

Pragmatic Imagination

A New Muscle for the White Water World*

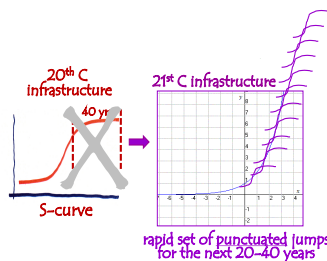
Ann Pendleton-Jullian

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Architect, Professor, Former Director of the Knowlton School of Architecture at Ohio State, and Architect of the Redesign and Professor of Design, Pardee RAND Graduate School of Policy and Action

a white water world

When the famous blue marble photograph was published, many of us saw, for the first time, the earth as a single sphere in space - its surface of geological distinctions and geopolitical borders blended beneath one atmosphere. Seemingly peaceful in the way it rested in space, its swirling atmosphere, however, suggested the dynamics of a world not at rest. And it foreshadowed a world of increasing turbulence. Whether you live in Los Angeles or London, Boston or Bangalore, we all share a world that is now rapidly changing, increasingly connected, and radically entangled. This is a white water world¹ – a world in which everything we do is somehow connected to everything else around it in dynamic flows of connectivity. We are in a state of hyper-connectivity that is both enabled and driven by digital technologies.



We have moved from an era of equilibrium to a new normal – an era of constant disequilibrium. In the past, we had punctuated evolution. Things changed abruptly and after the abrupt change, we had decades of stability that enabled us to build deep institutional models based upon infrastructural and technological shifts. And society as a whole evolved. But today's

* this concept was first articulated in chapter 17, "Pragmatic Imagination" in ApJ and John Seely Brown, *Design Unbound. Designing for Emergence in a White Water World*, MIT Press 2018

technological change and corresponding effects may not level out.² We are in an era of profound change, in which acceleration, instability, and disturbance have become the new normal. In this new normal, the challenges we face are substantial, fundamental, and entangled. COVID-19 plus street protests for social justice, plus increasing homelessness, plus fires in the canyons, plus climate change, plus the economic, governmental and social impacts of all of these globally, plus . . .

This is a whitewater world in which all issues are interconnected. Relationships of flow, exchange and entanglement dominate,³ creating volatility, uncertainty, complexity, and ambiguity to varying degrees for each of us.

agency and the imagination

How do we navigate this world with some degree of agency in our own lives and working on the things we care about? It starts with being able to *see* how everything is changed by the hyper-connectivity and pace of this world. Not just *that it is connected*, but more importantly, *how it is connected*. Joshua Cooper Ramo talks about the need for *a Seventh Sense*:

“The *seventh sense* is the ability to look at any object and see the way in which it is changed by connection. Whether you are commanding an army, running a Fortune 500 company, planning a great work of art, or thinking about your child’s education.”⁴

For the seventh sense to serve, we need to think of *seeing* as having two functions to it: seeing for understanding – seeing more, better, and faster. This is critical and we have new tools and ways of doing that. And we are building new lenses and skills that enable and empower those. The second function is seeing that which is beyond what we know or *can* know for certain. This *seeing works through the imagination*.

In a world that is rapidly changing, we need the imagination:

- for improvisation to respond to new events
- for adaptability and resilience

In a world that is broadly connected and with increasing heterogeneity, we need the imagination:

- to imagine oneself in another’s shoes to understand *their* motivations⁵
- to help us ‘see’ what is connected to what and in what ways
- to expand our own cognitive diversity

And in a world that is radically contingent, where problems and opportunities are contingent on contexts that are always changing, complex problems are contingent on other complex problems, and opportunities are contingent on other opportunities, we need the imagination: to help us ‘see’ not only what is, but what *could be*

to help us discover unknown – undiscovered – unknowns

to learn new skills and build new capacities to operate in this new era

For agency today, in this world, the imagination is more critical than ever.⁶ The unique power of the human imagination comes, in part, from its ability to integrate opposing qualities like emotion and reason, curiosity and certainty, and wrestle with diversity. It finds correspondences between things that are not obvious, or even logical, but *are* uniquely valuable. Despite the increasing need for truly imaginative thinking, we are experiencing a real *crisis of imagination*. This is due, in part, to a misunderstanding of the role of the imagination and its capacity to problem solve as well as innovate. We are not good at catalyzing it when needed, and more importantly, putting it to pragmatic purpose. The imagination is a muscle that, for many, is wasting away in a world ruled by text, data, pre-packaged images, and “easy” solution-seeking processes.

the imagination is . . .

But what is the imagination? What do we mean when we talk about the imagination? And is it something we can call on more intentionally like a physical muscle?

