Sensation, Experience, and Being Alive:

Foundations of Cognition, Learning, and Flourishing

by

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ABSTRACT

A great deal of contemporary research argues that humans learn from experience. This research, however, rarely explicates what constitutes an experience for humans, let alone experiences that lead to deep learning for human flourishing. Experience is constituted of inner and out sensations processed in certain ways. Thus, a biologically realistic theory of learning must be based on a theory of sensation and how sense making derives from sensation. This dissertation seeks such a theory in the emerging literature on what kinds of creatures humans are and what this implies about how they learn and flourish. This literature ranges across several different disciplines, including neuroscience, evolutionary biology, and work on how affect guides cognition and action. Humans are as able to learn from experiences they have had in media as they are from experiences they have had in the real world. In either case, however, humans do not learn deeply from random experiences. They learn best from experiences that have been designed to recruit affect, help them manage their attention, and give them ways to assess the success of actions they take toward goals. Thus, teaching in the sense of experience design—a task for teachers in schools, as well as media designers and artists of all different sorts—is fundamental to human learning and flourishing. The dissertation defines flourishing in terms of the state of a human being's allostatic load, a variable which can be measured. Since I am interested how experience designers design sensation to create sense making and sense making that can enhance human flourishing, I am interest in experience design in the arts, a domain that has traditionally been seen as an important source of insight built on sensation. I use examples from traditional and contemporary art in the dissertation. The last chapter is an extended study of the anime

Attack on Titan I show how the design of *Attack on Titan* uses sensation to engender deep contemplation and discussion of complex political, historical, and philosophical issues. The way it achieves this goal has important implications for teaching and learning in and out of school.

DEDICATION

To Claude Monet

A real scientist ahead of his time

I owe my initial epiphany about human sensations

To James Gee

A real human being daring to live our time

I owe the genuine care that he hands me for a world bigger than mine

And the ecstasy of running into a bigger mountain that I shall never cease to climb

To all the souls that LOVE summons

Of whose pain burned relentlessly for vocation, freedom, beloved woman and man

Ash residues scattered in the dark of the forgotten and anonymous

Yet flames engulf every beating heart, their conscientious human fellows

I owe –

MYSELF

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My parents, for their continuous love and support, to let me do what I want to do and struggle and thrive on the path I chose for myself. Despite the fact that they sometimes nag me about things I often see as trivial (of course I'm wrong on this), they are the best parents. And they are wonderful people, too.

Mr. Allen Iverson, my all-time role model, my hero who will never decease, for showing the very young me the significance of being true to myself and never yielding to anything you consider unworthy. It is the power he formed in my body that sustains me to come all this far and to become the person I am always proud of, no matter what situation I am thrown into and the consequence that comes after the choice I made.

The Song triplets (Daehan, Minguk, Manseh), three little angels, my sweet pumpkin pie, for always putting smile on my face, even in difficult times like now. Their existence just makes me happy.

The ones I love and who love me, for your unspoken, unfulfilled, unconditional love, giving me an intuitive body with a sensitive heart. Love is the quickest conduit to inspiration. You are behind this work within the lines, unhidden.

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INTRODUCTION

My task in this dissertation is to stitch together, from many different sources, a view about learning based on what it means, first, to be a living thing and, then, a human being. This viewpoint will call into question some taken for granted assumptions and practices in schools and society. I am interested in learning not just because learning is the point of schooling, but because learning is an integral part of what it means to be a living being. I will argue that we need to approach schooling as part of this larger picture if humans are to flourish in our complex and dangerous times.

Much research has demonstrated that humans care less about truth than they do about believing what they need to believe in order to feel a sense of belonging from the social groups that matter to them and to which they matter (Boyer, 2018; Flynn et al., 2017; Funkhouser, 2017; Rauch, 2021; Tomasello, 2014). Unfortunately, Mother Nature cares about truth and often bites back when humans project onto her fantasies, conspiracies, and illusions, as human-made climate change amply demonstrates.

When we say that humans often do not focus on truth, but belonging, we must admit that "truth" is a contested topic. However, we need to come to terms with it if we want to make empirical arguments about the controversial issues. In this dissertation, I will adopt a particularly American view of truth, one founded on the American pragmatists (William James, C. S. Peirce; John Dewy; Josiah Royce), especially C. S. Peirce (Capps, 2019; Isaac, 2012; Peirce, 1877; Rauch, 2021). On this view, truth is a process, not a product; a journey not a destination; a collaboration, not an individual expression of "genius"; an acceptance of uncertainty, not a refusal to accept any claim as

better than others because nothing is certain. It is a commitment with others, across different social groups, to do better through time, not a search for perfection.

The focus of this dissertation is to ask why it is so often claimed—based on lots of evidence—that humans learn from experience (Barrett, 2020; Gee, 2017; Eagleman, 2020), but work in education rarely speaks about sensation and feeling, which are the core elements of experience. Humans are experiencing *something* every single breathing second, as are all other living creatures. Experience, at its deepest level, is composed of sensations, sensations which create, feed, and guide cognition (Capra & Luisi, 2014; Maturana & Varela, 1980; Varela et al., 1974). Humans, like other living beings, are not consciously aware of a good deal of what they sense. Nonetheless, their sensations have consequences, one of which is staying alive and another of which is learning (Bergin, 2012; Solms, 2021).

As you walk around in the world you sense the placement of your body in space and adjust your body moment by moment based on sensations of change you get from the environment, but you are mostly consciously unaware of having such sensations. Of course, humans are consciously aware of some of what they sense and they can proactively seek sensations, as when marveling at a sunset. Indeed, one deep problem is why humans have a capacity for conscious awareness, especially of themselves as conscious selves ("I"), when most living things do not but get on just fine.

If humans learn from experience and experience is all about sensation, and cognition stems from sensation, then, if we want to study learning, we would study, first, sensation. Yet sensation plays a small and passing role in educational research on teaching and learning and in how we teach in most schools. There is no mention of the

word “sensation” in the 1999, 2000, or 2018 versions of the National Research Council’s consensus report on learning and schools, *How People Learn* (National Academies of Sciences, Engineering, and Medicine, 2018). Furthermore, sensation is often studied in psych labs in terms of individual senses, when, in the wild, it is almost always comes to us as multisensory ensembles.

Since humans are always experiencing something until they are dead, that means they are always learning something (or potentially learning something). Then, the question becomes not how learning works, but how to accomplish “good learning” (where “good” needs to be defined) and that means how to get “good sensations” as the components of “good experiences”. Of course, “good” is as problematic a word as “truth”, but I will argue later that there is, for humans, an empirical way to define “good”.

In modern science there have been two distinct approaches to research. Like all binaries this distinction overstates the extremes and undercounts the complex mixtures. Nonetheless, it is a useful place to start from. One approach stresses explanation and the other description (Gould, 1989; Quine, 1951; Pearl, 2000; Salmon, 1984). Explanatory approaches seek to explain a diverse array of facts and how they fit together. Descriptive approaches seek to stay close to a specific class of data and offer accurate and useful descriptions of it or hypotheses that do not go very far beyond the observations made. The distinction here often amounts not so much to a binary as to how abstract and wide in coverage one’s theory is**.**

Descriptive theories would (and do) count lung fish as fish because they share a great many descriptive features with other sorts of fish. Explanatory theories today argue lung fish are not fish because a whole set of genetic and evolutionary principles across

different disciplines allow us to deduce that the great many things they share with fish are less significant than the seemingly small things they do not (Miller, 2020).

Explanatory and descriptive approaches each have their place and both can go wrong or right. What I offer here is an explanatory approach based on a survey of ideas from many different areas. I put together different principles, from a variety of different disciplines (including biology and art and poetry and many others), that I hope will offer insightful, non-trivial, and sometimes non-obvious questions and hypotheses with important implications. I will argue for some plausible answers to these questions and offer some evidence for my hypotheses. I am, however, aware that—especially since so much of the work I draw on is relatively new and I sometimes put it together and add to it in novel ways—that much more empirical work will be necessary and such work will inevitably modify my theory. And, of course, in reality, "my theory" is not mine, but "ours" (as Peirce would argue), the product of many researchers with diverse backgrounds and opinions.

Cognition

In Western culture, people have long believed there is a part of us—the thinking part—that is the "real" us and can survive after death (Lent, 2017). Sometimes this part has been called consciousness; sometimes it has been called the mind and sometimes the soul. It has often been thought to live on past the body. It is the higher part of us and controls the urges of the body, urges we share with animals. In the Christian Western tradition, it is mind that earns us a position close to the angels.

The thinking self was thought of, for thousands of years in the West, as our "best" self, a rational and sober trainer who fetters the untamed Beast within. Anything mental was considered high and real; bodily stuff was low and ephemeral. But after science discovered that the brain, the seat of thinking, is just a material part of our material body (and even later discovered that the brain is situated throughout our body, not just in our head, and cannot be disentangled from it), the problem all of sudden became not the body, but the mind. Where was the mind? Where and how could it possibly exist if the mind was a part of our body yet somehow lay above and outside it and could outlive it? That the mind controls the body has become suspect; it appears that in reality the body controls the body. There appears to be no place in reality for a thinker who controls the body, but is above and outside it and can outlive it.

One reason that modern work in science leaves less and less room for mind and mental matters, rather than brains, bodies, and neural connections, is that living things—and most certainly human brains and bodies—are complex systems that have emergent properties that are not the sum of their parts. These emergent properties not only cover a lot of ground terms like "mind" and "thought" were meant to, but do so in deeper and broader ways that connect all living things.

"Cognition" has been taken to be what cognitive science, learning science, and schools are all about. It is what makes humans "intelligent", even "higher" than other living things. However, the notion of cognition obscures an important distinction. Cognition has been taken to be our capacity to reason and know for which consciousness (awareness) was believed to be indispensable. Now, however, consciousness has been discovered not to be necessary for reasoning and knowing (Solms, 2021; Zimmer, 2021).

Living things regularly solve problems and are said to learn new things even when they are not consciously aware of what they are doing (Clark, 2015).

Humans use a great deal of intuitive knowledge about physics to move through the world, but they are not conscious of this knowledge or of applying it. Humans know the phonological and syntactic structure of their language and use this knowledge all the time to solve problems regarding meaning. However, they are not conscious of this knowledge and how they apply it, otherwise no one would need the discipline of linguistics. Slime molds—one cell large and with no brain—can "compute" the shortest path through any maze. They can solve a computational problem with no brain and, of course, no consciousness in any sense. Great artists have often solved a creative problem with no conscious awareness of where their inspiration came from. And many a scientist has come upon an answer to an important question before working out consciously how they hit upon their answer.

Cognition is two problems not one. The first problem is how living things decide and "know" (solve problems) without conscious awareness. The second is why some creatures, like humans, sometimes decide and solve problems using conscious awareness (what we will later explicate in terms of the human capacity to build simulations in their heads) and how they do this. The answer here, though, is not that they do this to be better at truth and logic, because humans are by and large no good at truth and logic.

There is actually a third problem here. Humans have not only a capacity to be aware they are sensing or thinking (simulating), they also have another form of consciousness, what we can call "reflective consciousness" where they are aware they are aware (a meta-level capacity), where they are aware of themselves as a self that is aware.

This capacity has given humans a lot of grief (e.g., the knowledge of death of the conscious self) and lots of work has been done over the years trying to figure out why humans have this capacity and what it really is. There are innumerable books written about (reflective) consciousness in philosophy, psychology, and biology, but no consensus about what it "really" is.

These dilemmas around consciousness have led scholars in different disciplines to argue we should start with how living things, including humans, "decide" and "know" without conscious awareness (and in some cases without cerebral cortexes and in others without brains at all (Abbott, 2020; Solms, 2021; Zimmer, 2021). Only then should we move on to the small part of deciding and thinking that is conscious and the even smaller part that is the product of reflective consciousness, consciousness being conscious of itself being conscious.

What is a Living Thing?

Philosophers from time immemorial have worried about what distinguishes humans from (other) animals. It turns out, though, that the better and more illuminating question is what distinguishes a living thing from a non-living thing. "What's the difference between a slime mold and a rock?" is a better question than "What's the difference between a human and a parrot?". The first difference is far larger than the second (Barrett, 2020; Davies, 2019; Kauffman, 2019; Zimmer, 2021).

A living thing—slime mold or human—has special sorts of insides. Behind the porous barrier of its surface, those insides are constantly affected by changes in the living being's environment. So far this is true of rocks as well. However, while the environment

determines what changes will impact on a living creature, it does not determine what the living creature will do about these changes. A living being is built so that its insides determine "("decide") how to respond to change. The response is determined by the creature's structure as a chemical and biological complex system, a system that is always more than the sum of its parts.

The creature's response is, of course, crucial to its survival. But thanks to evolution, most creatures' responses are effective. They are good—though not necessarily perfect—choices. To make these choices a creature does not need a cerebral cortex, it does not even need a brain. The multiheaded slime mold *Physarum polycephalum*, found in many forests on wet ground, is a single (large) cell that can put out and withdraw "tentacles" in a search for food (Zimmer, 2021, pp. 80-89). It can detect sugars and other molecules that diffuse across the environment from food sources and make contact with its body. When one of its tentacles fails to find food in a given direction, it places slime on that path as a form of memory that this is not a fruitful path if it comes upon it again. The tentacle then withdraws and tries another path.

Slime molds need moisture to survive. If they are drying out they can turn themselves into a brittle substance which eventually flakes into fragments that blow away on the wind. If a fragment lands on damp ground, it revives, and the slime mold is brought back to life.

Slime molds can discover the shortest path through a maze. If you place the slime mold on top of some food at the opening of the maze and place some food at the end of the maze, the slime mold will extend newly formed tentacles through the maze and explore every possible path. When it finds the food at the end (and it always will), it

feeds on this food while still feeding on the food at the opening of the maze. The slime mold will then retract its tentacles from all the dead ends in the maze. It thereby becomes one big tentacle that maps the shortest route through the maze. In another experiment, scientists made a flat map of the United States and put oatmeal on the biggest cities and then let a slime mold loose. The slime mold ended up placing itself in a configuration very like the interstate highway system (Dussutour et al., 2010).

Slime molds have no brains. They are only a single cell. Yet they effectively solve problems. Problem solving is the *sine qua non* of cognition. A living creature does not need conscious thinking to solve problems because its internal structure has evolved to be a complex system that can "compute" the solutions to problems it needs to solve in order to survive. This is, in fact, the definition of a living thing: "I am therefore I think".

A great deal of what humans do and know is done and known in the way in which slime molds do and know things. Humans' internal systems—including their brains—are enormously complex—and they (structurally) "calculate" (as hardware, not software) decisions and solutions all the time without any conscious awareness. In fact, the majority of what humans do and know operates at this level.

For any living thing, then, what is crucial for its survival and flourishing is that its internal system makes "good decisions" in the face of environmental changes. For living creatures some of these "decisions" are innate. They are constructed by evolution to respond to certain changes in the "right" way. But for the vast majority of living creatures many of these decision processes are learned. They are learned from the past experiences of the creature (which change the creature's internal system in ways that allow it to respond in the future the way it did in the past). And, for many creatures—many more

than just us humans—they are learned from other more experienced creatures of their kind in a sort of cultural transmission of knowledge (Safina, 2020). None of this requires a brain. It does help to have a brain, of course, but neither a brain or a cerebral cortex in that brain is necessary (even in humans whose cerebral cortex is damaged).

So, the first and foremost consideration for taking care of any creature—including humans—is to give them the sorts of experiences that will prepare them for making good "decisions" in the future and to teach them the lessons from experience more experienced creatures have already learned. That is what "school" is about for animals like whales and parrots. It is what school ought to be about for humans.

Identity Signals

"I am therefore I think." At a fundamental level, humans do not differ from other living creatures in being designed to solve problems without conscious awareness; hence, cognition means being alive, not necessarily being conscious. However, humans have a form of cognition that most other animals do not have and that no animals have in the dramatic form humans do. This is what we called above "reflective consciousness". Humans can make decisions not just on automatic pilot based on their innate and habituated or learned skills, but on the basis of being consciously aware both of what they are thinking and that they ("I") are thinking it (a meta-level capacity). I will argue later that "thinking" of this sort is accomplished by the human capacity to run simulations in the brain and to be aware we are doing so.

This capacity is thought to make humans "rational" and direct us towards "truth", not passion and desire alone. However, modern work in several disciplines has made it

amply clear, as I said above, that most humans, most of the time, do no such thing. Humans, by and large, use this capacity to confirm what they already believe and, in particular, to confirm beliefs that give them comfort, not truth. For humans "comfort" at a deep level means a sense of mattering and belonging, a sense that things make sense and happen for a reason, and a way to deal with pain, suffering, and death. Humans are not particularly good at truth seeking and, in reality, do not care much whether something is true but whether it allows them to survive and flourish. For me, in this dissertation, this is a dilemma. I will be concerned with supporting human flourishing, but will argue that, though evading truth can be in some circumstances a good strategy for surviving and flourishing, it can be disastrous in other circumstances.

It is, in many ways, odd humans evolved self-reflective consciousness. It made them aware of death, something they never would have had to angst over had they never become aware of it. Further, while being tropic to comfort and not truth might work well in small groups living in slow changing times, it is dangerous in larger, more complex societies living in fast changing times.

The deeper reason humans are tropic to comfort and not truth is that, for humans, beliefs are identity signals (Brooks, 2011; Green, 2013; Jackson, 2019; Moffett, 2018; Simler & Hanson, 2018; Sloman & Fernbach, 2017; Wilson, 2012). Identity signals are pervasive in the animal world. Many animals can recognize their family, troop, or clan. But humans have taken group identity signals far beyond anything in the animal world. Furthermore for humans, identity signals have been a potent source of hatred and violence toward others. Chimpanzees already set out on this path, but they do not have tanks or nuclear weapons.

Humans as Social Animals

We started above from the idea that humans—and all living things, for that matter—learn from experience. Experience is composed of sensations that build neural connections in the brain through which the brain and the body can use the past to prepare for the future. There is an important proviso here in the case of social animals like parrots, whales, and humans. In the case of social animals, their sensations are, of course, theirs, but also "co-opted" by others. For social animals, others take up residence in their experiencing of the world and in their brains. Social animals process experience both as individuals and as members of social groups (what are often called, in the case of non-human animals, "troops" or "clans"). The type and quality of their sensations is in large part determined by others, that is, socially.

Humans have a deep need to feel they belong to social groups where they matter and where their participation counts. Social status, reputation, and group identity are profoundly important to most humans. If gaining a sense of belonging, respect, and group identity depends on holding a certain kind of belief, as it almost always does, many humans will believe it whether or not it is true. The human brain is built so that people readily accept and recall information that supports their social beliefs and ignore or dismiss information that does not. This effect works the same for the educated and the uneducated—indeed, it is sometimes stronger for the more educated (Eberhardt, 2019).

When people are asked to use their reasoning skills to interpret data or solve a problem that impinges on their social or political beliefs, their interpretations and reasoning are often based more on their beliefs than on "facts" or "truth" (Rauch, 2021).

Even people good at math will be more influenced by their beliefs than their knowledge of mathematics. However, no such effect occurs when they are asked to interpret data or solve a problem that does not impinge on their social or political beliefs. So, for example, people who deal with a statistical problem involving the effects of a moisturizer reason more "objectively" and correctly than they will in the case of, say, a similar statistical problem involving the effects of gun control (Kahan et al., 2013). People's reasoning powers wane when anything is "at issue" for them as a member of a group from which they draw belonging.

The American philosopher C. S. Peirce (1877) argued that the concept of truth is also social, just as are the fantastical beliefs of some social groups. People locked into one or a narrow range of like-minded groups base their beliefs on their own experience, as we all do, but that experience is narrow and deeply limited. However, as humans collaborate with wider and wider groups, with different beliefs and biases, something magical can happen. Over time—as long as the different groups agree to offer arguments and evidence for their beliefs and everyone is allowed to speak freely—incorrect beliefs and biases "wash out" since they have to compete with the beliefs of other groups and their (different) biases.

In the end, we reach "truth", not as a once and for all certainty, but as our best guess in a continual process. Beliefs become based on a process of argumentation among a very wide group of people with a very wide range of experiences. Now, humans are learning not just from "their" in-group experiences, but from the wealth of experiences of diverse groups of humans, up to humanity as a whole.

Of course, the entrenched "us" versus "them" tendences of social groups mitigates against this process and, thus, societies need institutions that support the process and work to widen people's sharing and interactions with diverse others (where "diverse" here does not mean race, class, and gender, but people who have had quite different experiences from others, whatever their race, class, and gender). Science, schools, journalism, and many other institutions, can be such institutions. But these institutions have to be operating with free speech, honest argumentation, and a wide diversity of opinions and experiences (Rauch, 2021*).* Institutions can be corrupted easily, but without them, each person has their own "truth" which too often involves demonizing other people and their social or cultural affiliations.

Institutions that can wash out biases and widen truth seeking (as a journey, not a destination) are not only vulnerable to corruption (the exclusion of diverse opinions), they are currently being undermined by social media and the internet. While social media and the internet can be very powerful devices for widening the opinions and the range of experience considered in truth seeking, they more often today seem to give rise to echo chambers based on identity signaling centered on a narrow and often divisive sets of values and beliefs.

There is no doubt that people's unexamined beliefs are often important to their survival, sense of self, and need to belong and matter. But such beliefs become toxic when they are formulated, as they too often are, so as to on a basis and define people who do not share them as "other", less, or the enemy.

Like all living creatures, humans are built to react to environmental changes based on their internal structure as a creature of a given type. For humans, a large part of this

structure is, as for other living things, chemical and biological. Our cells and organs know what they need and how to adapt moment by moment to the world. But, for humans, a large part of that internal structure is the vast network of associations based on experience represented by the myriad of neural connections in their brain. This network of changing connections represents a human being's model or map of the world, at any given time.

The problem here for us humans is that our model of the world, in terms of which we learn and adapt to change, is formed not just from individual experience. It is formed much more by the experiences we have had in social groups to which we belong or want to belong (or are forced to belong). These social groups have mediated, and sometimes outright designed, these experiences not just to teach us to effectively cope with what is happening around us, but also to get us to internalize—and not ask too many questions about—the group's beliefs, values, and behaviors as identity signals.

This ensures that, for humans, their model of the world will be as much about identity and belonging as about truth. Further, for humans with narrow and homogeneous social group identities, their model of the world will be constricted and often defined strongly against "others" who are not "like them". In our complex, fast changing, and diverse world, this means that the internal structure of humans—whose very response to the world defines what it is to be a living thing and which ensures survival—is often adapting not to material changes in the world but to social ideologies about the world we all share based on identity and too narrow experience of that world.

Core Issues for an Examined Life

Thanks to the fact that humans have reflective consciousness, they can—and many have—worry about their state as social animals. Their status as social animals has given rise to several core questions that have troubled humans from time immemorial. These core questions are a sort of historical "core curriculum" for humans who worry about the nature of existence, being, and humanity. Here is one statement of these core questions:

(1) Given that so much of what humans decide, know, and do is not a product of conscious awareness and is a product of what other people have done to them as social animals, do humans have "free will"? Are individuals responsible for their choices or are these choices just the outcome of social groups and unconscious processing stemming from past experiences, good and bad?

(2) Given that humans are social animals, what do they owe to themselves as individuals? What does it even mean to be an individual? Given that humans are prone, as social animals, to favor their kin and closely related social groups, what do their owe to wider groups like the nation or humanity as a whole? What do they owe to strangers? Who really is "us" and "them"?

(3) What is a human being? How much do humans share across all social groups and cultures? How much about humans comes from their diverse social, cultural, and national affiliations and how much comes from their shared senses

and DNA and the common environmental aspects all humans encounter regardless of where and how they live (after all we all share the earth)?

(4) How can humans find "truth" and shared meanings, interpretations, and values, across social, cultural, and national divisions? Can belief transcend the interests, desires, and animosities of social groups and their identity signals? Is there any notion of "objective truth"? What gives meaning to a human life?

I use the word "curriculum" here because these have been core concerns of what has been called "an examined life". Of course, many people are not interested in the history of ideas or the examined life. This may be so because they are so poor they have time and energy only for survival. In other cases, it may be because they are so powerful that encouraging themselves and others to encounter ideas and examining them in one's lived experience is likely to undermine their power.

Yet, I would argue, that these core concerns should be, for schools and society, across the world, a core curriculum if we want humans—not just ourselves or our favored groups—not just to survive, but to flourish. They should be a core curriculum, too, if we believe that, in reality, groups based on a disdain for diversity cut themselves off from the very foundations of a capacity for truth seeking in a world where nothing is certain, but some beliefs work better than others if the world we all live in is to survive, let alone flourish.

Of course, there are people who believe that asking such questions is the preserve of only elites and the highly educated. And, indeed, too often, these primordial human

concerns have been co-opted by educational and governmental institutions for their own institutional goals. I will argue, at the end of this dissertation, that these concerns need to be—and are more and more today being—taken out of the hands of institutions and elites and returned to humans as a panhuman quest, one that has always shown up in everyday, non-elite human interaction and media, starting with ancient burials and cave paintings and extending to the anime series with which I will end this dissertation.

So, I move in this dissertation from sensation to core questions of human existence. The two poles are more closely connected than one might suspect. They are connected by questions that arise for any human who experiences the world with all its grandeur and pain—and other humans with all their diversity and rivalry: What does it all mean? Who am I? What does it mean to be human?

Concluding Remarks

This dissertation is about humans and living things and the nature of learning for living beings and for humans as a distinctive (but not "higher") kind of living being. It will suggest ideas about learning that can occur in classrooms, on the internet, or in the world. It will treat teachers as designers of good learning experiences for others, along with parents, communities, artists, architects, and media designers.

However, the dissertation is not about school reform or bringing innovations to scale. I am skeptical that school reform, in any deep paradigm changing way, is possible, in part because schools appear often to be more about social sorting than learning in the sense of living a flourishing life. This does not mean I think good teachers, just like good

media designers, cannot create good learning and aid human flourishing. Indeed, both do it, not by conforming to traditional practices, but by going “against the grain”.

