

An historical perspective of how breakthrough innovators come to know

So, what's the big idea?

Taking one small step back to gain a giant leap of insight into the knowing characteristic of innovation



At times, each of us needs to step back as a means of gaining perspective in order to understand what really is going on.

The spatial aspect of such “stepping back” is illustrated marvelously in a short documentary film first released nearly fifty years ago, entitled, *The Powers of Ten*.ⁱ In a mere 9 minutes, writers and directors Charles and Ray Eames take the viewer on a voyage from a leisurely lakeside picnic in downtown Chicago to both the macroscopic (10^{24} m field of view) and microscopic (10^{-18} m field of view) ends of our known universe. Illustrated by 15 images at the top of this column (of the 43 images appearing in the film), as the audience steps back and then in from the picnic scene, traversing each logarithmic “power of ten,” entirely new perspective is gained.

The temporal aspect of such “stepping back” is illustrated powerfully in the *Big History Project* in which students are taken “on a 13.7 billion year journey in which they ask the big questions about our Universe, our planet, life and humanity (and) explore where we are going in the future.”ⁱⁱ By briskly traversing enormous spans of time in a logarithmic “power of ten” manner, students are better equipped to see the so-called “threshold moments,” the turning points of history that mark transitions from one major epoch to another.

With this present essay, I take a step back and survey the landscape of how breakthrough innovators come to know – and do so in such a way that we gain historical perspective as to how and why we might be in our current situation when it comes to successful innovation practice.

The salient features of breakthrough innovator epistemology

As I've reflected on how innovators come to know what to do today in order to have significant future impact, three

features of their practice of discovery emerge as plainly apparent. Their thinking is holistic, intimate and non-linear.

1. Holistic

Breakthrough innovators are systems thinkers, very often speaking as such in terms of “connecting the dots.” They see subtle, embedded patterns within massive amounts of data and sensory experiences much earlier than others, if not seeing patterns that others simply cannot perceive. Further, they often see and frame problems, as well as solutions, in new ways that others do not. In a world often dominated by disciplinary experts, they easily span multiple disciplines, integrating insights across them in new and unique ways.

By using the act of viewing Magic Eye® images as a metaphor for the discovery – the emerging awareness of breakthrough insight – characteristic of the best innovators, essays 4 through 9 in this series offer both broad and deep consideration of the holistic nature of breakthrough innovation thinking.

Three features of breakthrough innovation discovery are plainly apparent; such thinking is holistic, intimate and non-linear.

2. Intimate

Breakthrough innovators immerse themselves deeply in the lives of those they serve and the problems they solve. Intriguingly, I've noticed over time that much of the language used to describe how we know originally carried meaning consistent with very intimate engagement. Here are just a few “dead metaphors” of knowing that support this view:

- The etymology of the word understand reveals that its original meaning was “to stand *in the midst of*,” not “to stand *under*” as one might expect from a literal reading of the word we use today.ⁱⁱⁱ
- The word apprehend was first used in the sense of “to grasp with the senses or mind” in the mid-14th century and comes from Latin words that carry the meaning of physical grasping or seizing.
- We casually speak of “wrapping our mind” around an idea, evoking an extended embrace, not a fleeting glance.
- We also often speak of ruminating on concepts and digesting the facts. The use of such extreme, literal internalization as language for knowing also is illustrated by the concept of *Grok* in the classic literature of science fiction.^{iv}



I've not yet written up these insights into an essay for this series, but intend to do so in the not too distant future.

3. *Non-linear*

Not only do breakthrough innovators think holistically, they see how system elements work together beyond mere linear addition. Although related to holistic thinking, the non-linear nature of their coming to know is more nuanced, yet still powerful. I'll address this characteristic of breakthrough innovator knowing in some detail in a set of essays soon to appear in this series. For the purposes of the present essay, I'll just assert that the "dead metaphors" of innovation support this reality and ask that you be patient for an adequate reflection on the topic. However, I will leave you with this thought that should stimulate your curiosity: just as with the language of patent law where simple combinations of existing ideas do not qualify for protection, innovation is not a simple linear combination of ideas; instead, it (non-linearly) propels us into new dimensions.

So, what's the big idea?

If our new-found awareness of these three salient features of breakthrough innovator epistemology wasn't enough, there is significance in the fact that they exist together – this is no accident.

As noted in the table immediately below, these characteristics are collectively in direct opposition to the type of knowing that emerged at the time of the Enlightenment and has dominated Modern thinking since:

<i>Modern / Enlightenment</i>	<i>Breakthrough innovation</i>
• Reductionist	• Holistic
• Detached	• Intimate
• Linear	• Non-linear

The Enlightenment (think Newton when it comes to science) paved the way for Modernity (the mindset held by much of the developed world today) as well as the great scientific and technological progress associated with it. Were it not for the Enlightenment, the Modern Era and this way of thinking, we would not have benefitted from the great economic progress (both wealth creation and improved standard of living) experienced as a result of the Industrial Revolution.^v

Yet, what I'm saying here is that the best innovators describe their acts of breakthrough innovation as being

characterized by a diametrically opposed way of thinking. Although this fact might appear odd at first glance, I believe it represents a powerful aspect of what breakthrough innovation is all about.

In order to get into the game of innovation you typically need to be not only fluent, but really quite talented in Modern thinking. This is especially true for breakthrough innovation that involves technology in any way, as the best engineers and scientists emerge from their education having powerfully mastered analytic skills characterized by Modern thinking. Yet, their skill in Modern thinking is merely their entry ticket – the ante, if you will. Those who truly stand out as innovators have this additional set of skills, have the ability to think in this other way. Thus, breakthrough innovators represent something of a very-small, highly-successful "remnant" who have not lost this other way of thinking while fully developing the Modern way.

Since so few people exhibit great skill in thinking in both of these ways, it should not be at all surprising, then, that breakthrough innovators are such rare individuals – pathfinders and visionaries who, by virtue of excellence in these combined skills, lead us in new, exciting directions. ■

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ⁱ To view the *Powers of Ten* video, see <http://www.powersof10.com/film>.

ⁱⁱ For an overview, see <https://course.bighistoryproject.com/bhplive>; for a TED talk on *Big History* by David Christian, the academic driving force behind this movement, see <http://www.youtube.com/watch?v=yqc9zX04DXs>.

ⁱⁱⁱ <http://www.etymonline.com/> is a convenient source of first pass information on the etymological origins of words.

^{iv} Robert A. Heinlein, *Stranger in a Strange Land* (New York: G.P. Putnam's Sons, 1961).

^v Joel Mokyr, *The Gifts of Athena: Historical Origins of the Knowledge Economy* (Princeton: Princeton University Press, 2002).

"On the Epistemology of Innovation: How Breakthrough Innovators Connect the Dots" is a series of brief, occasional essays addressed to executives, managers, and technologists responsible for innovation in industry. Its purpose is to challenge readers to reflect broadly and deeply on the practice of innovation – in particular on how innovators come to know what to do today – in order to succeed commercially in the future. Essays are available without charge at the University of Illinois' digital archive at <https://www.ideals.illinois.edu/handle/2142/27667>. The discussion group at <http://epistemology-of-innovation.com> is a place to provide feedback and dialog with the author and others regarding these essays, as well as to register to receive notice of new essays as they are issued.