Simply defined, imagination is the power or capacity of humans to form internal images of objects and situations. These images may be visual images, auditory, or motor images.⁷ In *Some Notes on Brain, Imagination and Creativity*, the cognitive neuroscientist, Antonio Damasio, talks about how the imagination relies on banked images that one recalls, brings ‘on line’ and then uses to create novel combinations. Banked images come “from the world outside (as one is experiencing it) or from the inside world”⁸ and rely on an exchange between the two. How we interiorize what we see affects, ultimately, what we have *seen*. Experiences create images for the imagination to hold on to. But the imagination, with its propensity for playing with associations, with doing work when one is not aware of it, also creates new renditions of them. So, real world experiences seed rich image banks for the imagination to draw from.

In this way, imagination is different than creativity. The two are often confused because generating novelty is often considered the defining criteria, and both do lead to novel things. Viewed from this perspective of novelty production, only, it is often difficult to distinguish the two. To better understand imagination and its role in our lives, we *do* need to distinguish them.

Both imagination and creativity are processes that lead to products. Both interact with the world. And they do so within the domains of society and culture. But their processes and products are different. The imagination is primarily an intra-psychological process, occurring in the brain in microseconds, and ending when a resolution between an individual's experience and the internal image formation that it calls forth, emerges – when it resolves itself into something that displays coherence – something unified. The *product* of the imagination is this coherent unified resolution of images. Remembering that images can be visual, auditory, or motor, the resolution also will be any, or include all, of these. And while we've talked about it as *a* product (singular), *a* resolution of images (singular), this does not mean to imply that the imagination works singularly. It moves. Images are not static, and images build on other images.

Creativity, on the other hand, refers to inventive, productive and intentional actions that result in the making of a product that interacts with the real world. The mental processes of creativity operate on a longer time scale than microseconds and they are in *constant implicit or explicit conversation with real world concerns*. There is much room for, and need of, imagination in the creative process but the two are not the same thing.

Having clarified what the imagination is, we can now turn our attention to how it works, how it is deployed, and how we might access it more often, more intentionally, for increased agency.

the role of the imagination as a multi-functioning spectrum of mental activity

“There are imaginations, not ‘the Imagination,’ and they must be studied in detail.”

William James⁹

The role of imagination in the commerce between thought and action has been explored and debated by philosophers, artists, and scientists throughout the history of ideas. Seemingly illusive and undisciplined, it is held in high esteem for those endeavors associated with artistic creativity, fantasy, radical scientific discovery, invention and novelty of all sorts, while ‘higher’ orders of reasoning and logic are expected to carry us through our ‘real’ lives and work on our ‘real’ problems. From this position, logic and reasoning are warranted for pragmatic endeavors while the imagination is authorized to work on aesthetic and ‘creative’ endeavors. This counter positioning of imagination versus reasoning has been with us from classical times despite the attempts of many to expand our understanding of how imagination plays out within an entire range of mental operations. This polarization is counter-productive and scientifically unfounded. Instead, we need to understand the imagination as a critical partner in an entire spectrum of activities defined by diverse mental processes – processes that we use throughout our daily lives. This is the starting point for exploring *the Pragmatic Imagination*.

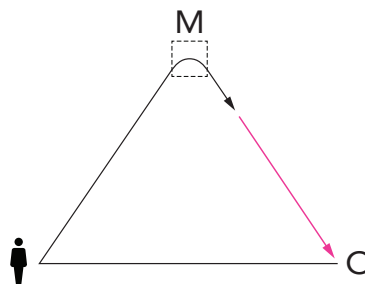
*"I think when I was growing up, I was dealing with a number of realities. The primary one involved being an immigrant. I moved from France to the United States when I was 7, and I had Chinese parents, which meant that I had three sets of divergent points of view broadcasting in my ears. It was very confusing. I needed to use my imagination to fill the gaps."*¹⁰

Yo-Yo Ma

Every engagement with the world, every experience we have, has a degree of novelty associated with it whether it is the nano-new - the small differences that give texture to routine - or the fully unfamiliar that, welcomed or not, rattle the routine in our lives.

Since the advent of modern philosophy and cognitive studies, we have come to understand that the imagination serves in more ways than just the forming of internal images of non-present 'wildly artistic' objects and situations. The definition has expanded to include the capacity to form images that actually aid the *various processes of reasoning*, and even for integrating sensory data *in the process of perception*, itself.

