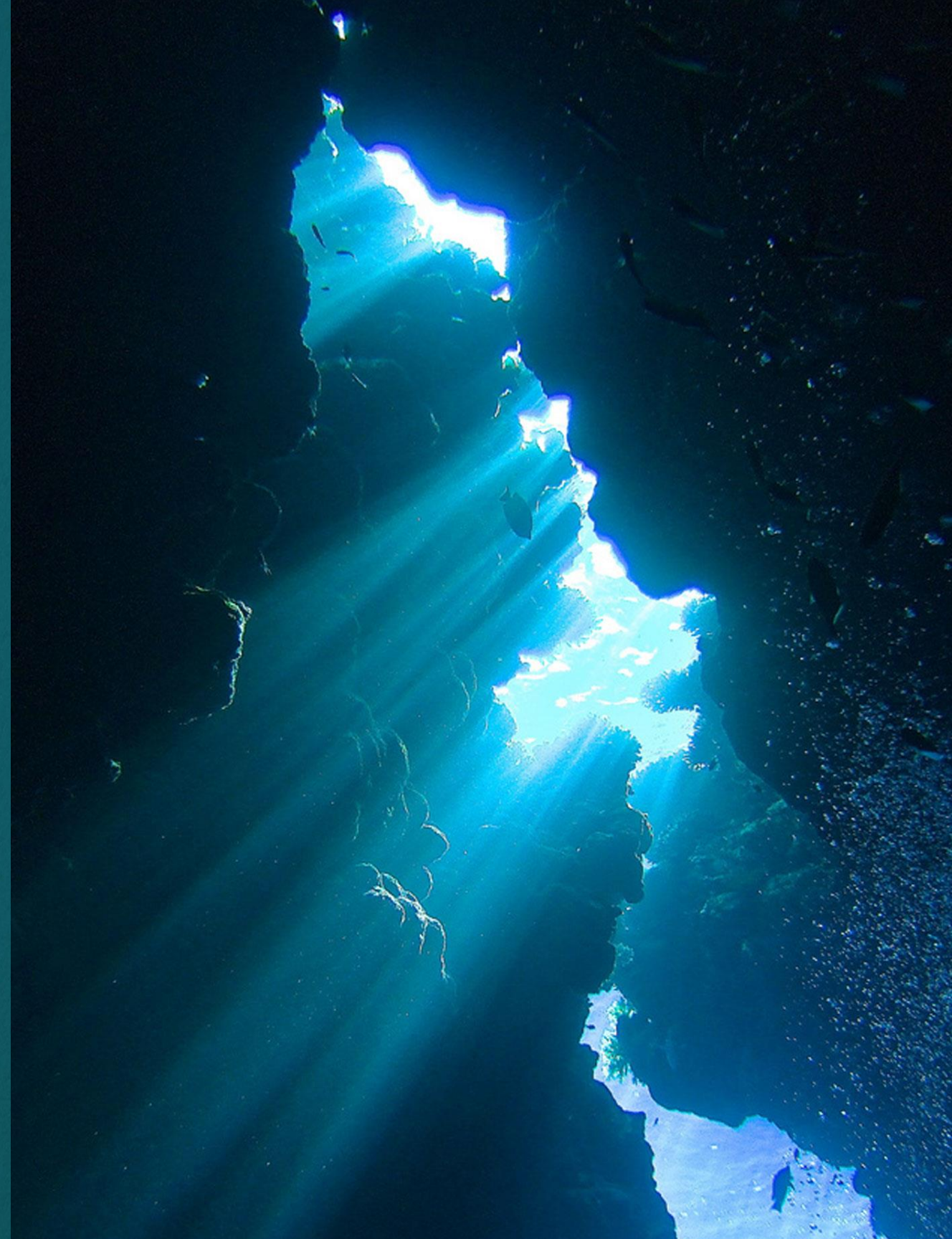
Wholesome Intentions

Let's sit a bit,
letting the mind settle down,
opening to support for yourself,
listening to what calls you,
carried along by your
wholesome intentions for practice.