Finally, I want to note I am a bicultural, bilingual, biliterate person, the product of two culturally different school systems. In this dissertation, while I will draw on Chinese work in some areas, I usually focus on problems and possibilities in American schools and society. I do this because this dissertation is written in English as a graduate student in an American University. Many of the problems and possibilities in the U. S. that I discuss here are similar in the U. S. and China (and, indeed, in much of the rest of the world, thanks to the prevalence of formal schooling and the nature of humans, such as they be). Some are, of course, quite different. I hope to discuss these different issues in later work.

But now we need to start from the beginning, with small things, not with the big questions we have focused on in this introduction. Our discussion of the big questions here were supposed to motivate readers to trust we will reach them again, even though now we start with things that seem quite small, but are, in the end, the very heart of the matter, things like the babbling or a brook.

CHAPTER 2

SENSATION BEFORE THOUGHT

Introduction: From Jellyfish to Humans

If we want to understand humans, we first have to understand what a living organism is. Then we have to understand what makes humans distinctive (not best), in the way every living creature is, in its own way.

We often think of the "real world" as the world "out there". However, no living thing knows what this world is like as a whole. Each living thing has different senses and, thus, senses only parts of the world and is oblivious to the rest. Humans live in a human world, octopuses live in an octopus world, and bats live in a bat world (Birkhead, 2012; Balcombe, 2016; Margonelli, 2018; Montgomery, 2014; Safina, 2020).

The Sensing System

While different kinds of living creatures each experience their own world in different ways, they all share a core system that is the basis of being a living organism (Barrett, 2017; 2020; Capra & Luisi, 2014; Casey, 2015; Godfrey-Smith, 2016; Nurse, 2021). We will call this the **sensing system**. In all living creatures, this system has two parts: **sensation** and **embodied associations**. In some creatures, including humans, the system has a third part: **simulation**.

Living creatures must also be sensitive to the properties of the outer environment. This process is often called "perception". We will call it "outer sensation", since it is focused on the outside environment and involves many senses at once, not just vision. Inner sensations can make organisms seek out certain sorts of outer sensations from their

environments and outer sensations can trigger inner ones. There is a reciprocal coupling of an organism and its environment; inner and outer sensitivity interact constantly.

Part 2. Embodied Associations: Any living being must be able to deal with changes and challenges. It does this by budgeting its inner resources (food and energy) so that it can handle routine challenges, yet expend extra resources effectively for emergencies, and always retain enough resources to repair and rebuild. To do this, it needs not just inner and outer sensations, but the ability to use past experience to anticipate and deal with the future. This requires the ability to retain, inside the creature's body, a record of past inner and outer sensations and the ability to reactivate them as a source of anticipation of and reaction to new challenges. This is a form of "memory".

One way nature first solved this problem was to have evolved, in creatures like Jellyfish, a nervous system that allows the creature to automatically react to outer sensation. Jellyfish don't have a brain. They respond to the changes in their environment using a nerve net just below the outer layer of their skin. The nerves in this net are sensitive to touch. Eventually this led, in the vast majority of creatures, to nerves called neurons in a brain (a very large nerve net) that can store past associations discovered in experience and activate them in the present as a form of "memory" and "knowledge" when a creature needs to respond in the future to situations similar to the past (Cobb, 2020). We will call such associations **embodied associations**.

For creatures with brains, an embodied association is a linkage, formed in previous experience, between one set of neurons and another whereby the activation of the first set activates the second set. Once a creature has experienced, for example, pain

from eating a certain kind of plant, it will form an association between this plant and feeling pain. In the future, seeing the plant will activate the association of the plant with pain and this, in turn, will activate the creature's innate connections between pain and avoidance of things that give pain. These associations will automatically cause the creature to avoid the plant. No conscious awareness or thought is needed. Embodied associations just work on their own. They are the most basic type of learning from experience.

Part 3. Simulation: Some, but not all creatures, have the capacity not just to have embodied associations and use them unconsciously and automatically to bring past experience to bear on current experiencing. They also have a capacity to use these embodied associations consciously to create a virtual world in their brains (what is sometimes called "the theater in the mind"). They can even combine and recombine elements of past experience in new formations. This is the capacity to **simulate** or, as we call it in daily life, the capacity to **imagine** (Hawkins, 2021; Solms, 2021).

In simulating, we activate, with conscious awareness, embodied associations (neural connections). Here we use the past to build a virtual world and act in it. In this regard, simulation is like dreaming. In fact, dreaming is just simulation activated in sleep (Walker 2017). Simulation is not unlike a gamer playing a video game. Instead of playing in the real world or in a game world, we are playing in our heads (Gee, 2017). We use simulations to "think" (imagine) before we act and to prepare and plan for the future.

Many humans associate snakes with danger and danger with fleeing. If you have encoded this association in your brain (and for many of us it is actually innate), it will

operate automatically. When you approach something that conjures up the association with snakes, before you consciously know it is a snake (it may not even be a snake), you will flee. Your brain senses and acts on fear before it becomes conscious of what exactly caused the fear. This is how embodied associations work and they work this way because fast reactions are of the essence in many situations animals face, including humans (Ruhl, 2020; Taylor, 2010).

But humans can use such associations not just here and now to adapt to a situation. They can activate them in their heads to create a virtual world they can experience and even act in. A human can imagine seeing a snake, feeling fear, and running; no real snake is required, only imagination. It is as if you can replay experiences from the past—either as they happened or in some novel combination of elements—inside a theater in your head.

Once young crows have learned that hawks are dangerous, they can use their embodied associations between hawks and danger automatically to react to hawks either by fleeing or mobbing them, depending on circumstances. This is the result of their embodied associations. It is a form of automatic pilot.

But crows can also face a multiple step problem—like a puzzle—and simulate in their brain different approaches and then test them out (Meiburg, 2021; Safina, 2020). They create their own internal experiences, based on current outer sensations and past experiences and the capacity to rearrange the elements of past experience into new combinations. They use these mental simulation to solve problems.

All living creatures must be able to assess, at any moment, whether they are safe or in danger (which is what it means to be aware of and monitor your boundaries). If they

are in danger, they must be able to deal with the danger, either by fleeing, fighting, freezing, or hiding, each of which costs certain amounts of the organism's internal resources. If they feel safe, they must be able to assess whether their resources need to be restored, saved up for future challenges, or expended in a search for development. If a living creature cannot budget its resources, it will not be able to face the challenges of life. How this process works has been the subject of a good deal of relatively new research in biology and neurobiology. In the case of humans, new discoveries are upending and calling into question how humans—and the institutions they have made—view themselves.

Web of Associations

Humans and other animals learn from experience. They use experiences to build connections among the neurons in their brain. These connections represent associations they have discovered in experience. They are used as a source of knowledge with which to deal with the present and future. Let's call any animal's total set of neural connections—the whole state of its brain at a given moment—its **web of associations** (Cobb, 2020; Churchland, 2013; Dennett, 2016; Eagleman, 2020; Hawkins, 2021; Purves, 2019; Seligman et al., 2016)

As we have seen, these associations can be used to act in the present automatically without conscious thought. The web of associations in some animals is relatively minimal and in others it is massive. In humans, the web of associations we have in our brain is one of the most complex systems in the universe. As we have seen, too, some animals, including humans, can consciously activate their web of associations

internally without input from the outer world. They do this in a way that their internal "imaginings" work like a simulation of different scenarios.

When a creature is using its web of associations on automatic pilot without conscious thought we call this **fast associating**. You see a snake, you flee, no thinking required because you, like many humans, have an innate association between snakes and fear. You do not have an innate association between nuts and fear, but if you are allergic to nuts and have eaten them without knowing it, you need to do so only once to create an automatic association between nuts and fear or revulsion. These are examples of fast associating.

When a creature is consciously using its web of associations to construct simulations, we will call this **slow associating** because it takes more time and effort than fast associating. The same web is used in both cases. When we act we use automatic pilot for some things and simulation for others. The terms "fast thinking" and "slowing thinking" (Kahneman, 2011) are often used where we are using "fast associating" and "slow associating". We do so because thinking, imagining, and dreaming are just different contextual instances of simulating.

Our web of associations is used for acting, reacting, thinking, reflecting, imagining, planning, dreaming, and daydreaming. These are not so much different capacities but different contextual uses of the same capacity, simulation. Here is how this works: If you have had some experience of birds, you may well associate the features "bird, gray color, patches of red, sparrow size, common around homes and at feeders, good singer, often in flocks" with the name "House Finch". These associations got into

your head by seeing house finches and being told their name or having seen it in a bird book.

Once these associations are in your brain, you can use them to imagine house finches when none are present. You can also use them to think and reason about house finches. Imagine you see a bird that triggers all your house finch associations except that it has yellow patches, not red. You see this bird with a flock of regular house finches. So, you infer or hypothesize (two types of reasoning) that there must also be yellow house finches not just red ones, and that yellow ones are much rarer than the red ones. You—perhaps tentatively—add to your house finch associations the features "sometimes, but rarely, yellow".

The fact that we build our brains by forming associations discovered in experience and then use these associations to imagine, think, and remember (imaging with time and location stamps, we might say) becomes important when we realize that the human brain, as an association engine, is the most complex object in the universe, in many ways as complex, or more so, than the universe itself (Churchland, 2013; Cobb, 2020; Eagleman, 2020). We have so many associations, so complexly linked to each other in terms of how strong or weak their connections are, that they constitute an ever-changing model of the world, our own map of our own world, based on our own experiences in life. This is what we might call our personal "**world view**". Each person's map is different.

This great web of associations—with which we sense, think, remember, and imagine—sometimes fast and sometimes slow—is formed not just by experiences in the real world. Humans have the interesting property that their minds very often treat

media—what they have read in a book or seen on a screen—as a source of associations with which to build their mental web (Reeves & Nass, 1999). Furthermore, humans very often cannot remember whether associations they have formed have come from real life or media.

The web of our associations that is instantiated in our neural networks can change with every new experience we have. The experiences we have had—and what new ones we seek out or have access to—represent the limits of our worldview, our imagination, and our thinking (Hoffman, 2019; Kahneman, 2011; Thaler, 2015). All of us have had limited experiences in the world and, thus, all of us need new experiences with which to modify or expand our web of associations so that we keep developing by pruning out-of-date or wrong associations and growing new ones.

Thanks to connections among neurons, creatures carry a model of the world they have experienced around with them in their bodies as a resource for facing new challenges. This does not require thought or awareness; it requires neurons that connect to and activate each other. These connections are formed by, and thus represent, associations (patterns) discovered in past experience, associations that can then be used to react to challenges in the future.

Relevance

When people experience—in the world or in media—they do not attend to everything in the experience. There is too much to attend to in any experience, given the world is replete with things that we could pay attention to, that no one can attend to it all.

We attend to only what is relevant to our goals in the experience (Barrett, 2017; Chabris & Simons, 2018; Churchland, 2013; Damasio, 2018; Furtak, 2018; Huntsiner, 2013)

In one famous experiment (Chabris & Simons, 2018), subjects were asked to watch a short video in which six people (three in white shirts and three in black shirts) pass basketballs to each other. They were asked to keep a count of the number of passes made by the people in white shirts. During the video, a person in a gorilla suit strolls into the video, faces the camera and thumps its chest, and then leaves, spending nine seconds on screen. Half of the subjects miss the gorilla and are shocked when it is pointed out to them on a replay of the video. Basketball passes were relevant, the gorilla was not.

It is still unknown how the mind makes decisions about relevance in context, especially in experiences where decisions about relevance are made in micro-seconds unconsciously (Mercier & Sperber, 2017). Some people could not tell you if they saw a hawk or not on a hike and others could tell you exactly how many. Some people love the sound of a babbling brook on their walk through the forest, others don't hear it. On crowded city streets different people notice quite different things. We sense what is relevant and what is relevant is what we care about in a given experience.

It is clear that people need to learn what is relevant for certain goals in certain types of experience. They learn this from social groups, families, communities, shared interest groups, and cultures. Furthermore, since belonging matters so much to humans, they attach affect (caring) to what the group considers relevant (Gee, 1990; Jackson, 2019; Junger, 2016; Moffett, 2018; Tomasello, 2019). For example, a new birder will be mentored by more advanced birders on what are the most relevant features of birds to attend to if you want to identify them. The new birder will attend to them and care about

them because she wants to be accepted by birders and sees her attending and caring as signals of her emerging identity as a birder. Others will walk through nature and not have any idea how many birds they saw or what sorts of birds they were.

Different social groups differ on what counts as relevant—what people care enough about to pay heed to. Is "race" relevant in any encounter between people of different "races"? Some groups say "yes", some "no", and others "maybe". How is it relevant in different sorts of encounters? What about gender? Hair style? Accent? Height? Weight? Where and how did you learn to care about these matters?

In the end, our social affiliations represent a limit of our imaginations because they shape the sorts of experiences we have and how and what we pay attention to in them. Many people, when they have changed social affiliations and learned to see different things as relevant have realized that, even in the sorts of experiences they have had many times before, they now attend to new things and form new associations.

Internal Feelings and Emotions

The human brain is not just in the head. The vagus nerve, the largest nerve in the human body, is neural tissue that transmits information from your internal organs and tissues (and microbiome) to the head brain (Dana, 2018; Enders, 2015; Gee, 2020; Mayer, 2016; McAuliffe, 2016; Porges, 2011). This information is about your internal state of wellbeing. It is information about the state of the hormones in your blood, your immune system, your microbiome, and the wear and tear on your organs and tissues. In turn, the head brain can communicate back, via the vagus nerve, to your internal organs.

This flow of information is used by the internal sensation system to unconsciously and continuously make "decisions" about how and when to expend resources.

The sensation system has done its work before the conscious brain kicks in, in the case of animals that have a conscious brain, such as humans. When the conscious brain does kick in, it tries to make sense of the unconscious decisions the sensation system has made without knowing how or why these decisions were reached by the system. The conscious brain plays catch up with limited evidence (Gazzaniga, 2011, 2018).

We humans are unaware of—unconscious of—lots of the sensations that are going on inside our bodies all the time. For example, your internal organs can sense chemical changes within your body and, in response, cause your blood pressure to raise or fall. Humans are most often unaware of changes in blood pressure. Consequential though they be, humans do not usually consciously sense them.

However, humans and some other animals can, in some cases, become aware of their unconscious sensations. While you usually are not aware of changes in your blood pressure, though your internal organs sense them and react to them, you are aware of some internal changes in your body. Imagine, you sense a gurgling in your stomach. We often say things like "I feel my stomach gurgling", and this is just an internal sensation you are consciously aware of and, in words, a metaphor at best. Inner and outer sensations are personal and non-verbal and hard or impossible to put into anything but figurative language. In these cases, the word "feeling" means little more than "I sense" or "I am aware of". We will use the word **inner sensation** rather than "feeling".

However, some things we call "feelings" are interpretations, not just sensations. Take the example of hunger. You can sense with conscious awareness certain changes in

your gut as an indication you need to get food. We call this feeling "hunger". Hunger (the feeling you get from your body's internal state) is an interpretation of that state. It says, "your body is giving rise to certain internal sensations because it needs food". And the feeling of hunger tells you what to do about it—get food. Finally, it tells you whether your actions are working or not. If you do not get less hungry—or even get hungrier—then your actions are not working. If you get less hungry, your actions are going in the right direction.

While English uses the word "feeling" sometimes just to mean "sense", we will use the word to mean interpretations of bodily states that tell us that we need to act and, in turn, assess the actions we take. Feeling pain works the same way. The sensation you have in your knee is, as all sensation, personal and not really able to be described in words. Feeling those sensations as pain is an interpretation of them that guides action and the assessment of action.

Another example: You can become aware that your heart is racing, your muscles tightening, and your face is getting hot. We call the sum of these bodily sensations "anger" and are consciously aware of feeling angry. Here you feel your physical states and interpret them as anger and that feeling of anger guides and assesses the actions you need to take.

Feelings like hunger, anger, or fear can sometimes propel you to act before thinking. They can propel automatic actions, especially if there is no time for thought. But they can also arouse your conscious reasoning processes and propel you to think, decide, and act in an effortful, slower, and voluntary way (what we called "slow associating" earlier).

So, feelings can, and often do, guide and assess conscious voluntary thinking, imagining, and acting. So, though the traditional view is that thought dominates feeling, the truth is feeling arouses and guides thinking (imaging, simulating, slow associating). Feeling pain or sadness rouses us to think, and the increase or lessening of these feelings is the guide (assessor) that tells us whether our thinking is leading to good or bad actions. No feelings, no thought. No feelings, no way to evaluate how well our thinking, deciding, and acting is working. As Mark Solms (2021, p. 97) says:

> Different feelings and emotions signal different situations of biological significance, and each one compels us to do something different: This is what affects are for: they convey which biological things are going well or badly for us, and they arouse us to do something about them. You decide what to do and what not to do on the basis of the felt consequences of your actions.

What is the difference between feelings and emotions? There is lots of disagreement about what words do or should mean here (Barrett, 2017, 2020; LeDoux, 2019; Solms, 2021; Sapolsky, 2017; Smith, 2015). And, as we have seen, ordinary English uses words like “feeling” and “emotion” in different and sometimes inconsistent ways. For us, feelings that are not emotions signal internal bodily needs (like pain or hunger). Emotions are signals that signal social or other directed needs (like love and anger). There is a relation between the two. Physical pain signals a need to work to repair the body. Emotional pain signals a need to work to repair our relationship with others or the world. Both are caused by internal bodily changes that we sense, but different sorts of internal changes connected to different sorts of feeling or emotion. We can call feeling and emotion together “affect”.

Feelings and emotions are a type of non-cognitive meaning. They explain to yourself what the internal bodily changes you sense mean in the current circumstances you are in. They can trigger certain automatic actions or, in some cases, activate your reasoning capacities to make voluntary, non-automatic, choices.

It is very often more difficult to meet the needs emotions signal than to meet our internal body needs like hunger or pain (Solms, 2021). This is because emotions often involve us dealing with other humans who themselves have feelings and emotions and concomitant needs of their own. Since they are outer directed and often responses to other humans, emotions are often more complex than feelings like hunger and pain. English is inconsistent with the two words. For example, in English, we can call anger a feeling or emotion, though we never call hunger an emotion, only a feeling. In this dissertation, I will use "feeling" for inner directed interpretations of internal states (like hunger) and "emotion" for outer directed interpretations of internal states (like anger).

As we have seen, there are a great many competing theories about what emotions are and the situation is not helped by the fact that different people use the word in different ways. We will argue that we should distinguish between emotion terms (or concepts) and emotions themselves as we experience them and act them out. As Lisa Barrett (2017) has said: "an emotion is not a thing but a category of instances, and any emotion category has tremendous variety" (p. 15).

Different people and different cultures display anger in different ways in different contexts. While there are some cultural universals here—for example, people can identify "angry faces"—there is a good deal of diversity in how emotions are displayed and acted

out within and across cultures. Just as the word “cat” stands for lots of different types of cats, the word “anger” stands for different ways of expressing anger.

As we said, an emotion like anger is an interpretation of what your internal bodily feelings mean in context. This interpretation is affected by your individual past experiences and your social and cultural memberships. Different social and cultural groups have different social and cultural stereotypes and scripts about emotions such as anger. Once your brain has decided that your internal feelings, in this context, mean you are angry, then you may just lash out without conscious thought. Or your feeling of anger can, in other circumstances, rouse your conscious reasoning (simulation) to kick in and try to construct a story or explanation of why you are angry and what you should do about it in a thoughtful and voluntary way.

CHAPTER 3

CONSCIOUSNESS

Consciousness has long been argued to be a distinctive property of humans, or, at least, more developed in humans than in any other creature (Churchland, 2013; Crick, 1994; Dennett, 1991; Graziano, 2013, 2019; Metzinger, 2009). However, we need to distinguish between two meanings of "consciousness". One meaning is "awareness". In this sense of the word, humans are aware of their sensations and thoughts.

Humans are often not aware of what they are sensing (detecting). For example, when you are reading, you are sensing individual letters and words—otherwise you couldn't read—but, unless you stop and think about it, you are not aware that you are sensing these letters and words. You are sensing (detecting) them unconsciously. But, of course, we are often aware of our sensations. When we smell a bad smell or taste a good tea or see a vibrant blue butterfly, we are aware that we are sensing them. We can report "there is a bad smell here" or "this tea tastes good" or "the butterfly is just so blue!".

Another meaning of "consciousness" is not just awareness, but a form of meta-awareness. This is what I called, in the last chapter, "self-reflective consciousness", but which I will now shorten to "self-consciousness". Self-consciousness allows humans to watch, think about, and judge themselves as they act in the world. It allows them also to simulate (imagine) watching, thinking about, and judging themselves after they have acted. This capacity is odd. It seems to create two selves, one that watches, thinks about, and judges the other.

Imagine you are talking to your boss. As you are talking, you find yourself thinking: "Wow, this is not going well; I am irritating my boss". Here your self has

doubled. There is the acting self that is right now talking to the boss. And then there is the thinking self that is now thinking about and assessing the performance of that acting self. We can certainly talk to someone, fully aware we are talking to them, but not think about the fact that we are doing so. This is just awareness. But we can also think about ourself talking to the other person as we do it. This is self-consciousness. This can sometimes get us into trouble. Thinking about what you are doing while you are doing it can interfere with performance at times (e.g., when dancing, giving a talk, or love making). Being "lost in the moment" is a state humans often value.

I have argued that thinking is a form of simulation ((Hawkins, 2021; Solms, 2021). So, when you think about and assess what you are doing while you are doing it, you are simulating (imagining) in your mind/brain yourself doing what you are doing and imagining alternatives to it so that you can change your performance. This also means that you are both paying attention to what you are saying to your boss and to what you are thinking about what you are saying to your boss, at one and the same time. This is quite a feat and does not always go well, as mentioned above.

Self-consciousness makes humans into creatures aware that they are a unique individual agent of sensation, association, and simulation. They do not just sense and simulate; they are aware that it is them that is sensing and simulating (see Graziano, 2013, 2019 for a theory of what "awareness" means at the level of the brain). They can think about themselves as they act or after they have acted, and they can even think about their own thinking (!). It is clear that animals like chimpanzees, whales, elephants, and some others, have the beginnings of consciousness in this sense, but we humans cannot know what it feels like to them. We only know what it feels like to us.

When humans are self-conscious, the self they are conscious of is not just them—an "I"—but them as a temporally and socially situated individual human (Moffett, 2018; Tomasello, 2019). If I, Qing, think about myself either as I act or in my imagination outside of action, I think about myself as a person with a history and a (changing) "story", as a person situated in the natural world and in various social worlds in specific ways. The self of self-consciousness is both a unique individual being and a participant in the social drama of life, a drama acted out both in the world and in our heads.

There is a great deal of discussion and controversy of how this form of consciousness arose in evolution. The social brain hypothesis (Byrne and Whiten, 1988; Dunbar, 1998; see Atzil et al., 2018 for an alternative version of the social brain hypothesis) argues that humans evolved this sort of self-consciousness because they lived in complex social groups where managing one's relationships with others required the capacity to understand (imagine) what was going on in other people's minds. Social animals need to be able to "read" others' minds in order both to collaborate with others and to protect themselves from others. They have a "theory of mind". In order to "read" other minds (guess what they are thinking), we need to be able to read our own minds (be consciously aware of what we are thinking and intending) when we act and then assume others have minds like ours.

Now, interestingly, the human theory of mind is an illusion. We feel as if we (and others) have two selves, one that is the "boss" and directs our other self to act in certain ways and then assess these actions of this "lower" self. It has often been said that humans feel there is a little self—a homunculus—inside their heads that tells the body what to do (thus raising the problem of who or what tells the homunculus what to do). This "higher

self" has been called "mind", "spirit", "soul", "consciousness", and other terms. The "lower self" has been called the "body", the "material self", or the "corporeal self". One self is mental, the other is physical. However, in reality, there is no non-physical "mental stuff" in the body. Humans are material entities, their brains and the rest of their bodies are material stuff, and each of us is one self.

There is another version of the social brain hypothesis that takes the illusion aspect of self-consciousness in a different direction. Some researchers have argued that it is the ability to lie that gave rise to the complexity (and duplicity) of human self-consciousness (Byrne & Whiten, 1988; Hare et al., 2006; Smith, 2004). The ability to lie requires self-consciousness (you have to know you are not telling the truth). If a creature evolves the capacity to lie, as have some primates and humans, that capacity will be a powerful force in their competition with others. The only way others will be able to compete with the liar is by getting good at detecting lies. But then the liars will have to get better at lying. This will start an evolutionary brain race of better and better liars and better and better lie detectors. Eventually, the best liar will be someone who believes their own lies (self-deceivers), that is, people who can convince themselves they are right when they are wrong.

The capacity to lie and self-deceive makes truth less important in a social group than shared beliefs. The self-deceptions we share with others come to be social identity markers (Green, 2013; Jackson, 2019; Moffett, 2018; Simler & Hanson, 2018; Sloman & Fernbach, 2017; Wilson, 2012). In fact, once lying arises in a group, evolution will not necessarily select for truth. A lie or self-deception that helps an individual or group survive will be advantaged by evolution over truths that work against survival. The belief

that our group is “better” than “others” helps humans collaborate and survive, even if it is nonsense.

If we cut to the chase, we can say that self-consciousness is the ability to story your own self through time and space and to imagine the stories others are telling themselves about themselves. Note, once again, the odd doubling here: The story telling self is different from the storied self. Humans author themselves, with help from their “friends” (social groups). But there are no two selves inside humans, only one, the human body. So, our two selves are a fiction. But it is the most consequential fiction in the history of humans and the history—and maybe even the demise—of life on earth.

This “storying self” sense of self-consciousness has been more the purview of poets, novelists, artists, anthropologists and other students of the human condition than of psychologists, philosophers, and neuroscientists (Fuentes, 2017; Lorde, 2009; Low, 2016; McAdams & McLean, 2013). While modern humans, since the Renaissance, have stressed flexible self-fashioning (Greenblatt, 1980)—something not much available to the fixed positions of Medieval humanity—all humans at all times have sought to give meaning to who they are and what they do. This meaning was often, in earlier times, based on people seeing themselves as participants in the grand shared stories of tribes, cultures, nations, and religions (Lent, 2017; Orsi, 2016). These were stories they adopted and adapted more than fashioned. But all human self-storying is a dialogue, across time, between self and society (Graziano 2013: Ch. 10; Gazzaniga, 2011, 2018).