In the processes of perception and reasoning we use the imagination to close the gap between what is presented to us as new and what we know. This is how the mind assimilates novelty in the environment and learns. In 20th century cognitive psychology, there was a movement that began to recognize the importance of culture and history in how our minds process information coming from the environment.¹¹ Since then, **perception** has been seen as a process of triangulation between an individual in the world, the object or experience encountered, and the mediation of that relationship through cultural frames and behaviors. It can be diagrammed this way where the figure is the individual, 'O' is the object or event in the world, 'M' represents the mediating frames, and the magenta line is the gap between what is new relative to the object or event and what we *recognize in* it based upon our mediating frames:

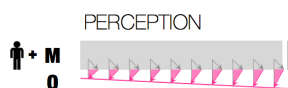


The mental images we form are not the same as what the thing or event *is*, in the world, unmediated. They are socio-cultural-biological constructs from the very beginning. What one sees, be it object or experience, is perceived through lenses that work to make sense of that

object or experience in terms known to the individual, who is formed by their experiences and culture, its frames, beliefs, and behaviors. Imagination, in perception, then, is “the process of resolving and connecting the fragmented, poorly coordinated experience of the world so as to bring about a stable image of the world (through) a feeling of oneself in relation to the world.”¹²

Because different people have different cultural frames and behaviors, they will perceive the same event, or objects even, differently. They will create unique triangulations between themselves in the world, the world, and the way in which their imaginations engage in making sense of the world to “create a stable image.” This is why ‘eye-witness’ accounts of a single event, without any intention towards bias, can still vary widely and even contradict each other.¹³

So, we can now see how the imagination is not uniquely about producing novelty that fuels creativity, nor is it simplistically the undisciplined counter-faculty to reasoning, but instead a means of “closing the gap” in perception even. The diagram below is the beginning of our spectrum in which: the gray bar represents the world; the pink line represents a thing or event one encounters, increasing in degree of ‘unfamiliarity’ or novelty towards the right; and the pink triangle represents the imagination at work closing the gap.



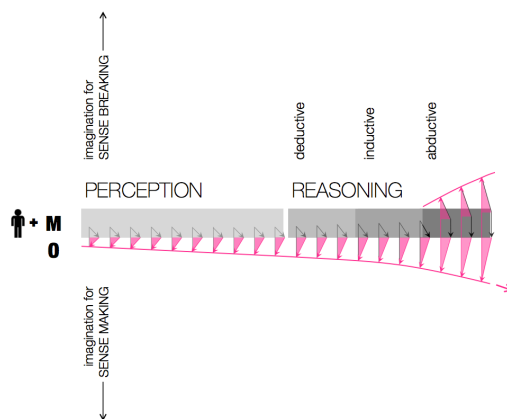
In reasoning, gap filling uses the imagination to figure out how novelty in the environment fits into the world we know, whether it is a small difference (a different brand of coffee) or monumental (the fall of the World Trade Towers in 2011). And the more extreme the novelty, the more the imagination must work in the process of reasoning. In deductive reasoning, where a conclusion follows directly from the premises presented, the gap is not large. The clues are supplied and lead to a rather direct answer. We just have to collect, sort and compare ‘images’ between the new and the known. In inductive reasoning, where the conclusion, while supported by the premises, does not directly follow them because there are missing pieces, where you rely on generalizations and patterns more than specifics, where the connections are less obvious/direct, the gap widens. We search for an answer by sorting through a larger database of ‘images’ to find the most viable answer. Instead of direct associations, we might have to employ analogy and metaphor to find correlations that explain the novel in terms of what we know.

But when circumstances are obscure, when critical pieces are missing, when the premises don’t ‘make sense’, or when what we encounter is just stranger than we can parse quickly, then we

must rely on abductive reasoning in which we have to *speculate* on *possible* answers and proceed by trying them out. Here the gap is too large to close with normal reasoning and so the imagination flips into a different mode. Instead of working to ‘figure things out,’ it must come up with various different, divergent – often fully novel – possibilities to work on the space of the gap.

Sherlock Holmes was a radical practitioner of this in the way he would imagine – visually imagine, not merely reason – in the space of a few minutes, divergent possible scenarios playing themselves out in his head such that when asked if he had a solution, he would always respond ‘yes, seven’ or ‘yes, three,’ meaning that he had that many viable hypothetical stories—imagined sequences of events—that he would then test against the clues available. Our fascination with Holmes and some of the more recent detective documentaries and binge-worthy shows is because they seamlessly move between a combination of rigorous observation, precise logic, and lively imagination.