“Anthem”

*Ring the bells that still can ring
Forget your perfect offering
There is a crack, a crack in everything
That's how the light gets in*

Leonard Cohen



Being Wholeness

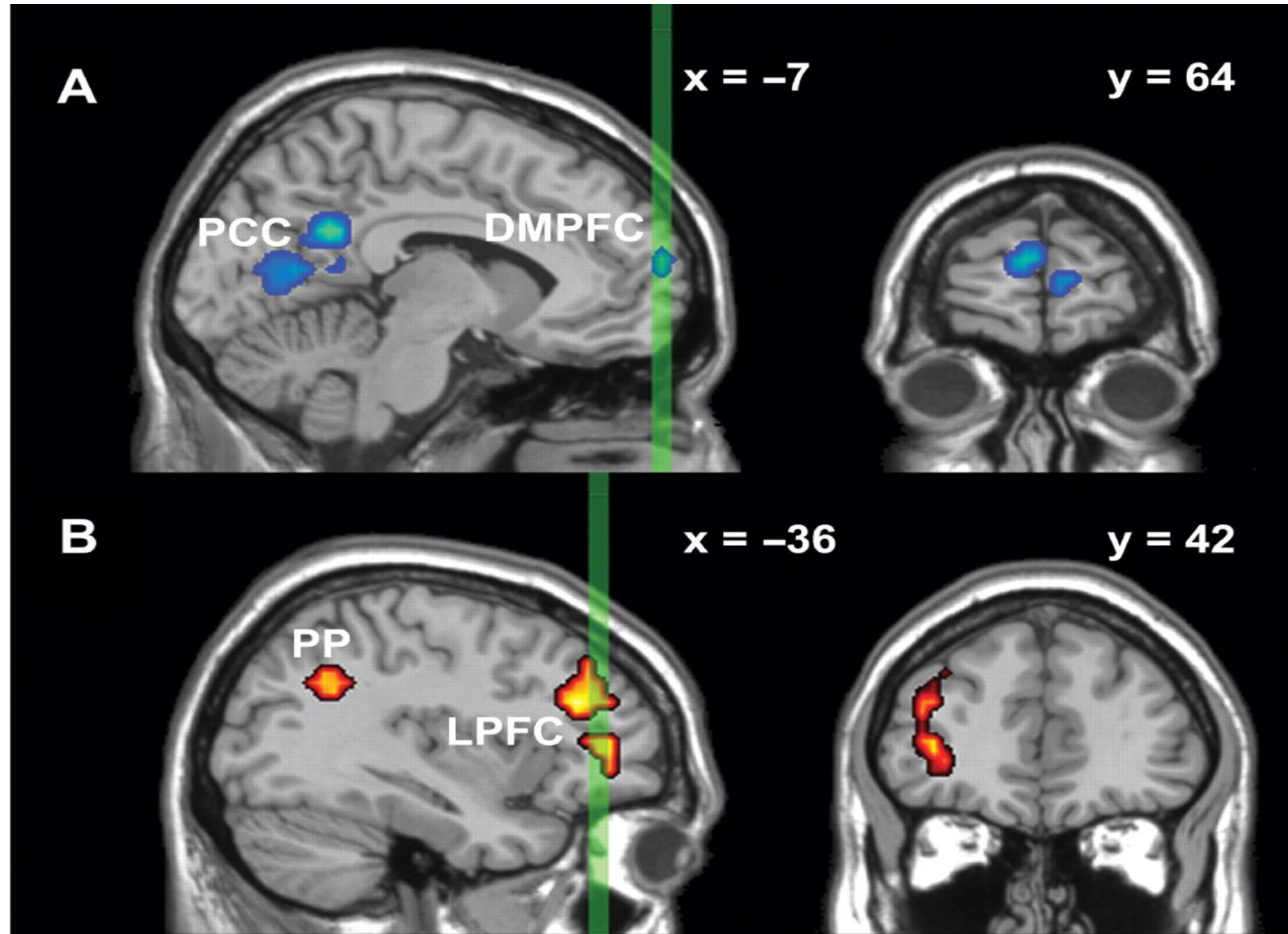
The Parts and the Whole

Suffering involves parts struggling with parts.
Which includes not accepting yourself fully.
Meanwhile, there is always mind as a whole.
Mind as a whole simply is, not a problem.
When you experience your mind as a whole,
suffering falls away.



What helps us experience
ourselves as a whole?