Talk of self-consciousness seems to remove us humans from the world of sensation and experience. However, self-consciousness as self-storying can bring us back to the ground of living things placed as bounded, but porous, bodies in the world. In her

book, *The Sociology of Space*, Martina Low (2016) says that "what we are and who we are and how we appear to others depends on the space in which we are integrated and which we at the same time form with our placement".

What makes a living thing a living thing and not just a thing is that it is (and must be) aware of its placement in the environment—that is, knowing where its boundaries are and how they are being affected—a placement that is a joint product of the environment and the living beings' internally guided reactions to the environment (Barrett, 2020; Davies, 2019; Kauffman, 2019; Zimmer, 2021). For humans, their environment is both physical and social and they must ever be aware of their placement in an integrated socio-physical environment. Awareness is one form of consciousness, as we have seen (Eagleman, 2020).

Perhaps, self-consciousness is required to know and act out one's place in socio-physical space and time as a member of social groups that have a shared history, where "place" means, as well, roles in the unfolding history of their groups and ultimately their species. This would mean, ironically perhaps, that self-consciousness is consciousness of "I as part of we", something elephants, whales, and chimpanzees have. For humans, once they got language (of the human form), history became storyable, an evolving story, not just the facts on the ground of survival. It is not clear there any other storying animals in this sense. It will be this sense of self-consciousness as self-storying that will be most important for the ideas I develop about humans as living beings and social animals in this dissertation.

Self-Consciousness: The Great Oddity

Self-consciousness, in the sense in which we are using the term, is the source of all that is vexed about humans to themselves and to other forms of life on earth. There are those who argue it is an evolutionary dead end and others who argue it is the force that places us next to angels or devils, depending on context.

There is, from the 1970s, a theory—highly controversial then and now—called the "bicameral mind" theory. My concern here is not whether it is right or not. That doesn't really matter, since it captures an important truth that all humans personally feel and recognize. Julian Jaynes (1920-1997) argued in his 1977 book *The Origin of Consciousness in the Breakdown of the Bicameral Mind* that prior to the development of self-consciousness, as humans now know (and feel) it, humans experienced internal dialogue in their head as auditory hallucinations (voices) directing them to act in certain ways. The voices were interpreted as coming from gods, spirits, and ancestors. Only later did humans learn that the voices were inside themselves, that they were talking to and directing themselves.

So, thanks to self-consciousness—and for Jaynes, thanks to breakdown of the bicameral mind—we humans have two selves that we feel are both inside us (and sometimes even at variance with each other). One self, the observer, seems less embodied, more "mental" or "ethereal", than the other self, the watched self, the acting self. This difference probably explains why humans have so long believed there is a self or a part of themselves that can leave the body, travel elsewhere, and survive death. They have sometimes called this their soul, spirit, or mind. Sometimes people say that it is their

consciousness itself that can exist apart from their body and live after death, either as a distinct individual or merged with some sort of universal consciousness or mind.

These beliefs are not trivial to humans or in human history and they have been with humans since, or even before, their origin as the species *Homo Sapiens*. The earliest religious figure in human evolutionary history is the shaman, depicted in cave paintings as old as 40,000 years, paintings probably used in religious ceremonies led by the shaman (Sidky, 2017). Originally, it appears, the shaman traveled to the world where animal spirits live to beg them to keep their bodies in the mundane world available for hunting and the survival of humans. Humans have long been able to see animals, and not just themselves, as having two selves, a spiritual one and a corporeal one. Shamans still exist all over the world today and play the same role. Their spirit can leave their body and travel to other worlds to placate spirits, gods, and demons in the service of their human community.

The self that observes ourself, that seems to us less corporeal, is also the storyteller that stories our corporeal lives, gives them sense and narrative meaning both as individuals and as members of social groups. We do not have a modern name for this self. Terms like "spirit" and "soul" have fallen into disuse in academic prose, as has a term like Freud's "Ego". So, let's call it the "transcendent self". The transcendent self is the watching, judging, storying self and the "natural self" is in fact the watched, storied, and corporeal self. Both selves are just artifacts of the human brain inside the human body—sometimes even called illusions —but that is not how humans actually feel them.

Humans' sense of a transcendent self is anchored in a deep human need for transcendence—for a feeling that there is "more" than my own existence; that what I am

seeing isn't "all there is"; that there are deeper meanings; that things are "meant to be" (Frankl, 1966, 1985; Hamer, 2005; Maslow, 1971). This need goes back to and before the shamans, the first priests, and is an eradicable need for humans to this day. The fact that modern humans have a harder time finding transcendence is part of the malaise of modern life. Early humans—more at home, but often, too, more in danger in nature—had no problem finding it.

Education: Start with Sensation, not Consciousness

So, I have sketched out a version of the evolutionary biology of humans as a distinctive kind of animal. Since humans are herd animals, their evolutionary biology is as much the biology of sociality and identity as it is of their individual bodies and neurons. Modern work on education largely ignores humans in this sense.

Modern educators may well see where we have started our journey in the last chapter—with sensation, the body, and evolution—as irrelevant to education. I argue that this would be profoundly mistaken. The mistake is caused by the fact that formal education for centuries has taken humans to be thinkers in search of truth and knowledge who, especially in modern times, need to know "the facts".

Human consciousness—and the transcendent self—are not and never have been focused on truth, logic, or knowledge. They have always focused on beliefs that both work in practice to bring themselves comfort and even transcendence and that signal their group loyalties and identities. Human consciousness can be terribly toxic for selves, groups, all humans, and other life on earth. And it can also be uplifting, progressive, and transcendental for all.

The irony is this: The human mind is made by experience, that is, temporal flows of sensation, and is no better than the quality of these experiences. If we want humans to flourish, we have to start with the quality of their sensational life, their sensory experiences in the world, the part of life they share with all life. We have been worshiping cognition as the "top" while, in fact, this top is formed, developed, and modified by what we take to be the "bottom" of the scale, namely, sensation and affect. The "bottom" is, in reality, the most important key decisive part, not the "top" in our traditional cognitivist views of the mind.

Since schools focus on conscious knowledge and not on sensation, they fail in two respects to actually deal with humans as there are (Gee, 2020): Humans are not tropic to truth and their flourishing—and, thus, too, the quality of their thinking and imagining—depends on sensation.

If we are interested in learning, in human development, or in the survival of an earth livable for humans, then we need to start with sensation and how it leads to good or bad "minds" through a long but profoundly consequential developmental process. Our goal must be not "intelligence" but flourishing, because humans who are flourishing are more prosocial and intelligent than those who are not.

CHAPTER 4

FLOURISHING

Flourishing and State of Nature

Anyone who takes enhancing human life as her vocation must have some criteria of what constitutes "good" for humans. Any institution devoted to learning must have a criteria for what sorts of learning, and what sorts of things to be learned, are "good" for humans. It is often argued that any criteria for "good" is subjective. Some parents feel it is good for their children to fear them and others that it is good for them not to. If these differences are cultural, then we are in danger of being accused of cultural chauvinism if we choose sides.

If you want to enhance life not just for humans but for all living things—and believe that unless we do so, humans will eventually make the earth unlivable for themselves and much other life—then you have to have a criteria for "good" that all living creatures can live by, humans included, but not only about humans.

There is one criteria that is not subjective. The criteria can be tested empirically. To see what it is, we need to start from the "state of nature" of living creatures. Evolution is about the survival of genes—about passing on genes to offspring—and mere survival long enough to mate is the goal of evolution for living things.

The human body and brain evolved under conditions quite different than the conditions under which we live today (Barrett, 2020; Sapolsky, 2001, 2017; Wilson, 2019). These new conditions arose so fast—thanks to culture and technology—that our bodies and minds have not had time to catch up. One good example is sugar. When humans lived in small bands as hunters and gatherers, they would have come across large

amounts of sugar rarely enough that an in-built propensity to eat as much as one could would be good for survival, given the benefits that sugar has for human bodies and brains. Yet when we moderns are faced with limitless amounts of refined sugar—and little physical exertion—the urge to keep eating it is toxic.

This is all true as far as it goes. However, it leaves out the important fact that while evolution only "cares" about organisms passing on their genes and not about their happiness, individual creatures do care about their happiness in terms of pleasure and pain. Even in the state of nature many sorts of creatures who evolved to live one way can live in other ways if the opportunity arises and some of these new ways can allow them both to survive as a species (a gene pool) and yet flourish as individuals.

Some examples: The relatives of domesticated cats evolved as small predators. They were very good at killing smaller creatures and almost always died before old age by being killed by a bigger predator. This worked out fine for cats in terms of survival as a species. But, about 8000 years ago, some cats "decided" to leave the great outdoors and make a deal with humans to take care of their mouse and rat problem in exchange for their huts and protection. There are more cats than ever today and a great many live to a ripe old age. Some flourish, though others get too fat thanks to overly permissive humans.

Baboons live in troops based on status hierarchies enforced by violence and lots of displaced aggression downward. Every baboon in a troop (especially the males, but many of the females as well) is filled with stress chemicals that make them less healthy than they could otherwise be (this is also what high levels of inequality do to humans).

Those lower in the hierarchy are continuously put upon and those much higher need to be vigilant about being overthrown and having to live the low life.

In one well-studied case (Sapolsky, 2001), a troop of baboons lost all their most aggressive and higher status males. The males ate tainted garbage at a resort which they hoarded all for themselves. With their demise, the troop became much more peaceful and equalitarian and new males joining the troop adopted the new culture. With less stress chemicals—a much lower allostatic load—each individual baboon was healthier and seemingly happier.

A final example: Humans can be as status oriented as baboons and one can see this in many middle schools. In one middle school (Michaels & Sohmer, 2001) the students had developed a "dissing" (insult) culture. The kids continually dissed each other, in humor or in all seriousness, in a constant jockeying for status and survival in the status wars.

It turned out that next to none of the students liked this culture—for many it made them miserable—but anyone who gave it up just became the victim of everyone else's insults. This is the old hawk and dove problem: if one hawk chooses to be a dove it will just get eaten by the remaining hawks. Hawks can only turn into doves if they all choose to do so at the same time.

When a number of these middle school students were given the opportunity to join a science club at a nearby college they were asked if they would like to decide to have a no dissing policy and enforce it themselves as a group. They all said "yes" and thereafter, in that space, the dissing culture was dead and unmourned.

This, by no means, implies we do not have much to learn from the "state of nature"—"Quit eating too much sugar" is excellent advice for flourishing. What the above examples tell us is that, like cats and baboons, we can seize or make better states under the right conditions. Let's call these **states of flourishing**. Of course, we must think seriously about and respect the "state of nature" for human bodies and minds, but we can go beyond it.

For living creatures, flourishing can be felt, but it can also be measured (Barnett, 2020; Sapolsky, 1994, 2001). Every living creature must face challenges and exert effort to survive. This effort can cause wear and tear on the organism's internal organs and tissues due to the effects of biochemicals the organism uses to deal with challenges, if these chemicals are not released and budgeted effectively. When these chemicals are in the bloodstream of the organism too long or at too high a level this causes internal damage. These chemicals—so called "stress hormones"—and the effects they are having, are a measure of how well an organism is flourishing, as long as you accept that continuous progressive physical damage to one's internal organs is not conducive to flourishing for living things, whatever else you might want to mean by flourishing (Burke Harris, 2018; LeDoux, 2019; Perry & Szalavitz, 2006).

While we will certainly want to consider other aspects of what it means to flourish for a human being, we will use toxic levels of stress hormones as an objective base from which to start. Even by this minimal criteria, in the US today a great many people, young and old, in and out of school, are not flourishing. Americans, more than any other people on earth, are afloat with stress hormones in their blood streams and burdened with anxiety, depression, and physical and mental illness (Pickett & Wilkinson, 2009;

Wilkinson & Pickett, 2019). The problem is worldwide—and connected to high level of inequality—but American leads the way.

So, our goal for humans and other living things is mutual flourishing. Our goal for schools and learning is flourishing humans. There is a good deal of evidence that flourishing humans are less violent and use their conscious powers of storying themselves in more prosocial ways, in ways that are still not tropic to truth, but at least compatible enough with it to sustain and improve the living world that sustains us humans one and all (Seligman, 2018; Umberson, & Montez, 2010).

The Path to Flourishing: The Teaching System ("Culture")

Flourishing humans can deal with stress, budget their resources effectively, and use embodied associations and simulation to prepare for the future (Seligman, 2018; Taleb, 2012; Zolli & Healy, 2012). To be able to do this they must have had rich experiences in the past that can fuel effective embodied associations and simulations for problem solving.

Many creatures, including humans, cannot bring these conditions about all by themselves. Most often creatures need help. We used to think that humans were special among animals in devising ways, through teaching, to pass knowledge down the generations. We now know that this is true of a great many other animal species as well (Ackerman, 2016; Balcombe, 2016; Kline, 2015; Meiburg, 2021; Safina, 2020). Teaching is for those species that use it as a system all its own.

Many sorts of living beings have experiences that have been designed for them by others so that they can survive and flourish without having to discover everything for

themselves. Cultural transmission of knowledge is as important or more important for survival than the genetic transmission of innate knowledge. Thus, it is just as evolutionary and biological as are genes. For many animal species, including humans, teaching is a basic condition of survival, flourishing, and life.

Teaching has its roots in the long evolutionary past (Kline, 2015). For example, in some bird species, elder male birds teach young ones the song necessary to attract females. If the elders disappear as the species is going extinct, it will do no good to rescue the remaining birds in hope of returning them to the wild (Crates et al., 2021). Since there will be no teachers to teach the males the song they need to attract and mate with females, the species will not survive. A vital part of their culture died.

Regime of Competence

All living creatures must be competent in the sense that they can face challenges and overcome them. Since a living thing cannot predict what challenges it may face, it has to develop a regime of competence and continually improve it. A regime of competence is the level of challenges a creature, at any given time, can overcome (diSessa, 2000; Gee, 2003).

This regime develops in a characteristic way. The creature develops new skills by facing and overcoming challenges that are at the outer edge of, but within, its regime of competence. These are challenges that "feel" to the creature demanding but, with effort, doable. They are not too easy (in which case, nothing new is learned) and they are not too hard (in which case the creature is injured or dead). By the way, solving a challenge does not mean no failure, but failure must be—and be used as—a form of learning.

Problems at the outer edge of a creature's regime of competence require effort and new learning. As such challenges are faced, the creature comes eventually to master them and then can only advance by facing new problems at it is now expanded edge of competence. Successful living beings live a cycle of challenge—mastery—new challenge, as the outer edge of their regime of competence keeps expanding. Challenges at the outer edge of one's regime of competence are stressful. Of course, too much stress for too long is harmful. But too little means that the creature is not growing a regime of competence that is ready for new challenges. The creature is fragile and not resilient.

The word "stress" is mostly used for toxic stress. Toxic stress has chemical effects that harm bodies and brains. Yet, stress is necessary. Psychologists talk about "allostatic overload", which means a body carries too much damage from stress, but creatures can have "allostatic underload" as well, which means a body that is too unprepared to deal with stress (challenges) even of the sort that can be expected in a normal life.

In the right conditions, when humans face problems at the edge of their regime of competence, they feel stress at a level that is motivating and even enjoyable, because they also feel a sense of possibility. In some cases, such problems lead to a state of "flow" (Csikszentmihalyi, 2009), a state of intense concentration, motivation, and, at a deep level, enjoyment (not necessarily "fun") and engagement even amidst frustration.

We are stuck with only highly negatively tinged words here like "stress", "tension", "anxiety", and so forth. What makes problems at the edge of one's regime of competence motivating is that a sense of tension is coupled with a sense of anticipation that the tension will lead to a resolution or solution. Just as toxic stress releases dangerous

chemicals into our bodies, resolution relieves stress and can release pleasurable and helpful chemicals.

I will hereafter often use the word **tension** to mean a feeling of anxious ("stressful") anticipation, a feeling which can be good or bad depending on context. I will use the term "tension" because this term is used in music in just the way I want to use it here, but more broadly.

A successful creature—one that survives and even flourishes over time—is one that, after having mastered a challenge at the outer edge of its regime of competence, does not rest on its laurels, but is capable of facing—and even seeks out—new challenges at the now new outer edge of its regime of competence. Though, of course, it sometimes takes time to rest and refuel before starting off again on its journey.

Developing a resilient regime of competence is a condition for the survival—and certainly the flourishing—of all living things, humans included. To the extent that the basic conditions of a flourishing life with the right degree of stress and challenge are not met—as they are not met for many humans in our schools—then, at best, we have fragile creatures, at worst we have sick ones. And we have not even begun to discuss the needs humans have beyond those they share with all other living things.

CHAPTER 5

IDENTITY SIGNALS

Why We Don't Help Everyone to Flourish

If you want to help a living thing flourish, you need to expose it to good experiences. "Good experiences" means experiences in the world that create embodied associations and simulation powers that make a living being well prepared to face the future without a load of toxic stress.

Humans have, in their history, seemed little concerned with the flourishing—and sometimes not even with the survival—of other humans who are not "like them", let alone other living creatures. It is manifestly true that a good many children are not flourishing in U.S. schools (Harris, 2018; Perry & Szalavitz, 2016). In the U.S., a great many people beyond school children are not flourishing, white and black, rich and poor, young and old (Bruder, 2017; Desmond, 2016; Kristof & WuDunn, 2020; MacGillis, 2021; Pickett & Wilkinson, 2009; Sapolsky,1994, 2001, 2017; Wilkinson & Pickett, 2019). The situation is similar in many other countries due to our highly inequalitarian and crisis-ridden global world (Ash, 2017; Hickel, 2018; Suneson & Stebbins, 2019; Stiglitz, 2012).

A great many other animal species can identify those who are "like them". They can recognize individuals and family members and sometimes a larger group beyond family. This larger group is rarely very large, a hundred or so for chimpanzees and thousand or more for sperm whales (Tomasello, 2018; Moffett, 2018; Suddendorf, 2013; Wilson, 2012, 2019). To be able to recognize individuals, family members, and a larger group beyond kin requires that animals can send each other identity signals. For example,

sperm whales (Safina, 2020) use three different characteristic sequences of click sounds to name themselves, their family membership, and their clan membership (the larger group of whales that they are willing to interact with). A sperm whale can say the human equivalent of "I am Allen (individual) Iverson (family) of the X clan". Of course, other animals use other sorts of identity signals. The signals demarcate who is "us" (at different levels) from who is "them".

Animals have to demarcate the world into us and them in order to know who it is safe to interact with. Other members of your species who behave in similar ways as you make you feel safe. Chimps (but not Bonobos) will kill other chimps they do not see as "us" (De Waal, 2013). Sperm whales do not, but they will not interact with clans outside their own clan (Safina, 2020). And, in the case of chimpanzees, sperm whales, and humans, different ways of behaving that signal who is "us" are learned from others and, in that sense, they are cultural.

Identity markers are biologically pervasive. Humans use them because, like other animals, especially social animals, they are necessary for survival in the wild. But humans have taken them vastly further than have any other animal. Humans can use a great many different sorts of identity signals, ranging from language and gesture to food and flags. They can make "us" versus "them" distinctions at many more and much larger levels than other animals (save, perhaps some social insect species), ranging from families and communities to ethnic groups, political parties, and nations.

Not only do humans invent many more types of identity signals than other animals, they also formulate different kinds of beliefs beyond anything other animals can do. Humans can believe in elaborate conspiracy theories or sumptuous afterlives. Other

animals don't bother. The capacities for elaborate identity signals and beliefs are probably both the outcome of humans' evolved capacity to create and even believe in fantasies (Boyer, 2018; Greene, 2013; Smith, 2019; Walter, 2013). In fact, this capacity has made them into the best liars and even self-deceivers in the animal world.

The human ability to use identity signals and imagination (even deception) to create identities and loyalties at so many different—and large—levels led to a distinctively human trait, one that is rooted in the biologically pervasive urge to make "us" versus "them" distinctions (Greene, 2013). This trait is that humans are deeply prone to "confirmation bias", the tendency to consider only evidence that supports what they already believe and to ignore or dismiss evidence that goes against their beliefs (Buonomano, 2011; Eberhardt, 2019; Gee, 2013; Kahneman, 2011; Smith, 2019). This is, in reality, a form of "othering" as its other name suggests: "my-side bias". People favor their own beliefs and retain them in the face of counterevidence because their beliefs are, in fact, identity signals of who they are and who are people "like them".

The fact that for humans—including highly educated humans—their beliefs are identity signals shows that humans orient less to truth than they do to belonging and the comfort that brings them. It takes an enterprise like science to mitigate confirmation bias and even then this only works when the group of scientists working together is diverse and can speak freely.

The fact that humans care more about belonging than truth means they are often not aware—or do not care—that the beliefs they share with others may be incorrect and sometimes toxic to outsiders. And the human super-power of lying—and even self-deception, a form of lying to oneself without knowing it—means people who enjoy high

status in a social group to which we belong can control “us” via lies that they may or may not themselves believe consciously. Often these lies are about some “them” as “enemies”.

Identity signals and “us” versus “them” distinctions are biologically based on the need to survive (Tomasello, 2014). The way humans have proliferated identity signals and the scale at which identity signals work—as well as their ability to treat beliefs as identity signals, engage in my-side bias, and use deception as a way to create and control identity in groups—is special to humans.

As humans evolved over time, their ability to form and manipulate identities at scale—and to engage in my-side bias—was a large part of what allowed them, not just to survive, but to dominate other living things. Yet, these very powers are, while effective in the short run, highly ineffective in the long run. They have allowed humans to overrun the earth, deplete its resources, and imperil not only themselves but much of the rest of life on earth.

In the end, humans are only motivated to work towards the flourishing of those who can signal the right identities that appeal to them, not abstractions like “humanity” or “Africa” or even (in the current state of the U. S.) “all Americans”. If we want “flourishing for all”—or “liberty for all”—we first have to change who humans view as “us”.

Here, too, evolutionary biology has much to teach us. We now know some important things about how a species—say sperm whales—breaks into “clans” where each clan eventually only interacts with its own members. These clans can even begin to evolve down different lines, drifting further and further apart (Safina, 2020).

Ironically, perhaps, evolutionary biology tells us this "clannishness" is cultural, not genetic. As Carl Safina says in his book *Becoming Wild: How Animal Cultures Raise Families, Create Beauty, and Achieve Peace*: "Whales recognize differences among themselves because groups have specialized differently in answering the question 'How best can we live where we are?'" (p. 104).

Different families of whales come to specialize in what they hunt, where they do it in the ocean, and the techniques they use. They pass down these specially developed ways of living to their progeny by their teaching system (culture) and, over time, they recognize each other by the way they act. The way things are done becomes an identity maker, a sign that you are safe because you do things the way "we" do and, therefore, we know what to expect from you.

For humans, the good news is that the "us" versus "them" distinction is heavily contextual (Gee, 2013; Gladwell, 2019; Green, 2013; Tomasello, 2014). When humans feel unwanted or unsafe they draw the distinction narrowly. When they feel safe and open to the world, they can and will draw it much more broadly, sometimes up to the level of all humanity or even all life.

CHAPTER 6

LANGUAGE

Systems and Situations

Living beings learn by sensing the world (or worlds media create) and forming associations in their heads. This is not a passive, one-way process; it is active and interactive. A living being is affected by the world and, through the workings of its boundaries and internal system, decides how to react to the world on its own terms. Many living beings also proactively change their environments to affect how the environment in turn affects them.

In education there has long been debate over whether humans learn best "top down" or "bottom up" (Gardner, 1983). Learning top-down means learning by being exposed to general principles and abstractions. Learning bottom-up means learning by being immersed in concrete cases where, with enough time and effort, the learner can eventually discover more general principles and abstractions.

Children learning their first language learn words bottom up (Gentner & Namy, 2006; Gleason & Ratner, 2016). They hear the word in different contexts and make guesses as to what it means. They may apply a word too widely (overextension), such as "daddy" for all men; "bird" for birds, butterflies, and other flying things; and "shoe" for anything that goes on a foot (e.g., socks). And they can apply a word too narrowly (underextension), such as using the word "dog" only for the family pet; "shoe" only for the shoes they wear or just the ones Mommy wears; or "flower" only for roses.

One can define a word for a small child over and over, but it will make no difference. The child learns the meanings of words by considering instances of their use

in context and eventually figures out a word's range of application. This is bottom-up learning.

Educators have long contested over the role and sequence of top down and bottom up learning in school subjects. For example, as Andy diSessa (2000) points out, algebra as a system doesn't distinguish effectively "among motion ($d = rt$), converting meters to inches ($i = 39.37 \times$ m), defining coordinates of a straight line ($y = mx$), or a host of other conceptually varied situations" (diSessa, 2000, pp. 32-33). At the level of the system (here equations), they all just look alike. DiSessa—an educator and a physicist—goes on to point out that "[d]istinguishing these [different] contexts is critical in learning, although it is probably nearly irrelevant in fluid, routine work for experts," (diSessa, 2000, p. 33). Experts have already had many embodied experiences using algebra for a variety of different purposes of their own and, thus, have, bottom up, discovered larger patterns and generalities that cover many different sorts of cases.

Schools often attempt to short-circuit bottom-up learning—in order to save time—by telling students general principles, abstractions, and rules, followed, perhaps, by a few examples (often just in words, not in terms of embodied actions taken by the learner). This, of course, advantages those students who have experienced specific cases in context out of school or earlier in school. For them, they are moving from bottom-up learning to consideration of wider patterns The other students are lost.

Having said all this, it is, nonetheless, crucial in school and society that people know not just concrete cases or examples, but also more general patterns or principles. Things like algebra, the vocabulary of a language, or literature are systems and knowing what systems are and how they work is powerful knowledge.

There is an important difference between what we might call “system meaning” and “situational meaning” (Levison, 1983, 1995; Gee, 2017). If I learn that the word “cherimoya” names a fruit, I know, at the level of the language system, that it is a noun, a term for a food and a fruit, and, thus, associated with other fruit terms and separate from terms for vegetables.