When the gap is large, as one finds when abductive reasoning is required, the imagination generates novelty to fold back into the reasoning process. So somewhere within the domain of abductive logic on our spectrum, the imagination’s functioning shifts from making sense of information – sense-making – to breaking away from the constraints of purely evidence-based reasoning – we can call this sense-breaking – in order to generate novel content for consideration. It widens the gap to disrupt normative thought processes and practices. It is then also employed alongside reasoning to close the widened gap so that novel content can be assimilated. In abductive reasoning, one is not using the imagination to merely connect the dots (dots, being information) but add new ones that one tries out in search of answers. We can diagram it this way:

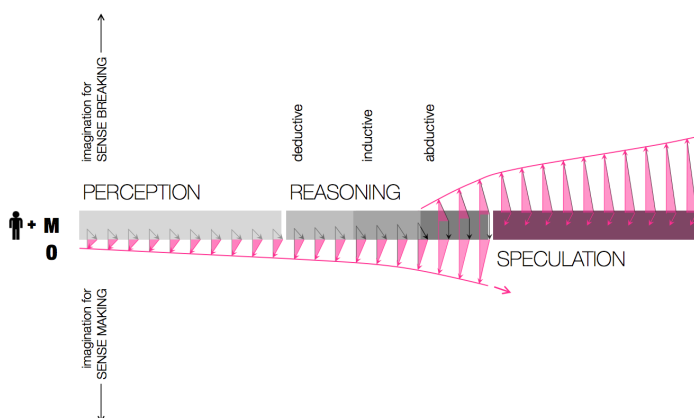


In an interview in 1929 Albert Einstein said, “Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world.”¹⁴

On the one-hundredth anniversary of the general theory of relativity, Walter Isaacson reminded us that Albert Einstein often engaged in thought experiments, in which he would visualize concepts that could not yet be proven through the mathematics of physics. At the age of sixteen, he tried to picture what it would be like to ride alongside a beam of light. If he were able to do so, he later wrote, “I should observe such a beam of light as an electromagnetic field at rest.”¹⁵ Under Maxwell’s equations, which describe the motion and oscillation of electromagnetic fields, this was not possible. Einstein had to break with these equations to imagine something else. Imagining – seeing – himself riding alongside a light beam led Einstein to other thought experiments, in which his imagination fed his talent and skills as a theoretical physicist, creating the theory of relativity. This is the imagination working in full speculative mode: asking “what if”.

The speculative imagination is about stretching reasoning out beyond what one accepts as real (for now). In speculation, the imagination begins in the present, in the problems and questions reality presents. It then moves into the unknown through new possibilities it sets out to see. Speculation is about asking “what if” questions (“What if I were riding on the back of a light beam?”) and then seeing what you would see if the “what if” were real.

For empathy, one asks, “what if I were that person (or thing)?” and then imagines themselves *as if* they were that person (or thing). The speculative imagination creatively sees/explores alternative states and alternative possibilities. It is powerful because it functions by relaxing or eliminating constraints of the situation at hand, or of reality more generally, in order to see/entertain “what-if” possibilities with the detail only the imagination can supply. In the speculative imagination, the exaggerated and fantastic get put to purpose. Building on our diagram:



* * *

Keith Jarrett, the great jazz pianist, said that jazz is an activity well known for “trying things out in an emerging context of one’s own making.” One does so with not only improvisational talent, but also technical knowledge and skill: “the great irony of the (jazz) improviser’s lot is that there is an enormous technical requirement to meet.” He then goes on to say the more interesting thing: “yet there is also a need to transcend if not negate (the technical) in order to find something truly novel.”¹⁶ Herbie Hancock, another legendary jazz pianist and composer, said, it’s “not just about playing notes. It’s hope. It’s courage. (When) we’re improvising, we’re in the moment. We don’t know what we’re going to play next. At its best, we are fearlessly stretching out and trying things—getting outside of the comfort zone.”¹⁷ “You’re in the dark room of unknowns and you allow yourself to go there.”¹⁸ **The experimental imagination** is the dark room of unknowns that one enters with the skill of one’s ‘craft’.

While we easily attribute an imagination of experimentation with the arts and allied fields, it also exists in the sciences, as many introspective accounts attest. Henri Poincaré, the physicist, mathematician, and philosopher of science, experimented with combining mathematical ideas that would often “collide” in interesting ways. In one account of his experience with mathematical discovery, he speaks of a resonance of play between an inspired nonrational image-based state, and a more rational state through which details would get elaborated. Often, when focused work led to no results, he would intentionally break off. Not thinking about the problem, he would find himself in other states in which “ideas rose in crowds, I felt them collide until pairs interlocked, so to speak, making a stable combination.”¹⁹

These are examples of the experimental imagination in action. Remembering that images can be visual, auditory or motor, the experimental imagination is about forming images *in action*. In other words, while engaged in doing something that is driven by curiosity and fueled by an aspiration for novelty, whether it is a novel scientific solution or a piece of jazz music that dares to try something no musician has tried before. The experimental imagination works off of an individual’s creative history and the domain practices of the endeavor. It is scaffolded by knowledge and skills the individual has acquired through experience. But its principal characteristic is that it pushes these into the background, holding them in tacit suspension so that experimentation can take over. The experimental imagination functions in parallel to the doing; there is a resonant back and forth between them. And both emerge in unplanned and unforeseen ways.