Self-Focused (blue) and Open Awareness (red)



Ways to Activate Lateral Networks

Focus on the present moment.

Don't problem-solve, fantasize, or ruminate.

Relax the sense of "me" and "I."

Widen into a panoramic view.

Rest in "don't know mind."

Sense your body as a whole.

Sensing Your Body as a Whole

Breathing while feeling your chest as a whole

Gradually include more of your body.

Relax and receive sensations.

Abide as a whole body breathing.

Opening into Being

Aware of the whole body, rest in a sense of openhearted contented peacefulness.

Let go of the past . . . Let go of the future . . .

Let go of the present . . . Let your mind be . . .

Aware of spaciousness . . .

Let go of doing . . . Let go of do-er . . .

Rest increasingly in a simple sense of being.



The Heartwood of Practice

*This holy life is not for the purpose of
gain, honor, and fame,
or for the attainment of virtue,
concentration, or knowledge and vision.*

*Rather, it is this unshakeable liberation
of mind that is the goal of this holy life,
its heartwood, and its end.*

Majjhima Nikaya, 30

*This is peaceful, this is sublime:
The calming of all mental constructions, the
letting go of all supports,
the extinguishing of craving,
dispassion,
cessation,
Nirvana.*

Majjhima Nikaya 64

*My mind has reached
the unconditioned.*

*I have attained
the destruction of craving.*

Dhammapada 11.154



Three Kinds of Unconditioned

1. Deconditioning *from* habits of suffering, and opening *into* what is effectively unconditioned: awareness, stillness, possibility
2. An extraordinary state of being – “cessation” – within ordinary reality
3. (possibly) That which is distinct from the conditioned universe: not arising and passing away: thus timeless (and conscious? loving?)

How might we understand the meeting of conditioned and unconditioned?

What could be happening as conditioned processes in the neural substrates of consciousness become extremely, perhaps utterly quiet?

And how might this quiet be an opening to what might lie beyond ordinary reality?

Eddies in the Stream - 1

Twirling electrons, the dance of relationship, flows of feeling and desire – all **eddies** in a stream

Thoughts and things have the same nature:
impermanent, compounded, and interdependent – thus **empty** of solidity, ownership, and independent existence

An eddying experience depends upon an eddy of information represented by an eddy of neural activity in the eddy of a body in the **stream** of the universe.

Eddies in the Stream - 2

Information is a reduction of uncertainty, a **signal** against a backdrop of noise.

For any experience to emerge, there must be unused neural capacity to represent it – fertile noise, quivering with possibility, **effectively unconditioned**.

Experiences are passing patternings of a field of infinite **possibility**.

Eddies in the Stream - 3

In the progression through the *jhanas* and the “formless realms,” mental activities gradually cease.

In the brain’s substrates of consciousness, eddies of information swirl apart, along with the neural assemblies that represent them.

The heart keeps beating, the brain keeps metabolizing, but signals drop out, stage by stage, so that nothing conditioned or constructed remains.

Eddies in the Stream - 4

At the ultimate point, there is mostly if not entirely unconditioned mental and neural possibility.

Profoundly open, continually in the emergence of the present moment before conditioning, *immersed in what is effectively unconditioned* . . . this could be so *like* the transcendental that there is an opening into it.

Freed from the ordinary mind, we could open to what is beyond ordinary reality.

Eddies in the Stream - 5

While the transcendental may be timeless, time continues for the body.

Eventually eddies of information begin to gather again in the neural streaming of consciousness.

There can be profound, liberating insights into the nature of the mind, and perhaps reality itself.

*It's as if you live in a deep valley
surrounded by mountains.
Then one day you're standing on top of the
highest peak.
The view is amazing.
Still, you can't live there.
And so you come back down to the valley.
But what you've seen changes you forever.*

Steve Armstrong

*We live in illusion
and the appearance of things.
There is a reality. We are that reality.
When you understand this,
you see that you are nothing.
And being nothing, you are everything.*

Kalu Rinpoche

Things appear and disappear according to causes and conditions.

The true nature of things is not being born, and not dying.

Our true nature is the nature of no-birth and no-death, and we must touch our true nature in order to be free.”

Thich Nhat Hanh



*Things fall apart.
Tread the path with care.*

Digha Nikaya 16

Coming Home

Love

Contentment

Peace

References

Suggested Books

See **RickHanson.net** for other good books.