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System knowledge, however, does not lead to the ability to apply such knowledge to actual situations of use. I may know “cherimoya” names a fruit, but be utterly unable to identity it in a supermarket or a field. I may know that “orange” names a fruit, but be unable to tell oranges from tangerines, calamondins, mandarin oranges (not really oranges), kumquats, clementines, and satsumas. Indeed, many people have no idea whether a tomato is a fruit or a vegetable or why scientists name it a fruit, but the Supreme Court of the United States once designated it as a vegetable (Arthurson-McColl & Chicago-Kent Class of 2020, 2017).

Now, some readers my argue that the system of fruits is really not a matter of language, but a matter of reality. An orange just *is* a fruit. This is a confusion between reality (which is blooming confusion of processes) and a system, which is a human made thing. For hundreds of years lung fish were classified as fish, now they are not (Miller,

2020). And, I have already mentioned the notorious tomato. Classifications change based on the purposes for which they are used and the criteria used to make them.

When we get to the understanding of language—humans' most important system—the difference between system knowledge and meaning and situational knowledge and meaning is crucial. To see this, consider a word like "pizza". At the level of the system of language (vocabulary and grammar) this word names a type of food and a food of a specific sort. It has been a major matter of contestation among philosophers and linguists to say what meaning at the system level—the level of literal meaning, definitional meaning, meaning out of any specific context—actually is. This is so, because at the level of situational application (language use) the number of things that can, for example, get called "pizza" is large and seems to get ever larger.

Let's say you were trying as a complete outsider to learn what a pizza is in practice, in actual talk and eating, in even one place, for example, in the United States. I might take you to a wide variety of places and start by showing you something I am pretty sure everyone in the U.S. would call a pizza. Then I would point to other things across many places and ask you to guess is this pizza or not. Sometimes I would tell you that you were wrong. Sometimes I would say you were dead right—that is a pretty typical or prototypical pizza—sometimes I would say, yes, that's a pizza, but not a very typical one, or a special sort of one. And sometimes I would say, maybe it is, I'm just not sure myself; it seems pretty borderline, but maybe that's what passes for pizza these days in trendy restaurants.

Note that at the end of the training, the learner would be able to be a teacher. But note, too, that the original teacher and the student who has now turned teacher may very

well have no clear idea why and how they identify something as pizza and why some things just seem more pizza like than other things though they are all, in some sense, pizza. To make matters worse, other places or cultures may have the same word but different typical or prototypical examples and different range of how far they will extend the word.

For many years philosophers and logicians argued that the system meaning of a word was a set of necessary and sufficient conditions that definitively put a thing in or out of a category (Sigmund, 2017). So, for example, the word "triangle" means "a plane figure with three straight sides and three angles" and it seems to be clear that things either do or not fall into this category—there appear to be no unclear cases here (but, of course, there are love triangles). But most words do not operate this way (Gee, 2017; Keefe & Smith, 1996; Levinson, 2000; Rosch & Mervis, 1975). It is not clear who is and is not bald, tall, fat, or smart. There are clear cases, boundary cases, and cases where we are just not sure. Even many cases where there seem to be definitive features that give us yes/no answers really aren't as they seem, as "lung fish" and "tomato" show. This is because, in reality, different groups of people with different interests use different classificatory systems.

It seems that "bachelor" is a clear yes/no case. An unmarried man is a bachelor. But, then, many people are reluctant to call the Pope, an old man in a coma, or a man in a committed gay relationship bachelors, male and unmarried though they all are (Filmore, 1975). And, of course, some people regularly now refer to unmarried women as bachelors. Humans have long thought of male and female as yes/no categories, but at the

biological level they never have been and at the social level the whole issue is now heavily contested.

The conclusion: Systems are made up by humans. They were made up and are learned bottom up. And, knowing them does not guarantee they have clear applications in all situations or that their applications will not change and, in the act, maybe change the systems. Both systems and situations are important, but systems and situations are different, though related, "games" we play at two different levels of reality, the level of emerging patterns (bottom up) and the level of found patterns (top-down) that we use until we make new discoveries or find new interests that may undermine them.

Finally, it is clear that when education starts by teaching systems top down both these games are impoverished. Students come to know systems (and pass tests on them) they cannot apply and come to never know the true power of systems as guides to, not substitutes for, practice in the world.

A system is a map. The people who originally drew it, first walked the land. The people who use it better pay attention to the land and change the map where need be. The land does not, like any other part of reality, stay the same. And, if you really want to understand maps, mapping, and mappers, walk some land and make one. There is not a plea for naïve constructionism—where every child is supposed to discover everything anew—it is a plea for learners having an active embodied presence in situations when they learn, use, and remodel systems.

Words and Associations

A word is a material thing (a set of sounds), just like a bird or a rock. But it is also a sign, a thing that has a meaning attached to it that has little or nothing to do with its physical properties. Birds and other things can become signs as well. The Bald Eagle is a symbol of the United States. This has nothing to do with its physical properties (other than the mistaken belief that Bald Eagles are fierce predators when in fact they are also, like vultures, scavengers that eat dead animals). Signs always get their meaning through social conventions, that is agreements among people to take them to mean something.

A word is part of a system—the grammar of a language. Words can combine with other words to make phrases, clauses, and sentences which are bigger signs made of smaller ones. A word has system meaning in the grammar of its language (Gee, 2017; Levison, 2000; Speaks, 2021). The word "democracy" belongs to a word family (a small system) that includes the words: direct democracy, representative democracy, socialism, communism, monarchy, oligarchy, autocracy, theocracy, and others. This nice little family of related words is a mess in reality, since each of these terms is not always easy to apply in practice to actual cases. It is also confusing that socialism and communism are both forms of government and types of economies, thus, also joining into the family of terms like Market Economy, Planned Economy, Centrally Planned Economy, Socialist Economy, and Communist Economies.

At the level of situational knowledge and meaning a word like "democracy" is just a label, in speech and writing and in the brain, for a myriad of associations that are based on the experiences in life one has had (Bergin, 2012). You may associate democracy in the United States with the wealthy buying votes or controlling

representatives; with voting rights acting in the 1960s and 70s that gave millions the right to vote freely or with current state laws that seek to suppress votes; with "the one-click democracy" to which the internet has given rise and which seems at times more consequential than real votes; with voting in countries where voting is restricted to local elections or in other countries where it is often rigged; with how much voting matters given the Gore-Bush election, which was so close, or with how much it doesn't, given the Trump election where he lost the popular vote; with gerrymandering that seems to rig voting or with activism that seems to extend it in the face of opposition. On and on your experiences in life and via media give rise to diverse opinions, much confusion, and lots of fodder for discussion and debate, but no nice neat conclusions. Some will withhold the word "democracy" from the Unites States, others won't, and some people will change their minds. The system of words for government, like so many systems, is more headings for issues, questions, and debates than the nice clear picture it seems when you stay at the level of the system as sets of relations among words.

The associations that you have with the word "democracy" and the phenomena it relates to in the world and media allow you to give different nuanced meanings to the word in different contexts of use. Think about the different situational meanings you might give to the word if someone said any of the following sorts of things to you (try to imagine the sorts of contexts in which these might have been said or which they seem to imply):

1. America is a one-click democracy
2. Democracy is a way of life

3. Washington is the cesspool of American democracy
4. Christian democracy is also a theocracy
5. Free markets are a prerequisite for democracy
6. There is an affinity between capitalism and democracy
` 7. There is no affinity between capitalism and democracy
8. We practice consensus democracy, not majority rule
9. Whitman's poetry radiates democracy
10. In our U.S. democracy the minority rules
11. Democracy is government by the worst
12. A democracy requires literate citizens
13. America is an oligarchy not a democracy
14. Modern Chinese leaders claim that China is a "socialist democracy"
15. The U. S. is not a democracy, it is a republic

Some of these seem like merely factual claims. But a little thought and discussion will show, I believe, they all turn on what you take "democracy" to mean in a given context as much or more than they turn on factual evidence.

Situational Meaning as Paired Ensembles of Language and a World

So far I have talked about individual words and how they are given meanings in specific contexts. This, however, is much too limited. We humans rarely make meaning one word at a time (Hanks, 1995). We make meanings, for the most part, by pairing

evolving ensembles of signs with evolving ensembles of sensations and associations we are experiencing and activating in action and interaction.

Lots of animals have communication systems (Safina, 2020). A sperm whale can use clicks to identify herself and her clan to other whales. Some monkeys have different cries to alert other monkeys to the presence of a predator coming from the sky versus the trees versus the ground. Bees can use a dance to signal the direction and distance to a good source of pollen. In these cases, one animal is trying to get other animals to act. The whale is trying to get other whales to recognize her and treat her a certain way. The monkey is trying to get other monkeys to look for a predator in the sky, trees, or ground and act appropriately. The bee is trying to get the other bees to go get pollen in a certain place.

Humans can use words for similar things. But humans speak or write, in most cases, to guide the embodied associations and simulations other humans will use to make sense of what they are saying, writing, or trying to do in context. This requires not single words but strings of them that help the hearer activate associations in their brains that will go beyond what was said and fill out much wider and more nuanced meanings in terms of the actual situation in which people are communicating and interacting. Words and grammar (which orders words) are cues or clues to help the hearer (or reader) activate old associations or form new ones in specific situations (Halliday, 1978; Hanks, 1995).

As an example of how this works, consider the dialogue below (this example is adapted from Gee, 2017):

Bead: Are you really dead

Allele: Yes, did you get the heart?

Bead: I got the heart—another guy was helping

Allele: Good

Bead: I am standing over your body mourning

Allele: I died for you

Bead: So touching

Allele: It's a long way back

Bead: I know—I've done it

The written utterances in this dialogue make little (system level) sense unless you know that they were written in a chat in a massive multiplayer video game. These utterances were made in the situational context of two brothers playing a massive multiplayer video game and communicating, from two different real world places, via the in-game chat.

The brothers interpret the utterances not in some literal or general way (this is system meaning). They interpret them in terms of the situation they are in, namely, two people, who know each other well, playing a massive multiplayer game. In video games death isn't permanent and your corpse can be seen by other players, even by you yourself as a player, before you get back your (avatar) body and live on.

The brothers give the utterances in this dialogue situationally appropriate meanings in terms of the associations they trigger in their minds. The pronouns "I" and "you" are given meaning here as a reciprocal pair that means person to person, brother to brother, fellow player to player, and avatar to avatar. Each of these relationships are the

source of various associations based on past history, shared knowledge, and the sensations coming from the game.

These associations all interact with each other. Perhaps, Allele's "I died for you" and Bead's cynical sounding "So touching" reverberate for the brothers in terms of other events in the lives outside the game; in terms of the history of their game play in this game or others; and in terms of the roles and skills their avatars have and how they play out in game play. Note that "I" does not mean "speaker" (this is just its system meaning). It means here, in this situation, "a known person, a known fellow player, and a known avatar" each of which—and all of which together—pair with the situational meaning of "you" here.

This dialogue unfolds along with the simultaneous images from any actions in the game. This unfolding ensemble of physical and verbal sensations pair with the unfolding and interacting ensemble of associations that activate in the brothers' brains. In turn, these associations (situational meanings) affect the words and actions the brothers take, giving rise to new associations. Language + Sensations from the world (here the physical world and the game world) interact with embodied associations and simulations that constitute the ongoing interpretations and storying of the brothers' play and, too, lives. It is a dance, the dance of (situational) meaning.

Weakness and Strength in Different Types of Understanding

Something interesting happens when a third party reads the brothers' dialogue, as I and readers of this dissertation are doing. Such third party readers ("overhearers" of a sort) will use the words to trigger associations based on their own lives, knowledge of

games and gaming, and whatever they can learn about the context. The associations they activate or form newly from their attention to this dialogue (and my discussion around it) are their situational meanings, meanings which can change as they find out more about the situational context the brothers were in and/or about their lives and relationships.

Such third-part meanings are essential to reading, whether fact or fiction, and viewing, whether of media or of cultures we are not a part of. They are the foundation of journalism, the humanities, history, anthropology and much social science. Yet they are "third-hand" and quite vulnerable (Trilling, 2000).

Situational meaning is at its best when you were actually there and participating. It takes a great deal of effort—and empathy—to recover even part of it. After the fact, it is difficult to recover all the situated lived meanings that made the moment what it was. After the fact, we are interpreting at third-hand. This is the plight of the human sciences, the fields that seek to understand humans and not just be humans. For the most part, these fields were not "there" and cannot be.

However, this plight of the humanities is a necessary one. We have seen that humans, in action on the ground of communication and interaction, often deceive others and themselves and work to create a divide between "us" and "them" as a form of social bonding. The weakness of third-party interpreters can sometimes mitigate the weaknesses we humans have and damage we do in the wild, since third-party interpreters can, at their best, offer us all a bigger picture, a wider view that is hard to see here and now on the ground of practice.

Situational communication requires people to use shared experiences to make sense of each other. However, if two people share a great deal of experiences in life, there

may well be very little new they can learn from each other. They will make all the same inferences and associations. On the other hand, humans who share too few experiences in life with each other may not be able to get on the same wavelength and communicate well with, and understand, each other.

The sweet spot is when there is enough common ground for understanding and enough diversity to allow newness. This sweet spot requires a different sort of communication. It requires trust, time, care, and sometimes raising to the meta-level to discuss differences in interpretations and associations. It often requires consulting third-party accounts of humans, their institutions, social groups, and cultures. It requires, in a deep sense of the term, an education as a participant in a pluralistic public sphere and civil society. This education could have and should have been one of the key purposes of school. The goal of schooling could have and should have been widening the conversation so that all of us can bring more and better associations to new situations where we can learn and change. But if can't be done in school, it can be done, ever more in the modern world, out of school.

CHAPTER 7

A THEORY OF SENSATION

Sensation

The human brain is likely the most complex entity in the universe. Beyond some innate connections, the connections in our brain are largely formed from the experiences we have had in the world and, thus, sensation is the basis of the human mind. Scholars beholden to older models of humans as "rational" will defer. They will say that humans are creatures of signs, symbols, abstractions, and words. But all of these are based on associations from experience as well, as we saw in the last chapter. The great author Borges (2000, p. 117) said it best:

> Words are symbols for shared memories. If I use a word, then you should have some experience of what the word stands for. If not, the word means nothing to you.

Your mind is an elaborate record of where your body has been and, it must be added, who it has been with. Borges is suggesting that words get real meaning from experiencing them as they apply *in situ* in and to the world. Many schools violate Borges' strictures regularly. They celebrate "background knowledge", by which they mean "facts", but not embodied experiences.

However, in the modern world, psychological researchers and "everyday" people think of sensation primarily in terms of vision, not the whole body and all its senses combined. Humans almost always—or certainly they did before the digital age—experience not one-off sensations triggered by one sense. They experience compositions, ensembles, symphonies of diverse outer and inner sensations (Clark, 1997; Pallasma,

2012; Merleau-Ponty, 2012). These composite scenes of sensations come at us in stages, waves, where encounters get resolved at different rates and in different ways. Sensation unfolds in time and in space. And we move with it.

Furthermore, the modern world tends not just to oversell vision, but one type of vision: spectator vision where we stare at a thing, person, view, screen, or manufactured image as something apart from us. There is nothing inherently wrong with this sort of vision, but when it used constantly for quick hits of titillation, or involves detachment or even disdain for what is being stared at, it can diminish the self or the object of the gaze or both.

What appear to be single senses are often not. Vision takes in color and motion and also information about texture. It combines with bodily motion to give us a 3D sense of the world. Taste is a product of taste buds and smell. We also have smell and taste sensors in our gut, not only in our nose and mouth. When we sense the world we always also sense our own body and feelings and emotions within it. All sensation, save in laboratories, is multi-sensory at all different levels.

Humans are not, in their daily lives, for the most part, standing still and spectating, save for those bound to media screens. This is not how we sense, for example, when we are hiking and watching the ground so we do not fall, yet still taking in the surrounding nature. It is not how we sense when we are in bed hugging a loved one with eyes closed and windows open. Here there is no detachment and no distance. We, as a self, are "in the midst of the situation".

While our modern high-tech media-driven world often focuses on the spectator's gaze, most sensation that sustains us as living creatures is sensation "in the midst", which

is “complementary sensation”. The word “complementary” means that two things combine in a way that enhances the qualities of each other, make each other better, or, at least, enhances one without harming or diminishing the other.

Imagine two scenes. In the first scene, simply picture yourself staring at your loved one. In the second, imagine reciprocally holding, feeling, touching, seeing, smelling, hearing, and moving with them in love, with cool air and sweat on your skin, your insides in commotion, your feelings and emotion afire, yet peace, trust, and safety reign in your soul. The former is spectator vision and the latter is complementary sensation. The latter has been the norm for humans as animals and it is still where good bodies, minds, and souls are formed. While we call it “pornography” when people stare at naked bodies they cannot touch, what do we call it when students at school spend their time staring at images and words they cannot and have not experienced as sensorial experiences in the world?

As opposed to “complementary sensation” there is what we can call “subtractive sensation”. By “subtractive”, I mean that two things come together and one or both are diminished rather than enhanced, made worse, rather than better. When people are forced by dire circumstances to be immersed in terrible situations, this sometimes brings out the best in people who seek to mutually support each other and it sometimes brings out the worst in people who seek to exploit others.

When the Siege of Sarajevo was taking place (Junger, 2016)—one of the longest and worst in history—some people found great solace and hope in how people pulled together, all now in the same sinking boat. When the Siege lifted and things went back to normal, some people said that the bad times were, in a sense, better because before

people were there for each other, not divided by status. On the other hand, as is the case with humans, the Siege also brought out the worst in some people who harmed others to ensure their own survival. For some, a terrible situation, nonetheless, involved complementary experiencing and, for others, it involved subtractive experiencing.

So, complementary sensation does not always arise in good circumstances and subtractive sensation does not always make people "feel bad" right away as many have experienced in relationships they have come only too late to see as mutually toxic. The important issue is whether the body and world relationship is leading to enhancement or diminishment.

Early humans saw nature as alive. They conversed with the spirits within mountains, trees, rivers, and animals. Much modern work shows that nature—like a babbling brook running through a forest—has a calming effect on humans, lowering their anxiety and helping mitigate the inflammation stress and anxiety can cause (Kaplan & Kaplan, 1989; Smith, 2020). This calming effect can lead people to see nature as meaningful, valuable, and worthy of respect and protection. Great architects design buildings and spaces that invite and entice us to enter and linger. These and many more are forms of complementariness. If a person looks at an ancient tree (Wohlleben, 2015) with no sense of homage and no feeling of wonder then the sensation is not complementary for her. It may be subtractive or just inert.

So, I will not discuss sensation as individual senses. I will leave that to psych labs and here talk about sensations as ensembles. I use the word "ensemble", just as I do the word "tension", because I take guidance from music. Music is language stripped bare. As Horace Engdahl, then permanent secretary of the Swedish Academy, said when Bob

Dylan won the Noble Prize for literature: “If people in the literary world groan, one must remind them that the gods don’t write, they dance and they sing” (Kanigel, 2021, p. 24).

Sensation: Not One Sense At a Time to World, but Whole Body to World

The world “out there” is only known in terms of the senses that a creature has. Different creatures have different senses—similar ones that work differently or completely different ones—and so they sense only a small part of the world. The world is replete with patterns, things that, in one way or another, are connected. Patterns are what any and every creature seeks and finds—though different ones—in their encounters with the world (Eagleman, 2020; Lent, 2017; Margolis 1987). The connections among things in the world are infinite. No creature could, will, or needs to discover them all.

Any creature, according to its kind, needs to discover the patterns in the world that are important to it. These are the ones that must be discovered if the creature, given the type of creature it is, is to survive and flourish. The patterns that any creature discovers are only a very small part of what is “out there”.

Any species of animal that failed to discover the patterns relevant to its own survival are gone. So, every animal is, in a sense, a map or record of the patterns in the world that are there and relevant to them as a species and as an individual. As we have seen, they all store inside themselves a web of associations (as a set of neuronal connections) that is a map of *their* world, of the patterns and sub-patterns that matter to them.

Humans, like all other animals, learn from experience (that is where they build their associations/neural connections from). We traditionally think of sensation in terms

of separate senses and define it as visual or auditory or something else in terms of one of our sense organs. But this is not how the human brain or human sensation actually works.

Brains crave patterns and will work endlessly to discover them (Seligman et al., 2016). A brain does not care which sense brings it "data" from which to search for patterns. In fact, since all sensory information is transmitted to the brain as electrical signals, it all looks the same to the brain (Eagleman, 2020).

Humans rely on their eyes to send data about the visual world (3D space) to the brain. The eyes evolved to be good at this and we call the area of the brain where they send their data the "visual cortex". Similarly, our ears send data from sound to the "auditory cortex". This makes it sound like the visual cortex is specialized only for vision and the auditory cortex for sound, probably because that's the way we humans would build a machine. But the cortex is not specialized in this way.

A person born blind can learn to see through echolocation, much like a bat, and "see" the world in 3D that way. They can make click sounds with their mouth and listen for the returning echoes. This way they can learn to identify the locations of objects in space. How "visual" this is to a blind person sighted people cannot know, but echolocation appears to allow them to operate in space, including identifying objects, better than humans with their eyes.

In 2000, scientists at MIT redirected inputs from a ferret's eye to the ferret's auditory cortex (Sharma et al., 2000). Visual data went to the auditory cortex, the part of the brain that normally deals with sound. One might expect that the auditory cortex would not know what to make of visual data. However, the auditory cortex made connections among its neurons from this visual data that resembled the connections the

primary visual cortex would have made. The rewired ferrets interpreted inputs to the auditory cortex like normal vision. The same thing could have happened in reverse. If data going to the ferret's ear was sent to the ferret's visual cortex, the visual cortex would have made all the necessary neural connections to map the world of sounds, not vision.

This tells us that the visual and auditory cortexes are not fully specialized for visual and auditory data from the world. The reality is that the whole brain is hungry to find patterns and any part of it can, if need be, take over the functions of another part of it. In a sense, the whole human body, inside and out, our brain and all our internal organs, is our sense organ and pattern recognizer.

Scientists are now able to make substitute senses for people. For example, there is a small device called the BrainPort (Bach-y-Rita et al., 2005; Sampaio et al., 2001). It is a small grid of electrodes placed on a blind person's tongue and connected to a camera attached to the person's forehead. The electrodes deliver small painless shocks to the tongue that correlate with the position of pixels on the camera's screen. Bright pixels on the screen are encoded by strong stimulation at the corresponding points on the tongue. Gray pixels are encoded by medium stimulation and darkness by no stimulation.

Users first feel the tongue stimulation as edges and shapes poked on the surface of their tongue. However, with practice, they learn to recognize the stimulation in a visual way. They feel they are sensing distance, shape, movement, and size as out in the world, not on their tongue, just as people who see with their eyes see what they see as out in the world not on the surface of their retina.

Studies have shown that the motion of the shocks across the tongue activate a brain area normally involved in visual motion. One blind person who had become adept with the device had this to say (Eagleman, 2020, p. 70):

> Last year, when I was up here for the first time, we were doing stuff on the table, in the kitchen. And I got kind of a little emotional, because it's thirty-three years since I've seen before. And I could reach out and I see the different-sized balls. I mean I visually see them. I could reach out and grab them—not grope or feel for them—pick them up, and see the cup, and raise my hand and drop it right in the cup.

The tactile input does not, of course, have to be on the tongue. It could be almost anywhere on the body. The brain does not care that a blind person avoided an object in space because she "heard" it via echolocation or sensed it on her tongue but did not see it with her eyes. All the brain cares about is that the object feels as if it is "out there" in 3 dimensional space so the person can navigate.

If we want to understand the role of sensation and experience in forming the human brain, then we need to understand the relationship, in space and across time, of a whole body collecting information in any and all ways it can and a brain that receives it but does not know or care where it came from. The brain seeks to find any and all relevant patterns it can in the data the body, as it moves in the world, sends to it (remembering that there are parts of the brain that are not in the head, but across the body as a whole).

So, instead of taking a person staring at an object as typical of sensation, think of how a basketball player driving towards the net is automatically and unconsciously using every bit of sensory information she can and all the internal patterns she has discovered and incorporated inside her as embodied associations. When sensation works at its best,

the world and the body are coordinating, collaborating, and are together the effective actor.

Designed Affordances

We have said that creatures seek not just for any old patterns in the world, but for ones that are relevant to their survival and flourishing as individuals and creatures of certain sorts. Let's, following J. J. Gibson (1977, 1979), call these patterns "affordances". Affordances are those patterns in the world that the creature, given its capacities as an individual and as a species, can effectively use for action. Affordances are invitations from the world that can only be accepted if you have the "right stuff" to make use of them.

Anyone who has watched a squirrel scamper across the tree tops knows that tree limbs are an affordance for running and jumping for squirrels, an invitation that they can readily take up. They are not so for us poor humans. Creatures orient to the world in terms of affordances.

Now some animals, humans among them, can do something very important. They do not have to just look for and use the affordances the world offers. They can make things and place them in the world to create new affordances for themselves and their fellow creatures. I will call these **designed affordances**.

The air is an invitation to fly that a bird can take up, but humans cannot. But humans can make a plane and put it in the world where it serves as an affordance to fly for humans. Most animals actively change the world so as to make new affordances for their actions towards survival and flourishing. Bird nests, termite mounds, gopher

tunnels, bower birds' bowers, ants' pheromone paths, and the tools crows and chimps make are all examples. Indeed, there are hawks that will pick up a burning stick in a grass fire firefighters trying to put out and toss it in an unburned area to start a new fire and eat the insects that flee from it (Meiburg, 2021, p. 9).

No animal has, however, made more designed affordances than humans. Humans live in a world where they can easily, in the right contexts, nearly forget the natural affordances of the world and see only designed ones. And, of course, they also have the very special capacity to design invitations for themselves and others to do stupid things that imperil them and other living creatures.

Designed Experiences

Humans learn from experience and experience wires their brain. In a great many cases they learn what to attend to in an experience—what is relevant—through different social groups to which they belong, starting with families. These groups—whether families, communities, religious groups, shared interest groups, or whole societies—create designed experiences that will help ensure their members share values and practices in regard to what is relevant and what should be attended to in experience. The designers here are people like parents, teachers, artists, and media designers of all different sorts. Designed experiences are a form of designed affordances where affordances are built not just into a tool (like a hammer), but into the very way we engage with experience. Designing experiences is the ultimate form of teaching.