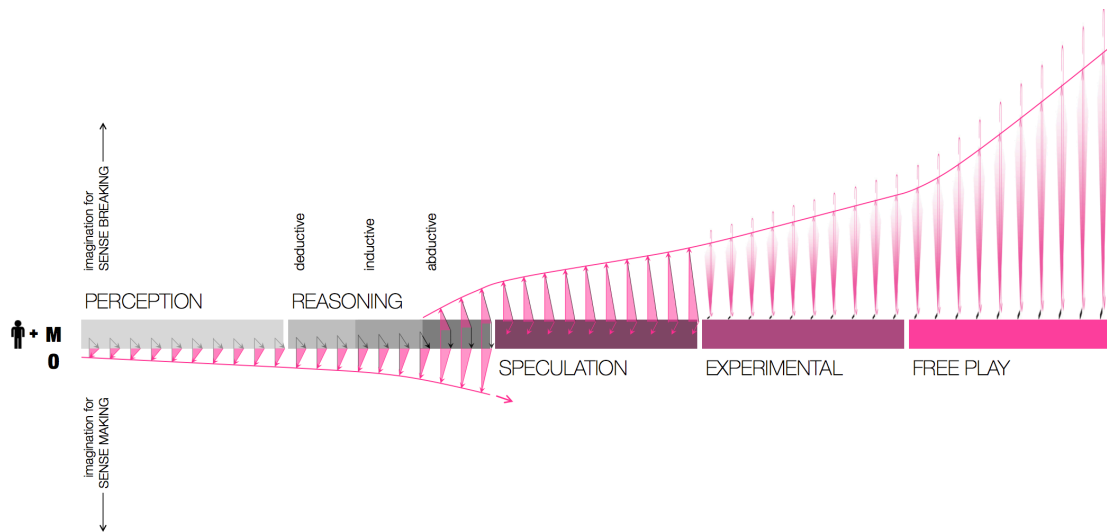
As an agent to experimental boundary pushing, the experimental imagination allows – demands - a wider range of play than one expects from the imaginations of perception, reasoning or speculation. Trying things out in an emerging context of one’s own creating is what jazz

musicians, comedians, and others call improvisation. Improvisation is the key spark for, and function of, the experimental imagination.

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Following on the experimental imagination, at the far right of the spectrum is a range of imagination that is often associated with inspiration or some form of mystical intervention. This is **the imagination of free play**. Like the experimental imagination, it produces images that are unplanned and unforeseen, and it is generative in nature – it generates novelty as opposed to synthesizing sensations and information. But while the experimental imagination serves one when they are engaged in activities and skills, functioning parallel to those activities, the imagination we associate with inspiration is an imagination that often functions when one stops focused activity. It is an imagination of free play as opposed to experimental play. Experimental play is guided by the boundaries of the experimentation one is engaged in. Free play is guided by the act of playing itself, which sets its own terms as it goes along. It emerges. It surprises. Often associated with what has been characterized as the unconscious mind, it is the imagination that creates the content of our dreams.

The free play imagination is associative, mostly unconscious, mental image making. For most of us, dreams are where we experience the imagination of free play. The Surrealists of the mid-twentieth century, however, built an entire literary and artistic practice on finding ways to subvert the restrictions of focused thought in an effort to spark the unconscious mind and pull it into service. Instead of sitting in front of a blank canvas, a blank page, or an empty music studio, waiting for something to emerge, they developed non-prescriptive methodologies that served as vehicles for play. These methodologies included: automatic writing, wordplay, and verbal free associations; free tonal and audio associations; nonsensical analogies; improvisationally rich performances or “acts”; induced dreamlike trance states; excursions or wanderings with gratuitous or nonexistent goals; chance associations; and games – card games, word games, drawing games. All of these were highly effective mediums for free associative play that was specifically after creating a “conducting wire”²⁰ between the world we live in day to day, and an enigmatic dimension of that world, in which unsuspected correspondences between things allow us to see the world differently. In addition to the products produced by these methodologies, they can also be seen as ‘exercises’ that served to build the muscle of the imagination at the scale of the individual, but also collectively.