- Austin, J. 2009. *Selfless Insight*. MIT Press.
- Begley, S. 2007. *Train Your Mind, Change Your Brain*. Ballantine.
- Carter, C. 2010. *Raising Happiness*. Ballantine.
- Hanson, R. (with R. Mendius). 2009. *Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom*. New Harbinger.
- Johnson, S. 2005. *Mind Wide Open*. Scribner.
- Keltner, D. 2009. *Born to Be Good*. Norton.
- Kornfield, J. 2009. *The Wise Heart*. Bantam.
- LeDoux, J. 2003. *Synaptic Self*. Penguin.
- Linden, D. 2008. *The Accidental Mind*. Belknap.
- Sapolsky, R. 2004. *Why Zebras Don't Get Ulcers*. Holt.
- Siegel, D. 2007. *The Mindful Brain*. Norton.
- Thompson, E. 2007. *Mind in Life*. Belknap.

Selected References - 1

See www.RickHanson.net/key-papers/ for other suggested readings.

- Atmanspacher, H. & Graben, P. (2007). Contextual emergence of mental states from neurodynamics. *Chaos & Complexity Letters*, 2, 151-168.
- Bailey, C. H., Bartsch, D., & Kandel, E. R. (1996). Toward a molecular definition of long-term memory storage. *PNAS*, 93(24), 13445-13452.
- Baumeister, R., Bratlavsky, E., Finkenauer, C. & Vohs, K. (2001). Bad is stronger than good. *Review of General Psychology*, 5, 323-370.
- Bryant, F. B., & Veroff, J. (2007). *Savoring: A new model of positive experience*. Mahwah, NJ: Erlbaum.
- Casasanto, D., & Dijkstra, K. (2010). Motor action and emotional memory. *Cognition*, 115, 179-185.
- Claxton, G. (2002). Education for the learning age: A sociocultural approach to learning to learn. *Learning for life in the 21st century*, 21-33.
- Clopath, C. (2012). Synaptic consolidation: an approach to long-term learning. *Cognitive Neurodynamics*, 6(3), 251-257.

Suggested References - 2

- Craik F.I.M. 2007. Encoding: A cognitive perspective. In (Eds. Roediger HL I.I.I., Dudai Y. & Fitzpatrick S.M.), *Science of Memory: Concepts* (pp. 129-135). New York, NY: Oxford University Press.
- Davidson, R.J. (2004). Well-being and affective style: neural substrates and biobehavioural correlates. *Philosophical Transactions of the Royal Society*, 359, 1395-1411.
- Dudai, Y. (2004). The neurobiology of consolidations, or, how stable is the engram?. *Annu. Rev. Psychol.*, 55, 51-86.
- Dweck, C. (2006). *Mindset: The new psychology of success*. Random House.
- Fredrickson, B. L. (2013). Positive emotions broaden and build. *Advances in experimental social psychology*, 47(1), 53.
- Garland, E. L., Fredrickson, B., Kring, A. M., Johnson, D. P., Meyer, P. S., & Penn, D. L. (2010). Upward spirals of positive emotions counter downward spirals of negativity: Insights from the broaden-and-build theory and affective neuroscience on the treatment of emotion dysfunctions and deficits in psychopathology. *Clinical psychology review*, 30(7), 849-864.

Suggested References - 3

- Hamann, S. B., Ely, T. D., Grafton, S. T., & Kilts, C. D. (1999). Amygdala activity related to enhanced memory for pleasant and aversive stimuli. *Nature neuroscience*, 2(3), 289-293.
- Hanson, R. 2011. *Hardwiring happiness: The new brain science of contentment, calm, and confidence*. New York: Harmony.
- Hölzel, B. K., Ott, U., Gard, T., Hempel, H., Weygandt, M., Morgen, K., & Vaitl, D. (2008). Investigation of mindfulness meditation practitioners with voxel-based morphometry. *Social cognitive and affective neuroscience*, 3(1), 55-61.
- Hölzel, B. K., Carmody, J., Evans, K. C., Hoge, E. A., Dusek, J. A., Morgan, L., ... & Lazar, S. W. (2009). Stress reduction correlates with structural changes in the amygdala. *Social cognitive and affective neuroscience*, nsp034.
- Jamrozik, A., McQuire, M., Cardillo, E. R., & Chatterjee, A. (2016). Metaphor: Bridging embodiment to abstraction. *Psychonomic bulletin & review*, 1-10.
- Kensinger, E. A., & Corkin, S. (2004). Two routes to emotional memory: Distinct neural processes for valence and arousal. *Proceedings of the National Academy of Sciences of the United States of America*, 101(9), 3310-3315.