Every human has had limited experiences and limited access to social groups. So, all of us need others to design experiences to teach us new ways to matter and care, ways

that lead us toward better flourishing. In human history there have always been those who take it upon themselves to design experiences that make others flourish beyond the narrow confines of the social groups birth and circumstance gave them. These are people like artists, architects, composers, media designers, and teachers whose job is to design new experiences for others that will open new worlds of experience to them and, thereby, change their minds and bodies.

Today, modern technology allows for new and very powerful ways to design experiences for others. These ways can be used for evil or good, for trivia or substance. In our imperiled world, beset by environmental, political, religious, nationalistic, and militaristic disasters, there is a dire need for good designers to change all our minds in ways that allow us to flourish, not at the cost of others and the world, but with them.

We live now in a world where human stupidity and selfishness is endangering all life, not the least, human life. It is time for teachers as designers of experience to take up the gauntlet. It does not matter whether they call themselves artists, architects, media designers, or teachers. In the end they are all teachers.

Note. The terms “designed experience” and “experience design”, both have, unfortunately, several different meanings connected to different constituencies. One group uses these terms to discuss ways to make people’s interactions with technology or products a good experience in terms of ease of use. Another group uses these terms to discuss creating experiences around a product or service that motivate people to buy them and see them as part of their identity or life style. We are not using these terms in either of these senses.

What we mean by designed experiences are experiences that have been designed to help humans form and change their web of associations so that this web is better for their own flourishing in a world where other humans and other living things can flourish as well. Sending someone for a walk in a forest is simply to send them out to have an experience, come what may. Sending them on a guided trail with informative signs is to send them into a designed experience where its design features are meant to guide and mentor them to care and pay attention in ways that we hope makes the experience good for learning, development, and flourishing. And, good, too, for enhancing future experience these people will have on their own.

CHAPTER 8

ATMOSPHERE

Atmosphere

A living being's boundaries are always transacting with the world, taking things in and letting things out. To survive, the living being has to ensure there is a balance, that the right sorts of things are coming in and going out in the right proportions so that the being can survive. When this balance is upset, the being must act to regain its balance before it dies. It must proactively change the state of the transactions going on at its borders.

To ensure balance, a living being must be aware of where its boundaries are in the world at any given time and place and what the state of balance is between the being and the world is at those boundaries. Let's call this awareness of where a self's boundaries are and what their state of balance is, at a given time and place, a **sense of placement**. Any self must be able to sense how well placed it is and must act on the basis of these sensations when necessary to maintain, improve, or restore balance.

A sense of placement in the world is manifested as a whole body multisensory set of feelings at the skin and within the body, a sensation that I will call a sense of **atmosphere.** "Atmosphere" is a word suggested by the Finnish architect Juhani Pallasmaa (2012).

When the weather dramatically changes, you immediately and automatically sense the implications of the change—a change in your placement in the world—for the integrity of your boundaries. When the sun is out, the sky is clear, birds are chirping, and light is radiating the world with vibrant colors you feel one way about your placement in

the world and when clouds roll in threatening rain and wind and things turn dark and colors fade to gray, you feel another way. These feelings are whole body feelings (often triggering emotions as well). The reactions of all your senses are combined into one gestalt. And they are a reaction to the world sensed as a gestalt, not yet sensed in terms of specific details, which come later.

The way selves respond to weather is much the way they respond to any placement in the world. So, we can use the word "atmosphere" here more broadly, as English already does. When you cross from a rich neighborhood into a poor one, your sense of atmosphere and its implications for your wellbeing change, just like they do for weather. You will not, without further attention, be able to say anything much about details—it was a change you felt in the relationship between yourself and the world.

Perhaps, it is not surprising that English uses the words "climate" and "atmosphere" literally for weather conditions and figuratively for other sorts of environmental, social, and situational conditions. There is something similar about them even at the biological level.

Awareness of, the sensing of, atmosphere is a "big picture" sort of immersion in or coupling with the world. It can lead to a desire to enter into further experience that will resolve the atmosphere into more details or a desire to flee from it.

Atmosphere is immersive in a wholistic way, a way we can call "atmospheric immersion". When the atmosphere successfully invites us in, we enter a different form of immersion, what we can call an "in-the-midst immersion". In this mode, atmosphere resolves itself into parts and wholes, details and clusters of details. Atmosphere, as a

gestalt, however, often lingers in the background and sometimes returns in full to the foreground when we are in in-the-midst immersion.

While humans have an innate need to feel safe and secure, and often use their sense of atmosphere to judge whether things are safe, they are not always and everywhere turned on by a sense of complete safety. In real life, humans are often energized by a sense of atmosphere that is inviting, but still evokes mystery or even a sense of some risk or challenge (see Chapter 9).

Video Games and Atmosphere

The term "atmosphere" is often used when designers or players talk about video games. As with other aspects of sensation, video games are a good place to study atmosphere. This is so because video games are a designed world wherein players can have experiences much like they do in the real world. The player, often via an avatar (a surrogate body), senses, feels, chooses, and acts in a virtual world. As in the real world, players feel they are "immersed" in the game world. They feel a certain sense of atmosphere when they begin the game, and as the game moves to a new level, a different atmosphere may arise and players will quickly feel that too. Players rely on this sense of atmosphere to guide them as they go on in the game. The atmosphere of the game leads players to immerse themselves "in the midst" as actors in the game world or, if the atmosphere turns them off, quit the game.

Here is what Matthew Bentley had to say on *Game Developer* about atmosphere in video games (Bentley, 2013):

> ... atmosphere is the feeling that is touched upon by only that particular combination of imagery, sound, music (or lack thereof), story, gameplay and the sense of agency which games are so well-known for. It is a sense of immersion within the game world, but is not principally composed of immersion alone. … It is the odd yet essential "X-factor" of games, the incongruous immersive edge that comes from the right combination of elements, in the right way. In the same way that the right key unlocks the right door, a good game can get access to our imagination via the right atmospheric engagement. Games seem to do this extremely well, because they involve the player as an active and integral part of the world-being an agent in the world has the power to immerse ourselves more in the feeling of it more fully than with a film, a TV program, or a novel, if done right.

Atmosphere in a game operates like it does in the real world. The atmosphere of the game world, like that in the real world, triggers our sense of safety, mystery, and danger, as well as the overall "feel" of the game. Depending on the game and how good it is, the atmosphere of a game can draw us in or repel us in different ways.

Atmosphere is an invitation to situate yourself in the game world in a certain way at a given time and place. The way you situate yourself affects your choices and how you proceed. Should I move with caution or jump right in? Should I be a child at heart or a serious adult? Is something off or odd or is this pretty "normal"? Is this familiar or quite unfamiliar? What can I expect here? Do I want to be here? And, of course, as in the real world, atmosphere can change in games and, when it does, players sense it immediately. We might say that atmosphere is the player's initial orientation to the game (or a part of a game) in terms of how the player should go on to feel and respond, predict, expect, and act.

Atmosphere in a game can be so replete and filled out that little is left to the player's imagination. Sometimes it can feel imposed. Or, the atmosphere can be so confusing that the player really does not know where she is or what is expected of her or

what might come at her. The sweet spot is in the middle where the atmosphere is rich enough to trigger feelings of placement, but not so rich that it does not invite the player to contribute to it with her own personal feelings, emotions, and imagination.

Here is Matthew Bentley again:

> The single largest constructor of atmosphere is the player's imagination. But that imagination has to be fed, and nurtured, via the game - specifically, the game has to allow gaps or 'space' for the player's mind to fill in. If you say too much, you leave no room to breathe. You have to create enough space for the player to be partially-process-oriented in the way their brain processes the game, as opposed to 100% goal-oriented…Modern games tend to detract from atmosphere principally by leaving no cognitive gaps - there is too much infinitude of stimuli and too much given away - not necessarily plot-wise, but in terms of an unwillingness on the part of the designers not to constantly bludgeon the player's subconscious with detail.
>
> Interestingly, there are corollaries to this gap between detail and emotional imagination in all fields of art- but again, more on that later.

While games are a particularly good place to study atmosphere, all designed experiences have some sort of atmosphere. A classroom does, as do buildings, novels, paintings, dance, and movies. The classroom, in fact, shares with video games the power to make the student an agent in the world, though sadly many do not, certainly not at the level of participatory immersion video games create.

In education, we most often use the term “atmosphere” when talking about classroom atmosphere, for just the sorts of talk and social interactions going on in the classroom. This misses the fact that classrooms like a forest or a video game are a “world” filled with sensations of all different sorts interacting with feelings and emotions of different sorts. For some people, just the image of a traditional classroom, without any talk or texts or interactions, turns them off.

There is a phenomenon where players purposely ignore the full atmosphere of a game world and its invitation to enter it and experience the game in a different way. This is so in e-sports, competitive gaming. When players are competing, they ignore any elements of the game—most of them connected to the game's atmosphere—that do not contribute to success in the competitive aspects of the game. They don't want to hear music, but do want to hear footfalls alerting them that an enemy is nearby. The colors and shapes, textures, and movements in the game are all irrelevant unless they relate directly to the task at hand. Players will even turn down the quality of the graphics if this allows them to pay better attention to the competitive aspects of the game.

What is happening here is that professional players have ceased to allow the atmosphere of the game to orient them as they enter into in-the-midst immersion. They are focusing only on the action aspects of the game, the ones that serve their narrow purpose of winning. Competitive players do orient to the atmosphere of the competitive event they are in, but ignore or turn off many of the elements of the game that constitute atmosphere (and an invitation to an in-the-midst immersion in game play within that atmosphere) for other sorts of players. The virtual world of the game has become subsidiary to narrow goal seeking and its atmosphere has been drained.

Humans can and often do orient to the real world this way, as well, often, too, in the service of competition. Let's call this orientation a "functional stance". Players who are not primarily oriented to competition take a wider and less single-minded focus orientation to the game and its world, as we do when we are at play in the world.

A competitive player is giving meaning to elements in the game world from an outside perspective based on a specific human activity, here e-sports. A player engaging

with the whole atmosphere of the game world and its eventual resolution into more specific parts and wholes gives meaning to all the elements of the game within the context of the game world itself. In the former case, the game world is subordinated to the values of another activity. In the latter case, the immersion in the game world is the activity and the game world is not subordinated, but lived in.

These two stances are important to all human activity in the real world or alternative worlds. Students in school doing mathematics can take a functional stance and orient entirely to getting the right answers on tests—a form of competition. Or, they can take an immersion stance where they live in mathematics as a world of sensation and patterns, aesthetics and wonder, where meaning is not assigned by a test, but by one pattern's relations to all the others. If you look at a game like *Dragon Box*, a game that teaches young people algebra, you see that immersion in its atmosphere is key not just to learning to solve equations but to know what they mean and why they are wonderful.

When students are asked to identify the theme in a poem, they are being asked to take a functional stance on the poem. Poetry is an integration of a great many features of language that cohere and resonate with each other. Detaching theme from the ensemble of which it is a part is like detaching the heart from a body. What you now have is a dead heart and a dead body, not a living body with a beating heart. This is good only if you want to study the anatomy of hearts that aren't functioning.

When humans take a functional stance to nature—for example, seeing it as a set of resources to extract—they can detach themselves from nature so much that they miss the unsustainable damage they are doing to nature and, thus, even to their functional goals. When people too often take a functional stance to other people—use them for their

own goals and purposes—they can miss the unsustainable damage they are doing to civil society and, thus, even to their own position in society as it fractures into competing identities.

We have seen that immersion in some things, like competitive gaming, resource extraction, and school can detach you from other things like games as games, nature, and school subjects as lived practices outside of school. This certainly does not mean humans should never take the functional stance, but only that they should beware what they are missing when they drain one domain's atmosphere in service of another domain. If you are not careful you can drain transcendence, even awe, from one domain in the service of trivia or exploitation.

Sensual Ensembles

Sensation and experience are the foundations of the brain, learning, development, and mental and physical health. Sensation is not a one sense at a time thing. The temporal and spatial sequences of sensation that constitute experience are ensembles composed of integrated and interacting sensual parts.

So, let's see how this works: On a windy rainy cold day, you are standing in a forest near a rapidly flowing stream. Your sense of atmosphere has been inviting enough to entice you to enter into the experience further. The sensual gestalt of atmosphere begins to unfold into patterns and sub-patterns, parts and wholes, flows and momentary stoppages.

You feel a chilling wind on your skin and in your nose and ears; you smell damp air with scents of humus and minerals; you hear the roaring of the wind with the rush of

the brook a feint undertone beneath it. Late Fall colors on leaves swaying on branches form a canopy over wet tree trucks, fallen tree limbs, and a dark green underbrush of mixed unruly vegetation. In the midst of it all, the surging brook flows across dark stones embedded in the muddy brown leaf-encrusted stream bed with turbulent white caps dancing across the larger stones.

This is a situational sensual ensemble. Situational because it is here and now. It is concrete and present, not abstract or general. All your senses are working together like a musical ensemble (e.g., an orchestra, jazz band, or quartet). In a good musical ensemble, the music is more than the sum of the parts of the individual instruments. Each instrument in a good ensemble is not heard as an isolated part of it, but, rather, each instrument is both played and heard in relation to—as a response, adaptation, invitation to—the others.

So, too, in our situational sensual array. The parts are not isolatable units because each is defined by its relationships to everything else in the scene. And each is connected to our sense of atmosphere as it lingers or returns in full in the flow of experience.

The words above that are meant to indicate the situational sensual ensemble you are experiencing in the forest are, of course, not adequate to capture it. Sensation is a matter of subjective feeling, not words. As you are experiencing this situational sensual ensemble there is another ensemble going on simultaneously. This is an ensemble of internal sensations. The external or outer situational sensual array is matched by an internal one.

You, the experiencer, are a self. You are moving through time and space and defined by that movement. Your inner response to your outward experience is formed by how you view and feel about your past as a human, as a member of social and cultural

affiliations, and as a unique individual; by how you tell and feel the story of your life and connect this present experience to your past and future. It is formed by the emotions that arise and change in the experience as a temporal event and how they connect to your sense of self. It is formed, as well, by all the experiences you have had previously and all the memories and fantasies you have built from them. Some of these things you sense here and now and some you call up to awareness as needed or as called forth by the temporal progression of your outer and inner sensations.

These two situational sensual ensembles constitute a sensing embodied inner self confronting and coupling with the sensuality of an outer world. Confronting not "the" world, but "a" world. Humans sense the world differently, sometimes dramatically differently, than do other sorts of living beings. They sense the "human world", not "the" world. And each of us, based on our social, culturally, and unique trajectories through space and time, sense our own "personal world", not just a panhuman world.

The only reason for distinguishing between the outer and inner ensembles—and not just referring to their coupling as the main ensemble—is that the whole process of coupling is dynamically changing through time and through space (if the self is moving or even just changing the focus of attention in space). Imagine two musical ensembles playing side by side, gradually melding with each other to form one bigger ensemble, but rearranging itself through time by adding new members to each ensemble and to the every changing bigger one as well (new outer sensations and new inner ones). Yes, there will be dissonance and harmony and transitions and tensions between the two. This is the dance, the music, of sensation, of living.

In the ever-changing inner-outer coupling, both parties—self and world—are proactive. The self seeks sensations and the world entices the self to pay attention, to see and feel, in certain ways. This proactive partnership is the result of evolution. Each type of living being has evolved (and humans have been culturally modified and supported) to seek certain things and be enticed in certain ways by their worlds. These themes and their relationship to cognition will be the subject matter of Chapter 14.

CHAPTER 9

BALANCE, TENSION, AND RELEASE

Harmony/Balance

Any living being uses sensations from the world and internal sensations from its own body to continually adapt to changes in its environment. The creature's environment changes; in response the creature changes; and the ways the creature changes often include modifying its environment. Creature and environment are dynamically coupled and reciprocating.

The most primordial sensation for a self is a sense of wellbeing, i.e., a sense of balance, equilibrium, harmony with the world (this is an elaboration of what we earlier called a "sense of placement"). Theories of evolution stress wellbeing in terms of survival. But, in reality, selves, whether human or not, orient towards flourishing, not just survival, unless the best they can do is survive (Spolsky, 2001).

Selves can achieve balance or harmony too soon in the sense that the balance and wellbeing they have achieved while adequate to survival is not as optimal as it could be for flourishing or greater flourishing. When complex systems—and selves coupled to environments are complex systems—achieve sub-optimal states of equilibrium they must be "shocked" or jolted out of them (Mitic, 2019; Mitchell, 2009; Waldrop, 1992) and this is, for humans, a major function of art and imagination (see Chapter 11). The jolt leads to new tensions and partial resolutions that constitute a journey to a better, more flourishing, sense of harmony and wellbeing.

Both the Chinese critic Wang Guowei (Rickett 1977; Yeh 2019) and the American-British poet and critic T. S. Eliot (1921) argued that true harmony in art is

achieved by what Wang called “ching chieh” and Eliot called an “objective correlative”. Paraphrasing Eliot via Guowei we can say: The artist correlates or balances or harmonizes a depiction of a realm of experience (ching)—a set of objects, a situation, a chain of events—and an emotion evoked by this realm of experience (chieh). The artist creates this balance so that the two fit together (belong together) perfectly in an immediately felt or intuited way. The two become one—the outer world (ching/objective) and the inner world (chieh/correlative) become two sides of the same coin.

Wang Guowei expressed the purpose of art this way (in our modified translation):

> When great writers express feelings they penetrate to the core of a person’s being. When they describe scenery they broaden a person’s auditory and visual powers (Comment 56, Rickett, p. 64).
>
> Therefore the reader of a poet with ching-chieh is raised to lofty heights, longs for that which lies far distant, and is possessed of the idea to go beyond the ordinary world. (Comment 123, Rickett, p. 92)

Harmony between “world” (words, things, images, scenes) and feeling and emotion in art is meant to inspire a search for a deeper sense of belonging to the world that is our first and only home. It is also to move humans beyond their outer world as sensed in daily life and even their imaginations as bounded by that life. It is certainly true that not all art or media—not much of it, really—can meet the exacting standards of Wang and Elliot. But we can ask of art and media both that they try and that, however far they fall from these standards, they enlarge people’s sense of self, their world, and of possibility. This is in service of moving humans from—jolting them out of—their less

than optimal states of wellbeing so that they and the world that they are part of are likely not just to survive but flourish.

Balance and Tension

Allostatic load is a measure of stress (Barrett, 2020). Stress hormones are released when we need extra energy in challenging situations. These hormones become dangerous and toxic to our organs when they are too often activated or stay continuously in the body for long periods of time.

Humans flourish under conditions where stress is held within certain bonds and spaced out in time. The dynamic balance humans need to flourish requires a certain tension between feeling challenged (stressed) and yet, feeling that the challenge is doable and can lead to resolution. Challenge brings tension and resolution brings rest, release, and resolution. Life for any creature who survives, let alone flourishes, is composed of repeated cycles of challenge (tension)—resolution (release) engagements across time that make the creature more and more skilled and able to handle future challenges. This is what, following diSessa (2000) and Gee (2003), I called in Chapter 4 a creature's developing regime of competence.

Cycles of tension and release are critical to any creature's survival and flourishing. Music is a good example because the build-up and release of tension lies at its center. A piece of music, for example, can create tension through changes of intensity and speed. As it gets ever louder and faster, this often creates excitement and anticipation. Flowing with the mighty current of heightened notes, you wonder how far it

can go. Then, all of a sudden, the intensity lowers and the music calms down, releasing the tension. Your feel both the tension and release in your body and your emotions.

The pianist Daniel Barenboim (2009) has argued that playing with less intensity by lowering the volume can also create tension too. And if it is done right, this can be even more effective than raising intensity. Barenboim believes it is through the revelation of the inner voice of each chord that music invites tension and becomes truly powerful. A lower volume calls for a greater need eventually to increase intensity and that is when tension arises. To that end, a unique strategy of his is to play softer when asked for more intensity to build up tension.

Music has a great many ways to create—and play with—tension and release. This is a large part of what gives us pleasure in music, the rhythm of anticipation and resolution which often continues as a cycle. The writing collective *Denver Taste* argues that the dynamic of tension and release is not just the basis of music but of life as well:

> From our biology to our psychology and even to our religious and philosophical worldviews, tension and release are everywhere. Music, then, isn't just some weird tension and release game we play for fun. Instead, it's the purest expression of the dynamic that is essential to all living things. Even to life itself.
>
> By turning back to music, we can actually learn a lot about life itself, since they both have the same fundamental dynamic. In fact, music is the expression of this dynamic in the abstract language of sound. It builds us up, only to drop us down. But hey, that's what life is all about. Not the building up, nor the easing down. But the playing with different tensions and different modes of release, and the experiencing of joy from moving from one to the other.

Any organism survives and thrives on the basis of cycles of tension (challenge) and release (resolution). In between cycles of tension and release, organisms need rest;

they need time to recuperate their resources and, in the case of some organisms, plan for the future before facing more cycles of tension and release. Such periods of rest are, for developing creatures, waystations on a trajectory to new ways to build and renew their bodies and minds, new ways to flourish.

Landscapes

We have been talking about the role of tension and release in sensation in general terms. However, what is primordial for humans is the sensory relationship between humans and nature, a relationship that is often greatly disrupted in modern life.

Research on landscape aesthetics has shown that natural settings and landscapes can produce emotional states of wellbeing in humans (Stuart-Smith, 2020). They attract us to stay and linger or set out to explore. This research has shown that images of urban scenes generally result in negative feelings whereas the opposite is true after viewing images from nature (Hartig, 2008). People shown scenes of cities with trees and other vegetation show less fear and more delight than they do when they are shown scenes of treeless city scenes (Roe et al., 2013).

Considerable recent work on health argues that humans need much more contact with the earth than they normally get:

> Research has shown that taking group nature walks, for example, is linked with lower depression, less stress and better mental health and well-being. Other research has shown that spending long stretches of time in the woods – a so-called "forest bath" – can boost the number of white blood cells that fight viruses and tumors (Miller, 2017).

Like all animals, humans evolved to interact with nature—they need, for their survival, to get from nature not only resources that nourish the body, but resources that nurture learning and imagination. Work in environmental psychology by Rachel and Stephen Kaplan (1989) has argued that humans have certain needs in regard to nature and these needs influence how they interact with nature at the level of sensation, imagination, and behavior.

According to Kaplan and Kaplan (1989), when early humans entered nature, before we had tamed and destroyed so much of it, they wanted their surroundings to be coherent and not confusing; to make sense in terms of parts and wholes; they wanted it to engage them, to be a realm of activity and stimulation; they wanted a map, in their head and later on paper, so they knew how to move around and get in and out of an area; and they wanted mystery, a sense that there were things to discover. These four needs have been called a need for "coherence" (a sense of parts and wholes, how things "hang together"); "complexity" (engagement and stimulation); "legibility" (a map); and "mystery" or "anticipation".

It is clear that these four needs are adaptive in that they would have helped our ancestors to survive and even flourish. They are adaptive for modern humans who are now more than ever isolated from nature in that they lower human beings' anxieties and bring them excitement, imagination, and feelings of competence and of belonging to and in the world.

Mystery is interesting here. In the research it is the most consistent and impactful variable. Humans feel very positive about mystery and eager to engage with it when it is safe, but also a bit risky. They like to be a little bit on the edge. Of course, when mystery

is associated with serious threat and danger, it no longer causes positive feelings in most humans (but there are those who get even more energized).

Mystery is clearly another tension sensation, a dance where we do not want to resolve the mystery too soon, since a large part of the excitement and fun of it is in the process of solving it and not just, or even at all, in having solved it. And, with mystery, there is the tension between safety and risk that at the right level is exhilarating.

Yet it is also clear that the other three needs are tension sensation as well:

We want things to be coherent, to make sense, for parts to form unified wholes, but, perhaps, not too fast and not all at once, since by delaying we might discover new unities.

We want things to engage and stimulate us, but do not want our sense of engagement and stimulation to end too soon, to be too simple, too predictable, to be merely titillating and not inspiring and life enhancing.

We want a map, but we want to discover it and still have some unchartered realms on it. For those who want to linger in nature and not just get in and out quickly, mapping is more engaging than the map it issues in.

These four needs apply beyond nature. We humans have these needs in our encounters with cities and in our social encounters with people. We have them, as well, in our encounters with art, media, and teaching and learning situations.

We want things to make sense, but not to foreclose deeper appreciation and understanding; we want them to be engaging and stimulating, but not to end too soon or be too trivial; we want to have a map or know the rules, but have a hand in making or unmaking them; and we want mystery, but a good one, with twists and turns. And we

want, or should want if we are to flourish, the resolution of all these needs as stopping off points for reflection and refueling before we head off to uncharted or less well charted territories again.

CHAPTER 10

VAGUENESS

Complementarity and Vagueness

In this chapter, I want to look at a principle from language that I will apply more widely to sensation and designed experiences: No communication in language can say everything in words (Gee, 1992, 2004; Hanks, 1996; Halliday, 1978). It would take far too long to say everything we meant explicitly; communication would be too slow. Communication in language always requires hearers or readers to fill in some of the meaning from context and shared knowledge.

However, there is a continuum at work here. While no communication is fully explicit, some communications are more explicit than others. When they are towards the explicit side, the speaker or writer is doing most of the work of meaning making. When they are towards the vague side, the hearer or reader is doing most of the work or the burden is equal.

Communication that is too explicit, that tries to leave little to the hearer's or reader's imagination, can be rude because it can presume to tell hearers and readers what they already know and can easily fill in by themselves. And it can be a form of distrust, assuming the hearer or reader cannot be trusted to understand the message without having the point belabored. Communication that is too vague can also be rude, because it leaves too much up to the hearer or reader and can cause confusion about why the speaker or writer is even bothering to speak or write.

For different communicational purposes and situations, the sweet spot on the continuum between too explicit and too vague is in different places in the middle. We see

here that, in language, vagueness of the right sort is a form of inclusion, mutuality, and immersion in each other's worlds. Like sensation, vagueness can create complementarity.