So, we can now see how the imagination is not uniquely about producing novelty that fuels creativity, nor is it simplistically the undisciplined counter-faculty to reasoning, but an entire spectrum of activity associated with diverse cognitive processes from perception through reasoning to novelty. While this spectrum might appear anecdotal and metaphorical, new advances in the neurosciences, especially with the advancement of fMRI (functional magnetic resonance imaging) practices in the area of behavioral and cognitive science research not only substantiates this but has greatly added to our understanding of when and how the imagination functions *in the brain*.²¹

And the gap between the new/novel/strange and known increases along the 'role of imagination in cognitive processes' spectrum from left to right from its appearance in perception, through the three processes of reasoning, to speculation, experimentation and finally the imagination of free play. Within the range of abductive reasoning, it makes a significant shift from sense-making to sense-breaking in search of novelty, surprise, and awe for play and *for purpose*.

We can now turn more directly to what we mean by the *Pragmatic Imagination*.

the pragmatic imagination

In our working theory of imagination, the role of the imagination has expanded from a simple imagination versus reason dichotomy to an entire spectrum of mental activity from perception, through reasoning, speculation, experimentation and then the free play imagination we associate with artistic creativity, fantasy, radical scientific discoveries, and invention and novelty of all sorts. We can easily understand how perception and reasoning, and even speculation,

have pragmatic purpose and therefore the imagination associated with these would be, by nature, a pragmatic use of the imagination.

But we would like to suggest that the entire spectrum can, and should be, available and instrumentalized for pragmatic purpose, and that it is especially the generative side of the imagination spectrum – the side least constrained by practicality - the ‘fanciful’ side - that is most needed for agency in the world today, whether in one’s own life, working on complex radically contingent problems, or for creating the kind of novelty that moves culture and society forward. ‘Seeing’ how connectivity changes everything. ‘Seeing’ hidden obstacles and barriers in the white water: ‘seeing’ more; ‘seeing’ better. And ‘seeing’ new possibilities in everything. Sometimes referred to colloquially as ‘out of the box thinking’, this kind of imagination is especially critical when the box is changing shape and size day by day.

The *Pragmatic Imagination* is a concept that proposes that the imagination is a spectrum of coherent synthetic image making that runs from dealing with the known to projecting the novel, and from prosaic sense-making to generative sense-breaking. It values the entire spectrum but suggests that the last portion of the spectrum, the domain of the generative imagination, is necessary in a world that is rapidly changing and radically contingent. And finally, it proposes catalyzing, scaffolding and instrumentalizing²² the entire spectrum for pragmatic purposiveness.

By “pragmatic” we do not mean merely “practical.” In general usage, the two are often used synonymously to refer to common sense conduct that is concerned with ordinary activities and ordinary work. While this accurately defines ‘practical’, it is insufficient for ‘pragmatic’ as both a way of acting and a way of thinking. The Pragmatic Imagination is based on a deeper and more textured meaning of the word by drawing specifically from philosophical Pragmatism, which asserted that knowing the world is inseparable from agency within it. But with the perspective/belief that every part of reality, whether thing or experience, tangible or intangible, contains within it both the actual and the possible.²³

the pragmatic imagination as a muscle

'I can't believe that!' said Alice.

'Can't you?' the Queen said in a pitying tone. 'Try again: draw a long breath and shut your eyes.'

Alice laughed. 'There's no use trying,' she said 'one can't believe impossible things.'

'I daresay you haven't had much practice,' said the Queen. 'When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.'

Lewis Carroll²⁴

The imagination is influenced by many factors: by personal factors such as experiences and lifestyles that are intrinsic to a given individual at a given time – experiences that create rich image banks; it is influenced by an individual's preparation in terms of their capacity to use their imagination in both easy and challenging situations; it is influenced by one's social environment; it is influenced by one's propensity for risk taking in general; and other factors.

Ultimately, the imagination is not under our *conscious control* and so one cannot just decide to deploy it. But we can make sure to build as many and as rich experiences as possible. We can work to keep an open mind – suspend disbelief more often. We can put ourselves in creative and imaginative contexts as often as possible. And we can also find ways to trick the imagination into motion through playful activities.

But, more importantly, we need to understand that the imagination is a muscle of a type. The science fiction writer Philip José Farmer said in an interview, "Imagination is like a muscle. I found out that the more I wrote, the bigger it got."²⁵ Both PJ Farmer and Lewis Carroll's White Queen are astute to point out that exercising and working the imagination, repeatedly, builds capacity of imagination just as physical tools build physical capacity. But using a muscle repeatedly also builds skill, dexterity and agility through repetition, feedback from the environment and correction or adjustment.