Suggested References - 4

- Koch, J. M., Hinze-Selch, D., Stingele, K., Huchzermeier, C., Goder, R., Seeck-Hirschner, M., et al. (2009). Changes in CREB phosphorylation and BDNF plasma levels during psychotherapy of depression. *Psychotherapy and Psychosomatics*, 78(3), 187–192.
- Lazar, S., Kerr, C., Wasserman, R., Gray, J., Greve, D., Treadway, M., McGarvey, M., Quinn, B., Dusek, J., Benson, H., Rauch, S., Moore, C., & Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport*, 16, 1893-1897.
- Lee, T.-H., Greening, S. G., & Mather, M. (2015). Encoding of goal-relevant stimuli is strengthened by emotional arousal in memory. *Frontiers in Psychology*, 6, 1173.
- Lutz, A., Brefczynski-Lewis, J., Johnstone, T., & Davidson, R. J. (2008). Regulation of the neural circuitry of emotion by compassion meditation: Effects of meditative expertise. *PLoS One*, 3(3), e1897.
- Madan, C. R. (2013). Toward a common theory for learning from reward, affect, and motivation: the SIMON framework. *Frontiers in systems neuroscience*, 7.
- Madan, C. R., & Singhal, A. (2012). Motor imagery and higher-level cognition: four hurdles before research can sprint forward. *Cognitive Processing*, 13(3), 211-229.

Suggested References - 5

- McEwen, B. S. (2016). In pursuit of resilience: stress, epigenetics, and brain plasticity. *Annals of the New York Academy of Sciences*, 1373(1), 56-64.
- McGaugh, J.L. 2000. Memory: A century of consolidation. *Science*, 287, 248-251.
- Nadel, L., Hupbach, A., Gomez, R., & Newman-Smith, K. (2012). Memory formation, consolidation and transformation. *Neuroscience & Biobehavioral Reviews*, 36(7), 1640-1645.
- Pais-Vieira, C., Wing, E. A., & Cabeza, R. (2016). The influence of self-awareness on emotional memory formation: An fMRI study. *Social cognitive and affective neuroscience*, 11(4), 580-592.
- Palombo, D. J., & Madan, C. R. (2015). Making Memories That Last. *The Journal of Neuroscience*, 35(30), 10643-10644.
- Paquette, V., Levesque, J., Mensour, B., Leroux, J. M., Beaudoin, G., Bourgouin, P. & Bearegard, M. 2003 Change the mind and you change the brain: effects of cognitive-behavioral therapy on the neural correlates of spider phobia. *NeuroImage* 18, 401-409.
- Rozin, P. & Royzman, E.B. (2001). Negativity bias, negativity dominance, and contagion. *Personality and Social Psychology Review*, 5, 296-320.

Suggested References - 6

- Sneve, M. H., Grydeland, H., Nyberg, L., Bowles, B., Amlien, I. K., Langnes, E., ... & Fjell, A. M. (2015). Mechanisms underlying encoding of short-lived versus durable episodic memories. *The Journal of Neuroscience*, 35(13), 5202-5212.
- Talmi, D. (2013). Enhanced Emotional Memory Cognitive and Neural Mechanisms. *Current Directions in Psychological Science*, 22(6), 430-436.
- Thompson, E. (2007). *Mind in life: Biology, phenomenology, and the sciences of mind*. Harvard University Press.
- Wittmann, B. C., Schott, B. H., Guderian, S., Frey, J. U., Heinze, H. J., & Düzel, E. (2005). Reward-related fMRI activation of dopaminergic midbrain is associated with enhanced hippocampus-dependent long-term memory formation. *Neuron*, 45(3), 459-467.
- Yonelinas, A. P., & Ritchey, M. (2015). The slow forgetting of emotional episodic memories: an emotional binding account. *Trends in cognitive sciences*, 19(5), 259-267.