Vagueness can also be an important source of learning. If I tell or show you what I want you to learn so completely and directly that I leave little room for you to contribute to meaning making with your own powers of association and imagination, then your personal investment in the learning can be weak and you will have formed few permanent associations in your web of associations (Jason, 2017). If I leave space for you to participate in the meaning making, to proactively (perhaps with help) imagine and form new associations to add to your current knowledge, then you have a larger sense of ownership and there is deeper effect on your personal model of the world (Chi & Wylie, 2014).

A certain degree of vagueness requires more active mental processing by the hearer or reader and this leads to deeper learning and longer retention. This mental processing means the hearer or reader has to connect what it is being said or written to their prior knowledge captured in their web of associations.

In Defense of Vagueness

"Vague" is usually a derogatory term. This is partly because vagueness can happen because of incompetence or oversight. But I am talking here about what can be called "strategic vagueness", where vagueness is done artfully and on purpose.

At a deep level, vagueness has long troubled philosophers. An influential strand of work in Western philosophy defines meaning in terms of set membership where any given entity is either in the set or not (Cresswell, 2006; Sigmund, 2017). So, the category

"fish" is defined as any and all things that are in the set of fish. A thing is either a fish or it isn't. Categories have strict boundaries.

This conception of meaning has long been formalized in terms of modern formal logic (van Benthem & Ter Meulen, 2010). In this conception, if it was vague what counted as a fish—there were borderline cases—then we would not know what a fish is and, and most problematically for logic, we would not be able to ascertain whether "this is a fish" is true or false. And true and false are the only two categories in standard logic.

This conception of meaning is, however, unable to deal with the reality that most words in human language are vague, not a matter of clear yes and no decisions. There are borderline cases. How thin, bald, smart, or tall does someone have to be thin, bald, smart, or tall? If a seven foot person is clearly tall, is a six footer tall? What about a 5' 10" person? There is no sharp line to be drawn and there is no definitive set of tall people that can be set up.

In philosophy this problem has often been discussed in terms of a paradox known as the sorites paradox (Hyde & Raffman, 2018). Here is one typical example of the paradox: The property of being a heap is insensitive to small changes. If 10, 000 grains of sand form a heap, then taking one away will not and cannot make it a non-heap. Removing a single grain of sand from the heap preserves its "heapness". However, repeatedly removing one grain after another, we will arrive at the absurd conclusion that a single grain of sand makes a heap. It's a bit like Zeno's paradox.

Wittgenstein (1953), the most important modern philosopher of language, offered a solution to the sorites paradox that is based on his distinctive theory of language. His

solution and the theory have been immensely influential in many different academic areas.

For Wittgenstein, our sort of language is particular to the human *form of life*, as swimming is to fish or howling is to wolves. In human language the meaning of a word or phrase is how it is *used* in context (for Wittgenstein, in the context of "language games"). Language is inextricably tied to action and context. Speakers and writers mold, design, and manipulate language to help them act to achieve their goals and desires. Maksymilian Dabkowski (2018, p. 11) has said:

> In the *Philosophical Investigations*, Wittgenstein observes: "If a lion could talk, we wouldn't be able to understand it" (1953, § 327). The self-evidence of the truth contained in this insight beclouds its profundity: language does not function in a vacuum; it is a medium embedded in a rich world of biological, psychological, and cultural facts. If a lion tells you "you smell nice," you cannot know if the lion is jealous of your scent, is threatening to eat you to make you back off from his territory, or wants to fornicate with you—there are various intentions the lion might have, and thus various responses that might be appropriate. If you ever found yourself in a situation like that, you can be sure the truth-functional content of the lion's utterance would interest you the least.

You would understand the lion if it spoke because you do not share a "form of life" with a lion. You do not share common and socially distributed experiences with the lion of the sort you share with humans. And humans care more about what a fellow human is doing with communication and what its purport is for them than they do about truth *per se* or achieving clear binary distinctions for set theory.

Many people assume that vagueness is just a property of vernacular ("everyday") language, not more formal varieties of language like academic writing. However,

academic writing does use vagueness strategically, as Greg Myers (1996) points out in his article *Strategic Vagueness in Academic Writing*:

> … academic writing takes place within social institutions that require negotiation of complex boundaries: between departments, between disciplines, between academic and applied goals, between academic and popular audiences. From this perspective we can understand some vagueness as strategic, enabling the terms and interests of one group to be translated into those of another group. For instance, a vague name for an approach may allow one to include apparently conflicting authors within it. (p. 3).

The word "fish" in biology, though often used differently than in everyday language, is still vague in the sense of its meaning being subject to context, purposes, goals, and social agreements that may change in other contexts. In biology, if we use genetics, we get a different set of things as fish than we do if we use morphology (structure and appearance) (Miller, 2020). Furthermore, since evolution is gradual there is no definitive way to decide where the first "real" fish arose than there is to say where tallness "really" begins or ends.

Myers argues (p. 12) that scientists need to remain open to further developments. For example, a certain vagueness as to how you state your claims allows your claims to be compared to results in other studies from somewhat different conditions. Or, a certain vagueness between results and implications or a discussion section can allow room for the text to be assimilated to future developments. Thus, interestingly, a good command of how to use vagueness strategically, both in vernacular and academic speech and writing, is an important for native and non-native speakers of a language.

The moral of this discussion of vagueness is that meaning making, whether in language or some other form, is always situated in shared experience, both here and now and in shared or inferred past experiences. Meaning making requires participation, negotiation, imagination, and proactivity. The process can be complementary or subtractive. It can be collaboration or contestation. And what I have said about language here is true for all designed experiences like painting, dance, music, poetry, architecture, media, and teaching.

Du Fu

Now I will discuss a specific example of how strategic vagueness works in a designed experience like poetry. I will use as my example a poem by the great Chinese poet, Du Fu (Hawkes, 1967; Rexroth, 1956) written in Mandarin.

Mandarin is a language that marks syntactic (grammatical) relationships less overtly than English. Linguists have argued that Mandarin is more discourse focused than syntactically focused (Erbaugh, 2019; Li & Thompson, 1981). When a language lowers the focus on overtly marking syntactic relationships, it allows the words and phrases of an utterance to play with each other and associate in different ways with each other, even to create some tensions, before things are resolved, if they are. Chinese poetry takes this discourse focus even further than vernacular language.

Below is a part of poem by Du Fu 杜甫 called “Spring Scene”. Du Fu is considered by many as China’s greatest poet. Spring Scene, composed in 757, reflects Du Fu’s experience of the turmoil and destruction caused by the An Lushan Rebellion, a

conflict between the Tang dynasty and various regional powers. Du Fu is struck by the destruction humans have wrought on each other and their towns and cities amidst the continued survival and even flourishing of nature.

Christopher Tong, in his paper "Nonhuman Poetics (By Way of Wang Guowei)" (2017) offers a word-for-word English rendering of part of the poem below:

State ruined mountains-rivers survive
City spring grass trees thick
Moved by times flowers sprinkle tears
Hating separation birds startle heart

Tong offers various translations of the poem that are meant to capture different syntactic possibilities and thus different interpretations. His interest is in how art treats the relationship between humans and the non-human world and how it could come to present a more equal, less human centric, balance between the two. The time we are living in is sometimes called the Anthropocene—the sixth great extinction of life on earth, this time caused by humans. At such a time, it is surely worth thinking about the relationship between humans and other living things and how they can live in harmony or balance before most of them are extinct.

I will not use Tang's translations here, but, rather, use my own English versions that I hope capture more directly the differing relationships between humans and nonhumans the poem can convey. This is fairly easy to do in English because of its syntactic overtness. I will take just one line of the poem: "Moved by the times the flowers

sprinkle tears". Below are five possible translations of this line. In each of these "translations" (interpretations) we see a different relationship between the distressed human poet and the flourishing flowers in the field.

1. In my deep sorrow, even the flowers seem to weep.
2. In my deep sorrow, the flowers bring tears to my eyes.
3. In deep sorrow, we weep side by side, the flowers and I.
4. The flowers weep at my deep sorrow.
5. In deep sorrow, the bright flowers weep.

In (1), the poet's emotions cause him to impose sorrow on the flowers so they reflect his emotions. This is a human centric world in which the world is a product of human sensation and emotion.

In (2), it is still how the poet senses—is affected by—the flowers that brings him to tears, as in (1), but now the flowers act on the human to make him feel this way; he does not just impose his mood on the flowers.

In (3), the poet feels distraught and the flowers cry (side by side). They are independent of each other but "in synch" with each other, in harmony with each other.

In (4), the flowers cry because of (are themselves distressed by) the poet's distress. Again, they are in harmony, but here the harmony is not just side by side, but caused by the flowers' response.

In (5), the flowers cry because of (are distressed by) the human war, perhaps by the effects human war has on the harmony between nature and humans. This is a flower centric view, save only for the personification of human emotions in flowers.

Each "reading" gets less and less human centric. Is there, though, any reading that could express the equal standing and necessary harmony between humans and flowers without personifying the flowers? Perhaps, that is a new task for art in the Anthropocene.

Du Fu's poem is a very important first step on this task and has much to teach us. The poet uses the powers of Mandarin to let words jostle and play, creating frictions and sparks without any necessary resolution, perhaps suggesting that it is the frictions and sparks—the holding of determinacy at bay—the living with disharmony long enough to imagine harmony without certainty—that might, in the end, bring us to at least a partial resolution that will illuminate a path forward. Poetry and art are much better than academics at this, but academics better catch up, and soon, to make truth, and not lies, the stuff of poetry. A harmony between academics and art may be necessary to our survival as well.

William Carlos Williams

Du Fu's poem is strategically vague and thus allows multiple juxtapositions and interpretations that jostle together and can be compared and contrasted and even added to by the reader's imagination. Mandarin, and Chinese poetry in particular, is good at this. But much the same thing is done in lots of other poetry across various cultures. For example, below is a poem by William Carlos Williams, one of the poets who was central to the Imagist movement in American poetry：

The Red Wheelbarrow

so much depends
upon

a red wheel
barrow

glazed with rain
water

beside the white
chickens

William Carlos Williams, "The Red Wheelbarrow" from *The Collected Poems of William Carlos Williams*, Volume I, 1909-1939, edited by Christopher MacGowan. New Directions Publishing Corporation.

At one level, this poem powerfully creates a specific set of sensations in one's imagination. Yet the poem is also vague—some have even called it cryptic. The reader must fill in *what* depends on a red wheel barrow glazed with rain water beside the white chickens.

People who are unfamiliar with the design features of imagist poetry and how they are meant to guide one's sensual experience of the poem sometimes interpret the poem as about the importance of manual labor, farming, or the relation between humans and nature. But such interpretations do not consider that it is not just a wheelbarrow, or rain water, or chickens on which so much depends—things than can remind us of labor, farming, or nature—it is the full range of images the poem tries to get you to create in your imagination on which so much depends.

The poem asks you to first imagine a red wheel. Then imagine a barrow, which switches the red from the wheel to the wheelbarrow, a new whole. Then you are asked to imagine the red wheelbarrow glazed with rain (painted with rain). Only then are you asked to imagine water and, thus, just as wheel became wheelbarrow, rain becomes rainwater, a new whole. Finally, you are asked to imagine something specific ("the") and white, but you do not know what this specific thing is, so you live a second with just the feeling or imagination of the color white as a thing in its own right. Then you are asked to imagine chickens and, again, we get white transferred to white chickens, a new whole. As in sensation in life, things come apart and recombine as a dynamic process of sensing in time.

The poem is not made of words *per se*—signs—but of images that the reader must create. The poem is about sensation and the importance of the flow of sensations in time and the juxtapositions of sensations in space. It is trying to guide readers to find relevance in experiences in new ways, ways that attend to flow and juxtaposition of parts and wholes, where atmosphere decomposes into more discrete sensations that still remain, as they emerge, elements of atmosphere. The poem is about a way of being in the world, a way of paying attention, a way of using and building imagination, a way of using sensation and experience to build your mind and couple body and world.

This poem has frustrated many a student when it is taught in school (Teicher, 2006). Many students' first response is to say it isn't a poem, that they have no idea what it means, that it is about farming or communism (because the wheelbarrow is red). This is because school often teaches poems as claims or statements, not as sounds and images.

The words in an imagist poem are not there as categories or concepts, but as guides for forming images and sensations in one's imagination and it is these images and sensations that are supposed to guide interpretation, not the words as items in a dictionary. Even "so much depends" is not a claim, but a suggestion that the reader treat the imaginative experience the poem leads to as important (relevant)—the basis of learning new ways to experience the world.

Students are taught to find "the meaning" of a text, to find its "deeper meaning". In poems as texts, they are often taught to search for "hidden meanings", as they are in religious texts. William Carols Williams's poem does not have a deep meaning, a hidden meaning, or really any meaning as claims at all. The meaning of the poem is the images and their flow and juxtaposition that poem guides but does not determine. The poem suggests that sensation is meaning, not a symbol of some other "deeper" meaning. Just as Wittgenstein suggested that the meaning of a word is the uses we make of it in actual situations, so William Carlos Williams is suggesting that the meaning of a sensation or experience is how it feels *in situ*, what it does to us.

Note: See this YouTube video (https://www.youtube.com/watch?v=2BeIBULpknA) for one good explication for what imagist poetry is about and how it fits into the history of art. There are other approaches that would work equally well, but none of them take William Carlos Williams' poem as an essay.

CHAPTER 11

DELACROIX AND VAGUENESS

Delacroix

Eugène Delacroix (April 26, 1798 – August 13, 1863) was one of the earliest and most important Romantic painters. He deeply influenced the later Impressionists by his dynamic brushstrokes and how he worked with color within the overall composition of his paintings (Allard & Fabre, 2018; Jobert, 2018). His disdain for realism and the stress he put on paintings as evocative of emotion and imagination—as well as his ideas about art as teaching people new ways to see the world—have a certain kinship with the Imagists, as well.

Delacroix, for years, kept journals of his thoughts and daily life (Wellington, 1995). The journals are, at one level, a fascinating intimate look into the everyday life of a unique artist in the 19th Century and, at another level, they explicate Delacroix's ideas about art and the world. These ideas stress vagueness and the imagination. Delacroix's ideas about painting as an art form are centered on the power of the sketch and the dilemmas of the final work, which should never be fully finished. Below is a sketch and the final painting of Delacroix's famous painting *Liberty Leading the People*:

Figure 1

Liberty Leading the People (Sketch)

Figure 2

Liberty Leading the People (Sketch)

I will develop Delacroix's ideas about art here using a good deal of his actual words from his journals. His ideas form a nice bridge between what has been said so far about sensation and art and the topics to which I will turn in the next chapter: "complex systems" and the equivalence between being a living being and knowing ("cognition").

Delacroix argues that what we see are not things but things in relationship to each other:

> When we look at the objects around us, whether in a landscape or an interior, we notice that between each of them there is a kind of connection produced by the surrounding envelope of air and the various reflections which, as it were, cause each separate object to be part of a general harmony. (p. 371)

These connections—this harmony—are ensembles of sensation where, like a musical ensemble, the whole is more than sum of the parts. But what makes the ensemble interesting and relevant to the beholder? Delacroix tells us that "In painting … proper justice is done … to what the soul finds inwardly moving in objects that are known through the senses alone (pp. 6-7). So, the ensemble is interesting to the extent that it moves the beholder's soul, whether in the world or in art. The term "soul" here is interesting. Many cultures have taken the soul to be the "breath of life", the vital force that distinguishes living things from non-living ones.

But, then, why do we need painting, or any other art for that matter? Why is sensation and experience in the world not enough? The answer is that artists design experiences for us that teach us how to sense and care—find things relevant—in new ways. The artist does not need to discover new ideas. Delacroix argues that what inspires

an artist is not new ideas "but their obsession with the idea that what has already been said is still not enough" (p. 41):

> You who know that there is always something new, show it to others in the things they have hitherto failed to appreciate. Make them feel that they have never before heard the song of the nightingale, or been aware of the vastness of the sea. (p. 43)

This point is similar to the notions of "defamiliarization" or "making strange"—"ostranenie" in Russian—developed by the Russian Formalist Victor Shklovsky in his 1917 essay "Art as Device" (Shklovsky, 1965). Shklovsky argued that the purpose of art is to make us sense anew things we have come to take for granted. To see them again as strange and, thereby, come to sense them and feel about them in new ways and even question our prior taken-for-granted knowledge (familiarity).

Delacroix sees the figures and objects in a painting, which seem to the viewer to be actual things, as a "solid bridge to support [the viewer's] imagination as it probes the deep, mysterious emotions of which these forms are, so to speak, the hieroglyph" (p. 213). Sensation in the world is always about melding what we sense in the outer world with the feelings and emotions these sensations give rise to in our inner world as they excite our imagination. Good artists see "nature in their own way" (p. 42) and help others, through their art, a form of designed experience, sense the world in a new way that enhances their imaginations and amplifies their emotions.

The artist seeks to design a new sensual experience and connect it to new feelings and emotions and, in turn, help the viewer to bring these new sensibilities back to

experience in the world and the formation of his or her web of associations. The artist helps build our minds (our web of associations, our model of the world) anew.

How can art do this? Delacroix explicates how painting, in his view, does it and then compares this with how other art forms do it. His theory of painting is based on an ingenious comparison of the artist's initial sketch and the final painting. He points out that a sketch for a work—the initial rough drawing from which the painting eventually comes--gives us pleasure because "each beholder can finish it as he chooses" (p. 183). This is because the sketch is vaguer than the final painting and, thus, leaves more room for the active work of imagination on the part of the beholder:

> Here we come back, as always, to the question of which I have spoken before: the finished work compared with the sketch—the great edifice when only the large guiding lines are visible and before the finishing and coordinating of the various parts has given it a more settled appearance and therefore limited the effect on our imagination, a faculty that enjoys vagueness, expands freely, and embraces vast objects at the slightest hint. (p. 216)

For Delacroix the "first and most important thing in painting is the contour" (p. 28), the overall gestalt or ensemble of the painting's elements. The sketch is the highest expression of the artist's idea not just because it suppresses less relevant details, but because it subordinates the details to "the great sweeping lines that come before everything else in making the impression" (p. 239).

Delacroix is not saying that the details or elements of the sketch or final painting don't matter—indeed, he argues that such details "make up the composition and are the very warp and weft of the picture itself " (p. 239). Rather, he is arguing that details have to emerge out of the overall composition—the harmony of elements in relation to each

other—and do so in a way that never leaves them isolated from the set of relationships from which they have emerged and to which they return as the beholder sustains his or her sensual attention to a painting.

Given the power of the sketch, then, why bother finishing the painting? As the painter adds more details to the painting—rendering it less vague—the painter risks losing the proactive work the beholder does in filling in aspects of the sketch based on his or her imagination. The painter risks dominating the beholder's imagination in the way didactic teaching often does and, in the act, leaving the beholder unmotivated to proactively process the painting:

> … an artist does not spoil a picture by finishing it, but when he abandons the vagueness of the sketch he reveals his personality more fully, thereby displaying the full scope of his talent, but also its limitations. (p. 183)

The art of the final painting is a test of the artist's skill. The artist must suppress certain details and enhance others—while still leaving a degree of vagueness (so the goal is not "realism")—in the service of a gestalt that subordinates the details but in ways that enhance them as members of an ensemble and not as isolated units. It is a very difficult balancing act in which the artist seeks to fill out the sketch with his own imagination while still leaving room for the creative operation of the viewer's imagination.

To that end, Delacroix talks about the need "to make sacrifices", which he calls "the first of all principles" (p. 425). By sacrifices Delacroix means leaving some things out, not seeking accuracy as if it was the ultimate truth. He means putting in and enhancing only elements that make the composition alive as an ensemble, a whole from

which an effect emerges in the viewer that connects sensation and imagination in a compelling new way:

> In the works of the Dutch and Flemish masters … you notice … this art of concealing sacrifices made for the delight of the imagination - a faculty that quickly grasps an artist's meaning and understands even what he does not make it manifest. (p. 398)

Delacroix tells us he formerly had been "haunted by this passion for accuracy that most people mistake for truth" (p. 210). He learned that "absolute truth can give an impression contrary to truth, or at least contrary to that relative truth at which art must aim" (pp. 280-281). Truth in art is relative because it is always relative to the perspective—the unique way of sensing the world, the new aspects the artist finds in old things and ideas—of the artist. Delacroix suggests, as well, that whatever truth we find in sensation and experience in the world is relative to our perspectives, to our webs of association—our capacity for imagination and emotion—that we bring to our new experiences based on our past experiences, some of which may well have been designed experiences such as one of Delacroix's sketches or final paintings.

Delacroix's views on relative truth remind us what the great physicist of quantum mechanics, Werner Heisenberg (1958) had to say about absolute and relative truth: "What we observe is not nature itself, but nature exposed to our method of questioning" (p. 58).

Delacroix also has a number of interesting things to say about how different art forms work. For example, in music or literature there is no sketch as there often is in painting. On the other hand, he argues that "nothing can compare with the emotion which

music inspires. … For its eternal honour we ought to reverse Figaro's remark, 'Whatever we cannot sing, we speak'." (p. 287). Instead of the vagueness of a sketch carried over into a final painting that retains enough vagueness to inspire imaginative participation while expressing a yet fuller view of the artist's own imagination, music dispenses all together with images or signs (like words)—with what we might call "content". Music designs sensations that speak directly to the hearer's emotions and imagination. How this works is a topic I will take up later.

In writing, whether prose or poetry, Delacroix argues that there needs to be "a chain of argument, an entirety, arising out of the birth of one idea from another" (p. 235). This "entirety" is the equivalent of the painter's overall composition, the whole that has properties—and an effect—that is not the sum of its parts, but is the active set of relationships into which they enter.

Here is what Delacroix has to say about reading versus viewing a painting:

> Reading any book that is not entirely frivolous means having to work; it causes a certain amount of fatigue. The author seems to wrestle against criticism. He argues, and one can argue with him in return.
>
> The works of painters and sculptors, on the other hand, are all of one piece, like the works of nature. The author does not appear in them, is not in touch with us like the writer or orator. He offers, as it were, a tangible reality, yet one that is full of mystery. He does not need to lure us into giving him our attention, for the good passages in his work can be seen at once. (pp. 277-278)

Delacroix is here stressing writing as conversation between people—which means that writing has to be vague enough to allow for the reader's mind to fill in some of the

details imaginatively and to fuel a response. The art in writing is, as we saw earlier, to use words in a way that leads the reader to give them situational meanings that create new associations and emotions (and a response). Writing is painting with signs, with abstractions that become rendered as specific realities in the reader's imagination. In this sense, one might say that good writing is always a sketch, never a finished product.

CHAPTER 12

MORE ON VAGUENESS

Vagueness in Art

Consider the poem *The Sky Above the Roof* (Verlaine, 1962) below with its last stanza left out:

The sky is here above the roof,
so blue, so soft.
A tree is here above the roof
swaying aloft.

A bell-tower in the sky that we see
calls soft and faint.
A bird that's sitting in a tree
echoes its plaint.

My God, my God, how life is here
calm and sweet.
How murmuring the sounds that here
come from the street.

The poem was written by the great French poet Paul Verlaine. Of course, he wrote it in French and there are a great many different translations of the poem into English (see

Translating Verlaine 2: https://www.textetc.com/workshop/wt-verlaine-2.html). Furthermore, the poem has several times been made into a song in English covered by different singers.

The fact that there are so many different possibilities in translating the poem shows clearly that the poem—like most poetry—is vague. The English translator has to draw on her own past experiences of the world and of poetry, as well as her current context, to transform the French poem into an English poem. In this sense, each translator is a "co-author" of the English version of the poem. But the same is true of readers, even those reading the poem in French. The reader has to translate the poem into her own situational meanings, meanings based on her own web of associations and her current construction of the situation or context she is in while trying to make sense of the poem. The poem that comes to reside in our memory and imagination is "co-authored", as is all language.

While you were reading the three stanzas above, knowing little or nothing about the author, you likely felt an overall atmosphere of peace and feeling of sweetness. Now read it again with its last stanza put back in:

> You that are here, what did you do,
> weeping each day:
> tell us, what did you do, you,
> to your youth?

Note how this last stanza changes, rather radically, the atmosphere or feel of the poem. In this last stanza the poet can be seen as talking to himself or to the reader (or both).

Now consider the information below about how the poem came about:

> The original poem was written by Verlaine whilst he was imprisoned at Mons for shooting his lover, the poet Arthur Rimbaud. Verlaine had abandoned his young wife and child to be with Rimbaud but the intensity of the affair was too much and on the morning of 10 July 1873, Verlaine bought a gun determined to put an end to the torrid two-year affair with Rimbaud. It is reported that the lovers rowed and became drunk and Verlaine raised the pistol.
>
> "Here's how I will teach you how to leave!" he shouted, before firing twice at Rimbaud. One bullet hit him in the wrist, while the other bullet struck the wall and ricocheted into the chimney. Verlaine was arrested and sentenced to 2 years' hard labour. During his imprisonment, Verlaine converted to Catholicism. The poem reflects on the loss of his freedom and the regret of being incarcerated for his wrong doing.
> (https://www.facebook.com/songsforsingers2/posts/847137568796270)

This information changes again how you sense the atmosphere and overall feeling of the poem. Further, of course, without this background, you would never have guessed that the poem "reflects on the loss of his freedom and the regret of being incarcerated for his wrong doing". This information has removed more vagueness from the poem (though, of course, not all of it).

Does this biographical information enhance or detract from your enjoyment of the poem? Is the information relevant to the poem or a distraction from it as poetry? These two questions have played a large role in the history of the criticism of poetry. Some critics (especially the so-called "New Critics", see Wellek, 1988) have argued that a

poem must be taken entirely on its own and others have argued that a poem needs to be seen as flowing from the life and identity of the artist.

However, there is an alternative to this binary battle among critics. We can ask whether what matters is how you are introduced to the poem. Should we start without the biographical information—even leaving out the last stanza to begin with—and only later, after the reader has engaged in imaginative translational work, introduce information about the author's life and times. In this perspective, we see reading a poem as a temporal journey, a cycle of reading and rereading, considerations and reconsiderations, and of evolving feelings and emotions. Further, just as a poem is a designed experience, so, too, is the teaching of the poem. What is the best design for teaching students to experience a life-enhancing temporal journey in their exploration of the poem and poetry?

Think about the way teachers often teach poems: Today we are going to learn a poem written by Paul Verlaine. First, we need to know the poet's biographical background and the historic time the poem was written. Verlaine wrote it while he was in prison.