The imagination is a mental muscle that becomes stronger the more one uses it. It becomes more agile. One develops greater confidence in what it can do and one's ability to then translate it into learning and action in the real world. In childhood, this muscle is fully activated. It is without limit, and it is easy to call on. A child learns by engaging the world through play, which forms a profound connection between his/her motor system, sensory system and imagination; playing with the world to understand it and see what one can do with it. Without use, the muscle of imagination can atrophy over time. As verbal and abstract thinking skills begin to dominate learning through our prescribed educational curricula, there is less and less time for many to exercise their imagination.

Therefore, when many people take a look at the "imagination spectrum" that we've drawn, they concede the role of imagination in their daily lives to a certain point. They situate themselves on it and declare a right-hand boundary, as if *their imaginations* have fixed capacity. But this is not the case. We aim to suggest that the entire range of cognitive activity is available to everyone. It's a matter of exercising it, developing greater capacity, pushing out further. In our whitewater world, this is so necessary; in a world that is experiencing a crisis of imagination on all fronts and at all scales from the most personal to the most pressing work on global problems – those that lie below the swirling atmosphere of our blue marble, putting it at risk.

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- ¹ The concept of the white water world was introduced by A. Pendleton-Jullian and John Seely Brown in *Design Unbound, Designing for Emergence in a White Water World* (Cambridge: The MIT Press, 2018). See chapter 8, “Skills Matter”, pp. 141-144. *White water* is intentionally misspelled to read as www, like the world wide web.
- ² John Seely Brown. The diagram is his as well.
- ³ We have moved from an era in which “enlightenment knowledge and natural laws orchestrated fantastic chains of causes and effect in our political, legal, and economic systems . . . (and) our philosophies neatly separated man and nature, mind and matter, cause and effect” to an era “governed neither by the mysteries of nature or the logic of science, but by the magic of their entanglement.” Danny Hillis in a working paper for the Center for the Advanced Studies in the Behavioral Sciences (CASBS), Stanford, 2018
- ⁴ Joshua Cooper Ramo, *The Seventh Sense: Power, Fortune, and Survival in the Age of Networks*, (New York: Little, Brown and Co., 2016), p. 36. Ramo is vice-chairman and co-CEO of Kissinger Associates, the consulting firm of former Secretary of State Henry Kissinger.
- ⁵ Empathy as a means to understand others and their motivations can be extended beyond people to other species and even to objects in the world. A great deal of modern philosophy (Latour, Haraway, U. Beck, T. Morton), aligns itself with today’s science-driven environmentalism, and sets out to include more than the human species and even inanimate objects that are part of the objects of our global ecosystem. This position is a post-anthropocene conversation in which humans are seen as one, but not the only, critical agent in a complex system.
- ⁶ Twenty-five minutes into the Peter Berg 2018 movie *Mile 22* an impassioned conversation is taking place between a CIA Officer and one of his operatives in a classroom full of analysts and operatives who are on the hunt for a shipment of caesium seized by terrorists:

CIA Officer: What?

James: (speaking about an asset) He’s been accurate on everything else, John. One hundred percent. And he appears driven and motivated by something other than funding.

CIA Officer: Fix this!

James: Oh, it’s going to be fixed.

CIA Officer: Every one of these events occurred as a result of failure of imagination (pointing to a white board that lists:

Pearl Harbor
Tet Offensive
Iranian Hostage Crisis
End of Russia, 9/11
Paris
Nice
London subway).

Your job is not to predict tomorrow based on yesterday. That’s what academics do. Your job is to prevent the end of tomorrow by using your brains and your imagination. If you don’t find the Cesium before it’s too late, you will be held responsible for the single largest intelligence fumble since a flight instruction school in Florida failed to grasp the significance of a 19 year old Al Qaeda terrorist saying he didn’t need to learn how to land.