Supplemental Materials

An Overview of Current Research

Much research on people that psychological practices lead to psychological benefits, presumably via changing their brains.

Much research on other animals that various stimuli lead to many kinds of changes in their brains.

Some research that psychological practices change people's brains.

Scattered research on deliberate internal mental factors that lead to individual differences in gains from experiences.

“The absence of evidence is not evidence of absence.”

Letting Go

Rest in a sense of alrightness . . . peaceful,
contented, warmhearted.

Be mindful of this moment continually
emerging . . . so it's alright to let go.

Let go while exhaling.

Be mindful of sensations, all experiences
changing . . . letting them pass away.

*If you let go a little,
you'll have a little peace.*

*If you let go a lot,
you'll have a lot of peace.*

*If you let go completely,
you'll be completely peaceful.*

Ajahn Chah

*In the deepest forms of insight,
we see that things change so quickly
that we can't hold onto anything,
and eventually the mind lets go of clinging.
Letting go brings equanimity.
In Buddhist practice, we work to
expand the range of life experiences
in which we are free.*

Gil Fronsdal

*The entire world is in flames,
the entire world is going up in smoke;
the entire world is burning,
the entire world is vibrating.*

*But that which does not vibrate or burn, which
is experienced by the noble ones, where death
has no entry –
in that my mind delights.*

The Buddha

*The born, come-to-be, produced,
The made, the conditioned, the transient,
Conjoined with decay and death,
A nest of disease, perishable,
Sprung from nutriment and craving's cord –
That is not fit to take delight in.*

*The escape from that,
The peaceful, beyond reasoning, everlasting,
The not-born, the unproduced,
The sorrowless state that is void of stain,
The cessation of states linked to suffering,
The stilling of the conditioned – bliss.*

Itivuttaka 2.16

Self-Compassion

Bring to mind beings who care about you . . . Focus on feeling cared about. . . Take in this experience.

Bring to mind beings for whom you have compassion . . . Receive the sense of compassion into yourself . . . Know what compassion feels like.

Be aware of your own burdens, stresses, and suffering – and bring compassion to yourself . . . Get a sense of caring, warmth, support, compassion sinking deeply into you.

The Negativity Bias

As the nervous system evolved, avoiding “sticks” was usually more consequential than getting “carrots.”

1. So we scan for bad news,
2. Over-focus on it,
3. Over-react to it,
4. Turn it quickly into (implicit) memory,
5. Sensitize the brain to the negative, and
6. Create vicious cycles with others.

Neural Substrates of Empathy

- Three *simulating* systems:
 - Actions: “mirror” systems; temporal-parietal
 - Feelings: resonating emotionally; insula
 - Thoughts: “theory of mind”; prefrontal cortex
- These systems interact with each other through association and active inquiry.
- They produce an automatic, continual re-creation of aspects of others’ experience.

Calming the Visceral Core

- A brief explanation of heartrate variability
- Relax.
- Gently lengthen exhalations . . . As long as or longer than inhalations . . . Then letting breathing be soft and natural.
- Bring attention into the chest and area of the heart.
- Be aware of heartfelt feelings . . . Perhaps love flowing in and flowing out in rhythm with the breath.

Feeling Alright Right Now

- Aware of the body going on being . . . Enough air to breathe . . . The heart beating fine . . . Basically alright . . . Now
- You may not have been basically alright in the past and you may not be basically alright in the future . . . But now you are OK . . . Still basically OK . . . Now
- Letting go of unnecessary anxiety, guarding, bracing
- Reassurance, relief, calming is sinking into you . . . Still basically alright . . . Now

Calm Strength

Calming in the body and mind

Feeling strong

What feels good about calm strength?

Calm strength while aware of others

Calm strength with goodwill for others

Softening All the Edges

Relaxing, abiding as a body breathing

Sensations softening together

Heart softening

Everything in the mind softening together, a
single mind process, awareness included

Edges softening between you and everything

Unconditioned Possibility

Disengaging from any particular experience

Opening into awareness, stillness, vastness

A sense of possibility . . . including what is
always just before the emergent edge of now

A recognition of mystery

Opening to timelessness