Upon knowing the facts and other details, students start to read the poems and answer questions like what the poem tells them about Verlaine based on a reading strategy called inference. They are asked to summarize the poem as if it were an essay or report and not an emotional experience. In fact, the remark "The poem reflects on the loss of his freedom and the regret of being incarcerated for his wrong doing" is close to this. The poem can be seen as reflecting a good many things, based on the situational experience of the reader, and it probably reflected a good many things to Verlaine.

The order of how the reader or a student experiences the poem is not trivial. When we reverse the school order, the multiple effects of the poem are much greater, and readers are allowed more time and space to feel and to taste the poem. As images and rhymes within the lines activate our web of associations and simulation powers, readers are able to gain a sense of atmosphere from sensing all the details of the poem as a whole that affects the reader's entire mind and body. Then they can sense how this atmosphere and its unfolding into details changes with new information or new readings.

Once atmosphere (composition as a whole) forms and exists and transforms, it means readers can enter the scenery and scenario of the poem as lived experience. And at this point, to introduce further details related to the poem becomes more meaningful, crucial, and tasty, and less an imposition on the reader, but just more fodder for their imaginations.

In the sort of reverse school journey, as Delacroix argued for painting, we start with the composition and its emotional effect (impact) on us and then move on to details without losing their relationships, relationships which change the reader's journey, including reading more of Verlaine or juxtaposing this poem to others. Indeed, reading multiple English translations of the poem and listening to how it has been put to music would be very useful parts of the journey as well.

Delacroix, in his journals, makes an interesting claim about the importance of "memory" (he really means imagination) to art:

> The feeling that a picture inspires in us must return to our memory when we no longer have it before our eyes, and then it is that the impression of unity will

> predominate—provided that it does really possess that quality. Only then can the mind grasp an impression of the whole composition or become aware of its lapses and incongruities. (p. 236)

If we apply this insight to the poem above, it argues that the poem must inspire an overall ambience (in which emotions converge) that enters our memories and imaginations and germinates our own "versions"—our "translations"—our co-authorship. An experiential journey with a poem must allow this collaboration between author and reader, rather than close it down.

Too often school turns art into facts. Many a school lesson is more concerned with "accuracy" and less with the experience of the journey itself. Yet, as Delacroix argues, paintings that strive for perfect accuracy leave little or nothing to the imagination and therefore leave the viewer cold, shut out from an imaginative and emotional encounter with the painting:

> … painting is nothing but a bridge set up between the mind of the artist and that of the beholder. Cold accuracy is not art; skillful artifice, when it is pleasing and expressive, is art itself. The so-called conscientiousness of the great majority of painters is nothing but perfection laboriously applied to the art of being boring. (p. 370)

Vagueness in Nature

The brain is a prediction engine (Eagleman, 2020; Seligman et al., 2016). When you pick up your old ceramic coffee cup your brain predicts what your fingers will feel on the cup. If the prediction is correct, you will not be consciously aware you have made

any predictions. And you will learn nothing new. You will go on as usual. There is no invitation to actively engage. You take the coffee cup in your grasp entirely for granted.

However, if the cup has a new crack in it and a finger falls on it, the brain's predictions will be wrong and you will immediately notice the crack, precisely because it contradicts your brain's predictions. This contradiction will be felt as a surprise, a form of learning. It is also an invitation to actively engage, for example to wonder how it happened, whether the cup will break further, or whether the coffee will leak out. Is the cup useless or has it now just got more character, the way an aging face sometimes does? Now you no longer take the coffee cup and your grasp on it for granted.

The first situation—when your unconscious predictions are correct—means you just accept things as they are. The second situation, where you are surprised, means you have to wonder about things, figure things out, engage in interpretation, engage the world at hand with your imagination.

This second situation is vague in the way a poem—or one of Delacroix's paintings—is. In William Carlos Williams poem discussed in Chapter 10, you have to ask yourself why so much depends on a red wheelbarrow, because he does not tell you. In the act, you co-author the poem. So, too, when the coffee cup contradicts your expectations, you have to ask yourself what has happened here and why and, in the act, not just accept the context you are in, but actively co-construct it. Is this a danger, a loss, or a new identity for my old coffee cup?

So, at one level, vagueness is surprise when your expectations (predictions) about the world fail and what you have heretofore taken for granted has to be dealt with anew. This brain principle has its analogue in art, in the way in which art can make things we

have come to take for granted, strange again. Art can make us see old things in new ways (and, thus, surprise us) and, in the act, re-program our brain.

Vagueness as surprise and making strange is also connected to the role of context in sensation and language. The more meaning a speaker leaves to assumptions and inferences to be made by the hearer, based on how the hearer construes their shared context, the more the hearer participates in and co-constructs the ongoing communication. Delacroix says the same thing about painting:

> Perhaps the only reason why the sketch for a work gives so much pleasure is that each beholder can finish it as he chooses (p. 183).
>
> … imagination, a faculty that enjoys vagueness, expands freely, and embraces vast objects at the slightest hint (p. 216).

So, vagueness of the sort we are describing here is a way of creating surprise, context, making strange, sacrificing accuracy, all in the name of inviting engagement and participation in sensation, art, and communication (Keefe & Smith, 1996). I will call this **productive vagueness.** Obviously, a lack of clarity done only in the service of creating confusion, deception, or due to ignorance is not the same thing. Productive vagueness creates what I will call a **Zone of Engagement and Participation** ("ZEP"). The ZEP is related to and inspired by Vygotsky's "ZPD"—Zone of Proximal Development (Vygotsky, 1978). Teachers and designers who want to create a life-enhancing ZPD need first to create a ZEP. The ZPD involves the imposition, by "masters", of values, forms of interpretation, and practices on "apprentices". Without allowing for a ZEP—a realm of

proactive and creative participation and freedom for the apprentice—the ZPD can become "colonizing". With a functioning ZEP, it becomes real teaching at its best.

Productive vagueness is what propels the human mind and body into action and engagement. Good learning experiences must be vague in part—there must be aspects that unsettle our expectations, our taken for granted certainties—so that we are forced to imaginatively engage and add new meanings—new associations—to our minds, the map of the world that is our brain.

When humans enter new experiences where they have limited knowledge of their surroundings, most information available to them is ambiguous, incomplete, even mysterious or threatening. This sets the human mind and body into an attentional, engaged, action-focused stance, puts them into the ZEP (see the discussion of SEEKING in the next chapter).

Vagueness as I am describing it here is state of surprise that seduces the human mind and body to enter the scene, whether it be in nature, in art, or in communication, and figure out its "composition" in Delacroix's terms, to figure how things "hang together" here and now, what effect they may have, how they are related to each other and to the self. Sometimes, we do this automatically when there is no time for slow associating. Sometimes we do it consciously and slowly. In either case, our web of associations—our imagination—is energized to form new associations, to fill in the gaps that have arisen in our taken for granted world.

Our school system has the problem that it too often insists on "cold accuracy" ("facts") as the learning objective. Students are thereby pushed out of the ZEP, not into it. Delacroix would say that facts are of little use on their own. They only have meaning and

effect when we know how they hang together, what unifies them. Just as a great painter invites viewers to see the details that matter as a coherent unity that gives rise to emotion, so, a great teacher invites students to see facts, information, and data as a coherent whole that gives rise to emotion, especially caring.

Vagueness in Complex Systems

Daniel Christian Wahl in his book *Designing Regenerative Cultures* (2016) has this to say about what he learned from his mentor Brian Goodwin, a founding member of the Santa Fe Institute for Complexity Studies:

> Brian taught me that any system that is constituted of three or more interacting variables is more appropriately described by non-linear mathematics and should be considered a complex dynamic system. One of the defining properties of complex dynamic systems is that they are fundamentally unpredictable and uncontrollable (beyond controlled laboratory conditions). Uncertainty and ambiguity are therefore fundamental characteristics of our lives and the natural world, including human culture, society and our economic systems (p. 41).

Complex systems are lived realities of vagueness. We must face uncertainty and ambiguity and, as with all productive vagueness, this leads to our active engagement and participation. Thus, Goodwin went on to say:

> We are not supposedly 'objective' observers outside these systems, trying to manipulate them more effectively; we are always participants. He suggested that the insights of complexity science invite us to shift our attitude and goal to our appropriate participation in these systems, as subjective, co-creative agents. Our goal should be to better understand the underlying dynamics in order to facilitate the emergence of positive or desirable properties – emerging through the qualities of relationships in the system… (p. 41)

As Wahl says, “complexity means befriending uncertainty and ambiguity”, that is, being able and willing to enter the ZEP. Vagueness is both at the heart of the world as a complex system composed of complex systems and is the only hope we have of dealing with the systems that are now running out of control because of human greed, ignorance, and arrogance.

The brain is a web of associations (encoded in connections among neurons) that is a model of the world. This model is used by the brain to continuously make predictions, consciously and quite often unconsciously. It is the failure of these predictions that lead to surprise and productive vagueness. Entering the ZEP can then lead to changes in our model of the world. Being wrong is often more useful than being right.

Tension

Earlier we discussed good and bad stress and the role of good stress (tension) in developing a healthy regime of competence. Tension (good stress resulting from challenges) is most fruitful for humans when it is at the outer edge, but within, a creature’s regime of competence. This is when and where the most learning occurs, and, too, when and where the regime of competence grows. Tension is another ~~v~~ersion/variant/derivative of vagueness, along with surprise, where vagueness leads us into the ZEP (Zone of Exploration and Participation). When we face tension, we do not know how and whether we will succeed in resolving it, so we must fully engage and participate in the situation we are in. Such circumstances, when they do not lead to bad stress, can give rise to the state of flow, one of the most energizing experiences for human beings.

Tension is akin to mystery, another force that exposes us to vagueness and requires high levels of engagement and often collaboration. The release of tension, when we succeed or resolve a challenge, is a reward. It is a resting place. However, it is one that leads people with "authentic expertise" (Bereiter & Scardamalia, 1993) eventually to hunt for new and higher-level challenges that will keep their regime of competence growing and adapting to changes in the world.

People who are at a stage where they can self-teach can seek for challenges (tension) on their own, but newcomers to a domain need help. They need designers who can design experiences for them that recruit productive vagueness at the right level so that they can enter the ZEP and grow their regime of competence. Eventually, they can learn to find or design their own experiences for growth in the domain, though they may well also enter new domains where they again become "novices"—though often "expert novices" (people who have become adept at learning new things). And, following Delacroix, they will often seek to see how different domains hang together as a larger system with emergent properties.

So, creating tension at the right level, making old things new and strange again, creating surprise by challenging expectations, using co-constructed contexts, offering mysteries—that is, creating productive vagueness—is key to designing and teaching (a form of designing). This means, too, that release must eventually come and, after recuperation, the learner must be helped to find new challenges to keep growing their regime of competence until they can become self-designers, self-teachers.

This approach to teaching is certainly not typical of many schools, filled as they are with tests which stress accuracy and not engagement, participation, or a sense of how

things “hang together”, cohere, relate to each other to create patterns of meaning. When we put the issue of productive vagueness front and center, art as designed experience gains a central place, along with science, in learning and development that can lead to flourishing.

CHAPTER 13

CONSCIOUSNESS AND THE CORTEX

Consciousness

Traditionally, the cerebral cortex has been taken as the site of human consciousness and of "higher-order thinking". It is supposed to be the place where the "self" lives (our subjectivity), the place where we reason and decide. The "lower" parts of the brain, below the cortex—developed earlier in evolution—are taken to be the sites of feeling, passion, emotion, urges, and drives, all of which need to be controlled by reasoning if they are not to go out of control. For Freud, this was the difference between the Ego and the Id.

Oddly, though, it turns out that mammals who have had their cortex removed exhibit, in Antonio Damasio's words: "a remarkable persistence of goal-oriented behaviour that is consistent with feelings and consciousness" (Damasio & Carvalho 2013, p. 147). For example, rats whose cortex has been removed continue to groom, play, eat, defend themselves, mate, and rear young. In fact, these rats are more active and responsive than normal ones. They do not need the so-called "thinking part" of their brain to make decisions and effectively handle action in the world.

These experiments (whose ethics are questionable) showed that the cortex is not needed for feelings or decision making. The same thing has been shown in humans who are missing a large part of their cortex (Solms, 2021). This, of course, raises the question why we humans have cortexes and such large ones. Indeed, we pride ourselves on the size of our cortex (not entirely correctly, some whale species have larger ones than we do).

The mystery gets deeper when we realize that even a slime mold—as mentioned in Chapter 1—is quite intelligent in its own way. Slime molds are only one cell large and have no brains at all, let alone a cortex. Consider in this regard the multiheaded slime mold named *Physarum polycephalum* as discussed in Zimmer (2021). It is found in many forests on wet ground.

Though only one cell, under the right conditions, a slime mold can grow quite large, the size of a throw rug. A slime mold can form tentacles which it can then extend and retract. Each tentacle can move in a different direction. To find food—bacteria and the spores of fungi—the slime mold moves its tentacles across its forest environment until it discovers food. Then it crawls on the food, releases enzymes that liquify it, and drinks it up. Though this all sounds like a horror movie, we see here the origin of intelligence, including ours.

The slime mold, of course, cannot see its food—it does not have eyes—but it can detect the sugars and other molecules that diffuse across the environment away from food sources and ultimately make contact with its body. If the concentration of these molecules drops as the slime mold moves a tentacle in a given direction, the slime mold stops moving the tentacle in that direction. If the concentration goes up, it continues to move it in that direction. In a slime mold, such decision making arises from biochemistry alone, with no need of a brain or consciousness.

Slime molds choose what directions to move by retracting their tentacles when they do not detect increasing signals of food and leaving behind on the ground a coating of slime. The slime mold can sense its own slime trails. If it comes across them again, it moves the contacting tentacle away from the slime trail to go in another direction. The

slime mode is storing its memory on the ground. Humans often use the same principle, storing memories in their environment, for example in notes, maps, pictures, and markers of other sorts.

Slime molds can solve yet harder problems. They can discover the shortest path through a maze. If you place the slime mold on top of some food at the opening of the maze and place some food at the end of the maze, the slime mold will extend newly formed tentacles through the maze and explore every possible path. When it finds the food at the end (and it always will), it feeds on this food while still feeding on the food at the opening of the maze. The slime mold will then retract its tentacles from all the dead ends in the maze. It thereby becomes one big tentacle that maps the shortest route through the maze.

In another experiment, scientists made a flat map of the United States and put oatmeal on the biggest cities and then let a slime mold loose. The slime mold ends up placing itself in a configuration something very like the interstate highway system (Dussutour et al., 2010).

Every slime mold is a single gigantic cell. Since it can respond very effectively to changing environment conditions, it is alive. It engages in processes of detection, deciding, and acting based on automatic reflexes built into its very chemical structure as a creature. It does not need a cortex or even a brain at all. Its intelligence is built in, thanks to its evolutionary history. This is true of lots of creatures. Even creatures, like us, that can act voluntarily and not just by reflex, often operate by reflexes or habits, just like the slime mold. It is easier, quicker, and requires less resource expenditures. This is what we

earlier called “fast associating”, where the associating is being done either by neuronal connections or by chemical connections (as in the slime mold).

So, why do some creatures, like us humans, have the capacity to act not just on automatic pilot but in a more conscious and voluntary way? One answer is that it gives us the ability to learn and do new things beyond what automatic reflexes or previous learning can accomplish, so that we can better adapt to changing environments. However, the slime mold is very good at coping with changes even though it has no brain. In an emergency, the slime mold can dry itself up into a brittle substance which eventually flakes into fragments that blow away on the wind. If a fragment lands on damp ground, it revives, and the slime mold is brought back to life. This is a pretty good trick to cope with unpredictable catastrophes and it happens automatically through chemical changes. So, why bother having consciousness? If the slime mold had it, what good would it do?

All sensation in living beings detects changes inside or outside the creature, changes that might require it to take actions needed for its survival or flourishing. So, the slime mold can sense (detect) things like a lowering of sugar molecules in its path (outer sensation) or a lack of water inside its boundaries (inner sensation). And it can act on these sensations by doing work or taking action to make the coupling of its body and its environment better. These sensations are all unconscious, since the slime mold has no brain. They work automatically based on the way chemicals in the world interact with chemicals in the slime mold.

What a slime mold cannot do is “make sense” of its unconscious sensations. If it detects increasing food molecules or its own slime trail, it automatically acts. What it

does not do is ask itself why it is acting as it is. The slime mold can't ask such why questions and, even though we humans can, we often do not.

Affect: Feelings and Emotions

As discussed in Chapter 2, for us humans, feelings and emotions can, and often do, guide and assess conscious voluntary thinking, imagining, and acting. This is what the slime mold cannot do. It can sense a decrease in food molecules, but this sensing (detection) does not feel any way to the slime mold. Thus, the slime mold cannot stop and think about how it feels, say, for example, regret that there is so little food.

So, though the traditional view is that thought dominates feeling, the truth is feeling arouses and guides thinking (imaging, simulating, slow associating). Feeling pain or sadness rouses us to think and act, and the increase or lessening of these feelings is the guide (assessor) that tells us whether our thinking and acting is leading to good or bad actions. No feelings, no thought, no action. No feelings, no way to evaluate how well our thinking, deciding, and acting is working.

Feelings and emotions stem from the "lower" parts of the brain, not the cortex. But they can trigger the cortex to engage in overt, conscious, effortful thinking and deciding. They wake the cortex up. Earlier, we asked why some animals have consciousness and others don't. Our discussion now suggests that the reason animals have consciousness, when they do, is that they need to make sense of what is impinging on them, inside and out. They need to make sense of their internal bodily sensations as they change in tandem with changes in the environment.

So, why would humans and some other animals need to make sense while slime molds and some other animals do not? Sense making must exist in the animals that have it because it helps them solve problems these sorts of animals face that cannot be solved by automatic reflexes and routines operating outside consciousness (awareness).

Consider an example: People have long wondered why octopuses are so intelligent, since they live in a sea replete with food and would not seem to need such intelligence (Godfrey-Smith, 2016; Montgomery, 2015). It has been hypothesized that while earlier in their evolution they had hard shells, they lost them and, thus, became very vulnerable to predators. Other species that have become so vulnerable—like humans—solve the problem by becoming social and cooperative so they can have strength in numbers. But octopuses are not social. So, they solved their problem by becoming remarkably imaginative in their strategies for survival, though they often live only a year. It is interesting that many animals who have this capacity for invention (trying things out and doing something new) also have the capacity to play, as do octopuses.

Humans appear to have evolved their conscious thinking abilities because they became a social species and had to deal with numbers of other humans and figure out what they were thinking or were going to do when they had no access to the insides of their heads. They had to develop what has been called a "theory of mind" (Moffett, 2018; Suddendorf, 2013; Tomasello, 2019; Wilson, 2019; Wilson, 2012).

If another human makes me angry, this feeling is a signal to ask why and do something about it before things take a turn for the worse. Should I fight, negotiate, apologize, demand an apology, hide my anger, or just walk away? There are lots of

options because making sense is always contextual. It works differently in different contexts and always demands considering and sometimes reconsidering the context.

Emotions and Vagueness

So, what is the role of outer sensation in regard to feeling and emotions? Well, we have seen, of course, that humans often respond to sensations from the world with a feeling or an emotion. A beautiful nature scene can make humans feel calm, because the outer sensations cause internal bodily changes that humans feel (interpret) as peaceful or calming. A beautiful nature scene can make humans feel happy, because the outer sensations cause internal bodily changes that we interpret as happiness.

Outer sensations and feelings and emotions are related in another way. In one respect feeling and emotions are vague. A feeling of hunger tells us we should get food, but not what food. If we are starving to death we may act reflexively and grab whatever we can. If we are not starving to death, the feeling of hunger will rouse our conscious thought and decision making. When this happens we have to make sense of our feeling of hunger in context and act in different ways, ways that will be assessed by how our feeling of hunger waxes or wanes. Your outer perceptions and your past experiences contextualize your hunger need. If you are poor or ill-informed about human nutrition you may walk into MacDonald's. If you are richer, better informed, or see healthier food that looks good you may avoid MacDonald's.

Anger (an emotion) may make you lash out without thought. But it can also be an invitation to think before you act to resolve it (Barrett, 2018; 2020; Damassio, 2018; Furtak, 2018; Le Doux, 2019; Solms, 2020). When you do this, the current context, past

experiences, and your knowledge will contextualize your anger and guide different responses. A parent can be quite angry at a child, but, when they look at the child, the anger is contextualized non-violently (we hope). Indeed, we often feel anger differently when we think of a past insult than we do when we come face to face with the person who insulted us.

Feelings and emotions can be vivid indeed, but they are vague. It is precisely their vagueness that can invite conscious thought. Now I turn to a claim that our most important emotion for flourishing is the vaguest of all our basic human emotions.

A Theory of Different Types of Emotion

Different cultures have words for different emotions. Further, emotions, whether named in a language or not, are expressed (acted out) in different ways in different contexts and differently in different cultures. Nonetheless, there are some universals here, some panhuman aspects of our most basic emotions as shared human biological and social systems. Different authors have tried to capture these shared systems in different ones. One influential source (Panksepp, 1998; Panksepp & Bevin, 2012) has named seven such basic panhuman emotions based on deep brain stimulation studies. Panksepp capitalizes his terms for the basic emotions because he wants to distinguish them from colloquial use where different cultures use different words for these basic emotions.

1. LUST. Erotic feelings guide your sexual behaviors.
2. SEEKING. Expectancy, interest, curiosity, surprise guide searching behaviors.

3. RAGE. Frustration or anger guide avenging behaviors.

4. FEAR. Feelings of threat guide fight, flight, or freeze behaviors.

5. PANIC/GRIEF. Separation anxiety or other forms of loss guide behaviors that seek reunion or mourn the loss.

6. CARE. Feelings of attachment causes behaviors that care for and protect others.

7. PLAY. Feelings of fun arouse our basic human need to play.

These emotional systems can interact with each other and conscious thinking can sometimes make us change from one system to another. Indeed, learning how to use and reconcile these systems, which express our most basic needs, in ways effective for survival and flourishing is the heart and soul of mental health.

The other thing worthy of note here is that SEEKING proactively engages with uncertainty, a form of vagueness that can be productive if dealt with in the right way. Humans have a basic need to engage with uncertainty (mystery, surprise, vagueness) as we have seen earlier. SEEKING is, in fact, our default human emotional system. As Mark Solms (2020) has said, "When we are not in the grip of one of the other ('task -related') affects, our consciousness tends towards this generalized sense of interest in the world" (p. 107).

SEEKING also violates a very influential, but controversial, principle called "the Free Energy Principle" (Friston, 2010). This principle, based on much empirical and mathematical work, says that all self-organizing systems—and all living things are self-organizing systems—will minimize entropy (uncertainty). SEEKING does not follow this

principle. In that sense, it can endanger a creature, because why engage with things you do not know or cannot predict if you don't have to? Yet, humans often find SEEKING as fun as play and as highly motivating as play. Evolution must have put this need into humans and done so in a big way. Thus, it must have not known about the free energy principle, save for slime molds, which appear to operate by the free energy principle.

One key implication here for education is that SEEKING only operates if we are not "in the grip of other ("task-related") affects. Yet SEEKING is at the heart of the growth of an ever-evolving regime of competence that should be the highest goal of learning in and out of school. If people are in the grip of "task-related" affects, they will seek to minimize uncertainty (and the best way to do this is just to do what has worked best in the past). But creatures who cannot SEEK do not learn new tricks. SEEKING is energized by productive vagueness. It is, in fact, what I called in Chapter 12, the Zone of Exploration and Participation (ZEP).

CHAPTER 14

AUTOPOIESIS

Autopoiesis: Living Bodies are Cognitive Systems

Traditional work in psychology starts with cognition in the sense of the mental processing of "propositions" (information, facts, principles, claims, and so forth). Cognition is treated as a property of only animals with fairly sophisticated brains and, of course, is seen to reach its high point in humans with their self-reflective consciousness. My goal, however, is to argue that if we want to understand and improve learning and development, in and out of schools, we need to start, not from cognition, but sensation.

The approach I am taking starts with sensation in the world and in designed experiences like art. The approach is founded in an alternative theory of "mind" and "cognition", one that reflects current work across several different disciplines studying what it means to be a living being. This alternative theory is called "autopoiesis theory". It is a set of ideas developed by two Chilean biologists, Humberto Maturana and Francisco Varela (Maturana & Verela, 1972, 1980, 1998; Varela et al., 1974; Varela et al., 1991; see also Capra & Luisi, 2014 for an overview of this work in a larger context that includes art). Their work is sometimes referred to as the "Santiago School".

"Autopoiesis" means "self-making". According to Maturana and Varela, the main characteristic of life is self-maintenance. Any living being, from cells to amoebas, insects to humans, has an internal chemical system that continuously reproduces itself within a boundary of the living thing's own making. In fact, many living beings—including humans—have smaller living beings inside them (e.g., human cells and the human microbiome).

Living beings interact with their environments as a bounded whole with porous boundaries. In the act, being and environment become coupled and together constitute a larger complex system, a system of systems. The interactions between a living being and its environment trigger continual mutual changes in each other and in the larger being-environment system as a whole.

The basis of autopoiesis is this: Since living beings are autonomous, bounded entities (actually systems) of their own, their environments can only trigger changes in them, but cannot specify what these changes will be. It is the internal structure of the living being—the chemical system that continuously maintains and rebuilds the self, a product of evolution—that "decides" what changes to make in response to environmental perturbations.