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- ⁷ For some people these images may be predominantly visual. For others, auditory or motor images may populate their thinking. How one creates and mixes different kinds of images is a function of propensity. In *Principles of Psychology 2* (1890, Chapter 16, Memory), William James says: "The visual, the tactile, the muscular, the auditory memory may all vary independently of each other in the same individual; and different individuals may have them developed in different degrees. As a rule, a man's memory is good in the departments in which his interest is strong; but those departments are apt to be those in which his discriminate sensibility is high. A man with a bad ear is not likely to have practically a good musical memory, or a purblind person to remember visual appearances well. . . . It is obvious that the machinery of memory must be largely determined thereby."
- ⁸ Antonio R. Damasio, *Some Notes on Brain, Imagination and Creativity* in K.H. Pfenninger and V.R. Shubik, Editors, *The Origins of Creativity*, (Oxford: Oxford University Press, 2001), pp.64-65.
- ⁹ William James, *The Principles of Psychology 2*, (New York: Dover, 1950), p. 50. from Steven Fesmire, *John Dewey and Moral Imagination*
- ¹⁰ Yo-Yo Ma quoted in Joan Anderman, "Yo-Yo Ma and the Mind Game of Music," *New York Times*, October 10, 2013.
- ¹¹ This work was pioneered by the Russian psychologist, L.S. Vygotsky, known for founding the cultural-historical vein of cognitive psychology.
- ¹² Etienne Pelaprat and Michael Cole, "Minding the Gap: Imagination, Creativity, and Human Cognition," in *Integrative Physiological and Behavioral Science*, 2011 Dec. 45(4), p. 399.
- ¹³ There are actually many factors that can contribute to inaccurate eye-witness accounts in extreme events, but in situations where these (stress, emotional state, influence of others around you, etc.) are not present, one still sees varying accounts.
- ¹⁴ Albert Einstein in "What Life Means to Einstein: An Interview by George Sylvester Viereck", *The Saturday Evening Post*, October 26, 1929, 117. The full quote: "I am enough of the artist to draw freely on my imagination. Imagination is more important than knowledge . . . "
- An expanded version of it appeared later in: Albert Einstein and George Bernard Shaw, *Einstein on Cosmic Religion and Other Opinions and Aphorisms* (Mineola, New York: Dover Publication, 2009), 97. (Originally published, New York: Covici-Friede, Inc., 1931) "Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution. It is, strictly speaking, a real factor in scientific research."
- ¹⁵ Walter Isaacson, "The Light-beam Rider," *New York Times*, Oct. 30, 2015.
http://www.nytimes.com/2015/11/01/opinion/sunday/the-light-beam-rider.html?_r=1, accessed November 1, 2015.
- ¹⁶ Keith Jarrett in an interview with Kevin LeGendre, "Keith Jarrett—the fine art of extra-sensory improvisation," *Independent*, 27 (November 2009).
- ¹⁷ Herbie Hancock interview in *Esquire Magazine*, October 27, 2014, just before the release of his new memoir, *Possibilities*.
- ¹⁸ Herbie Hancock in an interview by Joy Williams in *Jazz Forum*, February 1988.
- ¹⁹ Nancy C. Andreasen, *The Creative Brain: The Science of Genius* (New York: Penguin Group Plume, 2006), 43.
- ²⁰ André Breton, French writer and poet, known best as the co-founder, leader, and principal theorist of surrealism used the metaphor of a 'fils conducteur' ('conducting wire') in the mind that finds correspondences and analogical coherence between seemingly unrelated things and phenomenon.
- "L'oeil ne saurait être fait . . . pour inventorier comme celui des huissiers ou pour jouir d'illusions de fausse reconnaissance . . . Il est fait pour jeter un linéament, pour faire passer un *fil conducteur* entre les choses d'aspect le plus hétérogène. Ce fil, de toute ductilité, doit permettre d'appréhender,

en un minimum de temps, les rapports qui enchaînent, sans solution possible de continuité, les innombrables structures physiques et mentales. (Breton, *Le Surréalisme et la Peinture*, 1925-27, pp. 199-200 with Breton's italics.)

"The eye cannot have been made . . . for inventorying, like that of the bailiff's, or for enjoying false illusions of recognition . . . it is made for throwing a line, for passing a conducting wire between things of the most heterogenous aspect. This ductile wire will make it possible to apprehend, in a minimum of time, the relationships which link (double meaning: enchain), without any possible solution of continuity, the innumerable physical and mental structures." (Breton is very difficult to translate with the full fidelity of his unique semantics and word play. Translation by A Pendleton-Jullian.)

²¹ For specifics see A. Pendleton-Jullian and John Seely Brown, Pragmatic Imagination, chapter 19 in *Design Unbound* (MIT Press., 2018), throughout but principally within pp. 401-409.

²² For more specifics on this and some examples, see Ibid., Pp 423-430, 431-435.

²³ For elaboration, see Ibid. pp. 420-424.

²⁴ Lewis Carroll, *Through the Looking Glass and What Alice Found There (1871)*, in M. Gardner, *The Annotated Alice*, (New York: W.W. Norton & Co, 2000), p. 199.

²⁵ P.J. Farmer interview: see the official Philip José Farmer homepage "Interviews": <http://www.pjfarmer.com/intervp.htm>.