The way the living being continually responds to the environment by making changes in its own structure constitutes a learning system. As Capra and Luisi (2014) say:

> Continual structural changes in response to the environment—and consequently continuing adaptation, learning, and development—are key characteristics of the behavior of all living beings. Because of this dynamic of structural coupling, we can call the behavior of an animal intelligent but would not apply that term to the behavior of a rock.
>
> The living being not only determines what structural changes it will make to itself in response to environmental disturbances (thanks to how its internal system works), it also determines which disturbances from the environment it responds to—pays attention to—at all. (p. 255)

The great Marxist biologist Richard Lewontin (1991) argues much the same thing:

> [T]here is no "environment" in some independent and abstract sense. Just as there is no organism without an environment, there is no environment without an organism. Organisms do not experience environments. They create them. They construct their own environments out of the bits and pieces of the physical and biological world, and they do so by their own activities. (p. 109)

For Maturana and Varela cognition is not, as it is on the traditional view, a representation of aspects of the world (which is what a proposition is). It is a continual act of *world making*. The living creature brings forth its own world (its umwelt) by its choices and responses that stem from the very process of living, the process of being able to maintain and rebuild the self on its own (internal) terms, so to speak. Cognition and life are the same processes (and they are processes and not things). To live is to know; to know is to live. Knowing does not require a brain. It requires sensation and an internal system that can respond "intelligently" (adaptatively, in a way that constitutes learning and development).

It is here that we see a radical difference between how Maturana and Varela use the term "cognition" (I will place the term in quote marks when I mean it in the broader Maturana and Varela sense) and how it is used in traditional cognitive science. An organism is coupled with its environment in such a way that it determines what to respond to and how to respond to it. To do this, it also has to be aware of where its boundaries are and what its internal state of wellbeing is, as we have seen in earlier chapters. All of this is "cognition", a way of attending, deciding, responding, and assessing that carries out what we often take as cognitive (knowing) functions in creatures with brains. However, even creatures without brains—like cells and bacteria,

not to mention slime molds—can do these things and, thus, in this sense, cognition does not require a brain.

The idea that "cognition" is the form of living and belongs to all living things will seem odd to many people. This is so because we are so used to making a hardware/software distinction for computers and, by extension, human brain/mind. Hardware is something brute and software determines processes that the brute stuff carries out according to the commands in the software. However, for living things there is no software, only hardware: molecules interacting with each other in a complex system.

This is equally true of the human brain. Traditionally psychologists have seen the brain as wetware that uses software to compute processes. But we know now that the neural system of the brain—its brute part—is hardware in need of no software. The brain, which is not only in the head, uses experiences to construct, maintain, and rebuild itself—so it is a living being itself.

There is another reason why seeing "cognition" as the very process of living, and not just thinking per se, seems odd to us. We saw earlier that all living creatures store a map or model of the world inside themselves as part of their internal system coupled with that world. Earlier, I called these maps, in their simplest forms, "embodied associations". For humans and some other animals, evolution has given them the capacity to create mental images of this internal map or model (simulations) and, in turn, to associate these images with emotions. This is one form of consciousness. This simulation capacity makes it hard for us to see that knowing (attending, deciding, assessing, acting) does not require consciousness. The capacity seems to "fool" us into thinking there is some entity in our

head “watching the action” and maybe causing it, without which cognition cannot exist. But there is no such entity.

Systems Thinking

Johann Wolfgang von Goethe (1749–1832) was one of the earliest figures to see biological form—that is the composition or structure of a living being—as a pattern of relationships that constituted an organized whole, a network of integrally interconnected parts (Capra & Luisi, 2014, pp. 9-10). Such patterns are called systems. Earlier I also called them ensembles.

In a complex system, the whole has emergent properties that are not the sum of its parts. The philosopher Christian von Ehrenfels (1859–1932) used the term “gestalt” (organic form) to describe an irreducible perceptual pattern that he characterized by the mantra “The whole is more than the sum of its parts” (Capri & Luisi, 2014, p.10 & 66). The phrase has come to be the definition of a complex system. The idea of a whole, a gestalt, a pattern of relationships, a network—and emergent properties—is the basis of systems thinking. Systems thinking sees the world not primarily as things, but as relations, processes, connections, patterns, networks, ensembles.

Systems thinking of this sort—systems as patterns or relationships that have emergent properties—has long been present in intellectual history outside science. This is a type of thinking many artists have engaged in—including Leonardo de Vinci and Delacroix—as well as many Eastern philosophies.

We saw in Chapter 11, that Delacroix stressed both sensation and painting as systems, compositions, wholes, ensembles—as set of relationships—in which the whole

and part relate to each other in a way that gives rise to emergent properties like emotions and imaginative creativity. In his comparison of the sketch and the final painting he is, like biologists, pointing to a core commonality. For biologists, the commonality among all living things is self-maintenance as a cognitive process embedded in a body and structure. For Delacroix the commonality of the sketch and the final painting—and, at a higher level, the commonality among all the arts—is vagueness: Vagueness in the sense of a coupling of the perceiver and the art that constitutes its own system, a system wherein the art work perturbs the viewer, but the viewer directs his or her own response and, in the act, restructures him or herself as a living (learning, thinking) being.

In this sense, art is a trigger that the viewer responds to by becoming something new and, at the same time, makes the work of art his or her own world (an umwelt). There is a difference though from autopoiesis. Both the artist and the viewer are living beings, the work of art is not, though it is an ensemble with emergent properties (but it cannot repair itself). However, the viewer's "cognition"—choices, emotions, learning—can and does trigger complementary responses in art as a cultural system and, thereby, triggers changes in what artists do. At a higher level, art as a system and viewers as a system are coupled in a mutually interactive and evolving way.

Artists make art; art makes people new; and new people change art and artists. It is a big system that operates much like an ecosystem, a sort of living thing itself, though at a higher level than Maturana and Varela deal with. Since art is one of the main forms of designed experience by which humans learn and grow, the health of this ecosystem is crucial for human flourishing as is the health of the natural environment.

The idea that art as a social system might have autopoiesis like properties is something theorists in this area have thought about more widely in regard to social systems in general. In the words of Capra and Luisi again:

> The observation that the "bio-logic," or pattern of organization, of a simple cell is the same as that of an entire social structure is highly nontrivial. It suggests a fundamental unity of life, and hence also the need to study and understand all living structures from such a unifying perspective. (p. 137)

So, when we say school is about cognition, what we should mean is it should be about "cognition" as living, that is, sensing, changing, developing, and maintaining the self in the face of challenges. Only then can "content" (facts, principles, generalizations, signs and symbols) matter and enter the process of living. Even then such content must enter as a pattern of relationships, an ensemble; in Delacroix's terms they must give the learner a "feeling for the whole scene and its composition" (p. 208). Or, as he also says: "If only it hangs together!" (p. 39). Or in the words of another great artist, the novelist E. M. Forester (1910) in *Howards End*:

> She would only point out the salvation that was latent in his own soul, and in the soul of every man. Only connect! That was the whole of her sermon. Only connect the prose and the passion, and both will be exalted, and human love will be seen at its height. Live in fragments no longer. Only connect and the beast and the monk, robbed of the isolation that is life to either, will die. (Chapter 22)

CHAPTER 15

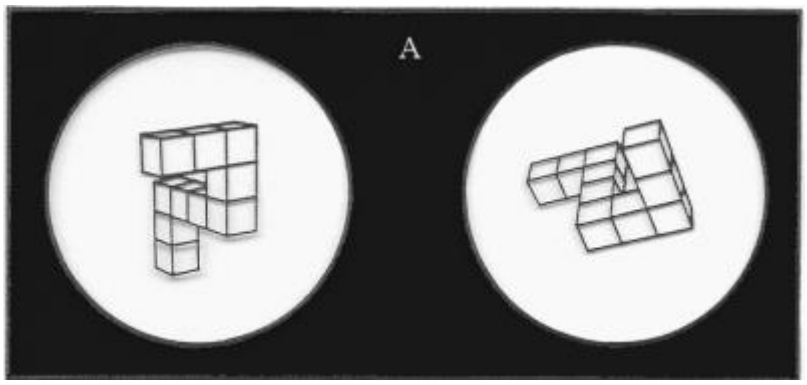
SENSING POSITIONS: REALITY AND IMAGINATION

Reality and Imagination

There is less difference between reality and imagination than we typically think. For example, human beings can rotate objects in their heads, much as they can rotate them in the real world. A famous early study (Shepard & Metzler, 1971) showed subjects a picture like the one below and asked them to tell, as quickly as they could, by pressing a button, whether the two objects depicted were identical except for rotation.

Figure 3

Mental rotation



This work showed clearly that humans can form a three-dimensional mental image of one of the images and rotate it, in their imagination, to check whether it can be brought into correspondence with the other image. Furthermore, the subjects rotated their mental image at a steady rate (different for each subject), so that the further they had to

go to match the images the longer it would take them, just as would be the case in rotating objects in the real world.

The way humans rotate things in their mind is a good deal like how they rotate them in the real world because the same sets of neurons are activated, in one case with mental movements triggering physical hand movements and in the other case with mental movements of the same sort but without actual muscle movements.

When humans imagine actions they suppress muscle movement, but, nonetheless, their brains still sends signals to their muscles. A study by Brian Clark and colleagues (2014) showed that people whose wrists were wrapped in surgical casts for a month, but who for 11 minutes a day, 5 days a week, sat still and focused their entire mental effort on pretending to flex their muscles, had wrist muscles that were two times stronger than those that had not done the mental exercise. When we imagine flexing a muscle our brain actually contracts it, but does not activate full movement. Such results have been widely attained and almost everyone has experienced something like a twitch in their arm when they vividly imagine throwing something.

When human read (if they were not born deaf), they activate the neurons that represent speech sounds and this sends signals to their speech muscles, though they suppress actual out loud sound. Many people have found themselves occasionally mumbling when reading, showing the speech apparatus is being activated and here not so well suppressed.

What all this shows is crucial. If you imagine yourself being sad you can get sad; if you imagine yourself being harmed, you can feel fear. If you feel fear, but are not consciously aware of what triggered it, it has the same effects as fear whose real cause

you know or fear you have imagined. Indeed, belief (imagination), in humans, can cause chemicals to be released in them that have real effects, good or bad. That is why faith healing sometimes works, as long as a person strongly believes it will and why sometimes people who fear others have put a curse on them get sick and sometimes even die. Imagination is no less than reality in its powers to cause real effects. This will be a crucial point when I discuss sensing positions below.

Mirroring Others

Each of us can only sense from our own embodied position in the world. Sensation is private and personal. Yet humans can sympathize with other people's feelings and emotions and they can imagine how things might look and otherwise be sensed from another person's perspective. They can also imagine alternative positions of sensing, as a climber may anticipate the view from the top of the mountain.

A good deal of popular work has connected these capacities to so-called "mirror neurons" in humans (Ramachandran, 2000). Mirror neurons are neurons that fire both when a person acts or feels in a certain way and when the person observes the same action or feeling in another person. Supposedly, mirror neurons "mirror" the behavior of others, as though the observer were engaging in the same behavior. Mirror neurons enable humans to reflect body language, facial expressions, and emotions they sense in others. They have been argued to be essential to social development and child development. They are also held to be the basis of learning by imitation.

While the idea mirror neurons have been widely popularized, especially in education, our scientific understanding of them is still limited (Hickok, 2014). However,

there is no doubt that humans have the capacity to intuitively sense in their own bodies how others are sensing and feeling. And they have the capacity to use their own brains to run simulations (imagine) how others are sensing, feeling, or acting, albeit based ultimately on their own experience as a human being. It is probably the case that this capacity varies across people and needs, in part, to be trained not only by experiencing a wide variety of different sorts of people, but also by gaining guidance from others on how to pay sympathetic attention to others and their feelings, including other living beings that are not human. In any case, humans can clearly "mirror" others, though more than mirror neurons are probably involved.

These facts are crucial to media and education, though not much commented on in these areas. Engaging people's conscious sensing, unconscious sensing (embodied associations that are trigger automatically), and their capacity to imagine how others sense and feel are all ways—used by art and media—to "manipulate" them for good or bad. And they become most powerful when they are mixed, matched, and combined. Indeed, good media and education should seek to give people new experiences, undo bad automatic habits of association and create better ones, and enhance people's simulation powers. Humans live in a mixed blend of reality, habits, and imagination.

Sensing Positions

An experienced birder knows that when you are looking at a bird in a tree from a particular place and the view is not good, you are aware of alternative locations around the tree where the view will be better, less obstructed, and you can move there. New birders have to think more consciously where the best positions are, but old-timers move

around pretty much automatically. They have embodied their knowledge in terms of embodied associations that do not require overt thinking.

This shows clearly that humans can both inhabit a "real" position in space where they are having sensations and can also intuitively know or overtly imagine the sensations they would get at an alternative place. There are two sensing positions here. Let's call these two positions an **first-person sensing position** and an **alternative first-person sensing position**. "First-person" here just means "I". In the first case, I actually sense something and, in the second case, I unconsciously or consciously activate predictions (based on embodied associations or simulations) about what I could sense at another position.

First-person sensing and alternative first-person sensing activate (automatically or purposefully) sensory neurons and, thus, can have the same sorts of effects. For example, a hiker might be tiring on her way up a high mountain and then imagine what she will see from the top and how she will feel up there. Her current real sensing position is causing her to feel tired and perhaps worried. Her imaginary sensing position can cause real effects in her body, too. Perhaps, her simulation of the experience she will have at the top of the mountain causes her to feel motivated and exited and to feel less tired or to be able to power through her tiredness.

The human brain does not really care where its sensations come from, whether they are "real" or imagined; it cares about what those sensations do to them and what they mean for the self. A human does not discount her excitement and recharged energy because they were triggered by her imagination of sensation at the top of the mountain.

Now, humans are also well aware that other sentient beings are in their own real sensing positions (their own first-person sensing positions). In fact, a birder might be aware that where another birder is positioned is giving them a better view of the bird they are both looking at. Just as I can intuitively know or simulate what I would sense in an alternative position that is unfilled, so to speak, I can intuitively know or simulate what another person is or may be sensing from their own position. This is a form of what we earlier called "mirroring". Rather than knowing or simulating what I would sense from a different position, I am now knowing or simulating what another person is sensing from their own first-person position, albeit based on the experiences I have had in my own life. We will call this a **third-person sensing position** ("third-person" means another person, "he, she, it"), a position in which I sense through another person at their actual sensing position.

First-person sensing is "real" and alternative first-person sensing and third-person sensing are not "real" in the same way, but they can each have the same sorts of "real" effects on our bodies and brains. Placebos are a good example here. People who get the actual pill get better because of what the pill did; people who get the placebo often get better because they unconsciously believe or consciously imagine they will. Both are real effects and both are ultimately caused by chemicals released into the body. If I mirror someone else's sadness that sadness can release chemicals in my body. If I imagine myself sensing a calm scene, it can slow my heart rate, calm me, and make me feel at peace.

Let's turn to some examples that can further refine our discussion of sensing positions (what some people call "perspectives"). Consider the picture below:

Figure 4

Open door view

You, as a sensing self, can sense (see) this picture as a picture, the way you would any object. Sitting in your chair, you see it as a picture of a door. Rather than looking at a real door, you are looking at an image of door. This is first-person sensing.

However, the picture has been designed to imply a place from which the door would be seen and interacted with if a human were in the scene, not just looking at it. Such a human would be standing a bit away from the door and to the right. This is an alternative first-person sensing position. In this case, the position is not in the real world, but in a designed one. Unlike, an alternative position around a tree with a bird in it I am looking at, I cannot actually enter the picture. Yet, I can purposefully imagine sensing from a position within the room. And this imaginative sensing can have real effects on my feelings and emotions. Indeed, that is the point of much art.

Humans can unconsciously take up an alternative sensing position like the one in the picture. This is typical of all human sensation. Lots of what we sense is not open to our conscious awareness, it just happens on automatic pilot. A friend of mine felt somewhat "creeped out" by this picture, but did not know why. This means unconscious processes in her brain and body—caused by taking the perspective of the alternative sensing position the picture invites her—gave rise to a certain feeling or mood. In such a situation, she has to use her conscious awareness to formulate some reason for her feeling, a reason that may or may not be the "real" reason (only her unconscious mind knows that). The interpretation she reached, when asked to think about why she felt creeped out, was that the implied alternative sensing position can seem to be a place of hiding and staying in the darkness and this seems to contrast with the inviting light on the outside. Not everyone will have experienced this, but such things are common in the realm of human sensation and sense making.

So, I can also use my simulation powers to consciously imagine sensations, feelings, and emotions they I might have if I was in the scene in the applied sensing position. This can trigger feelings and emotions in me—which can, of course, have real effects on my real body. If I take the time, I can even story a whole alternative experience for myself from the implied sensing position, imagining why I was in the dark and what would happen if I moved through the door and what it might mean. Open door pictures are quite common, in part, because they can so easily trigger in humans conscious or unconscious longings to move through the door and, in the act, feel things like excitement, freedom, mystery, fear, or escape.

Now consider another open door picture:

Figure 5

A Little Girl at the Gate

This is an image of a little girl in a doorway, looking out. We, as sensing selves looking at the picture, automatically (unconsciously) sense (know) the sort of embodied position of sensation the girl in the picture is in. We can see and feel what the sunrise (or sunset) over the sea depicted in the picture would look and feel like from the position the girl in the picture is in. This is an alternative first-person sensing position, though one we cannot literally move to. And, once again, this unconscious processing can trigger real feelings and emotions in the sensing self.

However, here, too, we can also consciously take over the girl's body as a position of sensation and imaginatively inhabit that position (third-person sensing position). The viewer can choose to imaginatively sense and feel from the child's embodied perspective, to fill it up with meaning, to author it. We can inhabit, imaginatively, the girl, a self that is not ours. This is sometimes called "taking the other person's perspective", but it is more than perspective taking, it is a form of empathy, of

melding of self and other. It is third-person sensing, but now in a virtual world and not the real world.

A third-person sensing position can be an invitation to our reflective consciousness and our power of simulation to story another self—here a little girl—but melded with our own individual identity. What is my story of the girl poised in the doorway? What can I learn about her and about myself by inhabiting her body and being able to reflect on her from the inside, so to speak? Since imaginings can create real feelings and emotions in my sensing self, they can have real effects on my body and on the ways in which I change my web of associations, remembering that affect guides thinking and learning. Such storying of another—real or in a virtual world—can lead to what we might call "vicarious selves".

I am now going to turn to examples of how media uses the sensing positions we have delineated to achieve effects on viewers and to encourage them to "co-author" the media. But, first, I need to stress the point that humans can rapidly switch between and combine first-person sensing (their real sensing position), alternative first-person sensing, and third-person sensing positions. Human conscious and unconscious sensation can operate rapidly and move back and forth—like a beam of light—and, too, stitch things together as a narrative or story in the mind.

Example 1: *Brothers*

Brothers: A Tale of Two Sons is a video game. In this game two brothers go on a journey to get magical water to save their dying father. The younger brother is moved by the right thumb stick on your controller and his actions are triggered by the right trigger

button. The older brother is moved by the left thumb stick and his actions are triggered by the left trigger button.

The player must manage both sets of controls simultaneously to get the brothers through a great many challenges and dangers on their journey. The effort of coordination it takes to do this creates a physical stand in for the continually collaboration of the brothers in the game world.

You see each brother you control and you know their stories from what you have seen and experienced in the game. Yet you are physically controlling them and making decisions for them. When they fail, they fail because of you. So, this is a very powerful version of inhabiting another self, here two other selves tied together in collaboration by your simultaneous control of both of them at the same time. In this game, we have duel third-person sensing supported in the unique way video games have of coupling a real body and a virtual one (here, two).

Toward the end of the game, the older brother is killed. You can move his control stick and tap his action button, but nothing happens. They are dead like he is. After having bonded so closely to each brother—and seen the close bond between the two of them—this is shocking. You feel the older brother's death in the death of the controls. You feel for the little brother who has always been helped and encouraged by his big brother.

The younger brother must go on, miserable and frightened as he is, to bring the magical water to his father. It feels very odd controlling him all alone, after having spent so long a time controlling the brothers as a team, a team that got ever better in the game world as you, the player, got better at the controls.

Then the younger brother comes to a stream and must swim across. But he can't. You very well know, from earlier in the game, that he is afraid to swim and cannot swim. His brother has always carried him across.

The younger brother hesitates at the stream. Since he can't swim, his stick and action button do nothing in the water. So, you, as he does, hesitate and wonder what to do. His controls are dead and so are the older brother's. You feel the plight of the little brother; you feel your plight as a player. How can he get across the river to save his father? How can you continue the game?

And, then, eventually, you try the big brother's dead controls when the little brother is in the water and they come alive again and work, so the younger brother can swim across. His brother is there still, but has transferred his powers and courage to his little brother, who goes on to save his father. The big brother has inhabited his little brother, melded with him. Just as you physically felt the death of the older brother in the dead controls, you feel his resurrection as part of his brother's soul in the dead controls coming back alive, now to power the little brother.

This effect at the stream seems small. Just one very small moment in a long game. Yet, it is a powerful moment that you never forget. Many gamers have commented on its emotional power and have it as a permanent emotionally laden memory of the game. What we see here is that when we look at artists and media designers as experience designers we discover that they achieve large effects by designing at quite small, detailed, and specific levels. Such care does not seem, from work in education, part of a teacher's job—or of an educational researcher's responsibility to study—but it is an important part

of their jobs if we see teachers as experience designers and educational researchers as students of experience design.

Players learn something deep from *Brothers: A Tale of Two Sons*. They learn to think and feel about collaboration in new ways. They learn to think about the effects of collaboration on ourselves and our futures in new ways. They learn that they carry with them all the people with whom they have collaborated in deep enough ways. This learning is powerful because the game drives it, as all deep learning needs to be driven, by feeling and emotion (affect). The physical feel of controlling the brothers and the emotions the story engenders are real and a powerful part of the learning. They are not the least bit trivial. They are not "add ons"—extras—that can be dispensed with.

Example 2: *Stitches*

In David Small's (2009) well-known and highly regarded graphic memoir *Stitches*, there is part near the beginning where you see an expansive view of a forest as you might experience it walking towards it. Then you see pictures that look as if you are moving through the forest into a neighborhood up to a house with an open door and walk into it. From the doorway you see a young boy laying on the floor. Finally you move to stand in front of him and look down on him.

Figure 6

A Screenshot from the Stitches

It is as if a virtual version of you has moved into the room. Of course, this is an odd experience. Why is the door open? Why isn't the boy startled that you are looming over him. You can feel like an intruder or like an unseen presence. This creates a certain tension and sets up certain sorts of feelings and emotions, as well as certain sorts of tentative attempts at sense making (reflection, interpretation).

Eventually, as you move on in the story, you realize the author (David Small) is narrating, as an adult, his own experiences as a child. The alternative sensing self you have taken up—your alternative first-person sensing of journeying to and stepping inside the house--becomes the sensing position the narrator would take up if he were in his own story as a character, his adult self present before his child self. Something odd happens here. You can alternate between alternative first person sensing (how you would sense and feel if you were standing in front of and looking down on the boy) and third-person sensing (how you would sense and feel if you took David Small's (as author and narrator) third-person perspective.

This alternation between alternative first-person sensing and third-person sensing is risky for the author. You, the reader, become the stand in for the narrator, but a stand in who has to reflect on whether to trust his narration and on how accurate you feel his view of his earlier life is, since you are now both outside and inside him. The experience is emotionally complex and teaches us important things about reexperiencing childhood, the burden of the past in the present, and the difficulties of forgiveness. Indeed, some reviewers argued they felt more sympathy for Small's parents when they viewed them on their own terms than they did when they took Small's narrator perspective (and taking Small's narrator perspective is something the book virtually forces you to do.

CHAPTER 16

TEACHING AND LEARNING

In this chapter and the following two chapters, I will turn to a consideration of education and learning in and out of school. This chapter will deal with embodied learning. Chapter 19 will take up the issue of belonging and identities and chapter 20 will take up the issue of leading what used to be called an "examined life".

Teaching and Learning

If I want to teach you to be an "X" (e.g., a gamer, a birder, a biologist, a graphic artist, a street gang member) I need to create caring in you that will make you attend to what needs to be attended to if you are to be an "X". I need to help you create embodied correlations so you can operate on automatic pilot, which of course also requires lots of practice. And I need to help you gain the new powers of simulation you will need to flourish in your new identity. This is required for learning new things and, as you develop, for undoing automatic mastery and then taking it to a higher level before you automatize these new higher-order skills.

While out of school a great deal of learning is devoted to becoming an "X" of some sort, in school the goal often is not to teach people to become something, but, rather, to know something. It is not that knowing is not important, but knowing is much more useful inside of social identities and their endeavors than outside of them (Halliday, 1978; Hanks, 1996; Wittgenstein, 1953). So, the real problem is that knowing is often placed "out of context" and in the service of nothing in particular.

School used to be thought of as forming new social identities. Public schools were supposed to socialize students into shared identities beyond kith and kin, such as being participants in a community, region, state, nation, and even the globe. This were meant to prepare students to be members of civil society. Unfortunately, today, in the United States and much of the rest of the world, people are more intent on division than on unity (Andersen, 2020; MacGillis, 2021; Serwer, 2021). Americans today could not agree on what sorts of citizens schools should create, not even on what citizenship means. The same is increasingly so in other countries, as well.

Schools also used to be thought of as places to help students prepare for work. Doing well at school gets you in the door for a better job, but you learn almost everything you need for the job on the job. However, much research has shown that schools do not do this well (Schmidt & Hunter, 1998; Peterson, 2018). Doing well at school signals at best that you will be a conscientious and conforming employee (Caplan, 2018). And, of course, school does next to nothing to help students find and prepare for outside of school social identities—such as game modder, activist, or citizen scientist—that can give them meaning and purpose beyond employment, pay, and status (all hard to come by at a satisfying level in today's world) and powerful modern skills fit for the current world.

The dilemmas about identity and school are deep. So, let's drop them for the moment and look at how sensation and learning can work in school when we involve both body and mind in learning. I will use as our first example a now old curriculum, one that worked well. I do this because I do not want to encourage the idea that we need to discover new "silver bullets" for the future and then sell them as the next new trend in school reform. We already know many good approaches.

Let's say you want to teach algebra. One problem you face—as with so many other areas—is that you need to get learners to know what words and symbols in algebra mean. Furthermore, as we saw earlier, words and symbols take on useful, contextually appropriate meanings based on the different contexts we have experienced them in and all the associations these experiences have created in our minds. These experiences—and thus the meanings of these words and symbols—are "owned" by people who know and do algebra and who are using algebra as part of a given social identity they have in society.

Another problem is that algebra—like other areas of science and technology—is composed of many abstract generalizations and principles. When we incorrectly thought that the human mind learned by being exposed to generalities this was rarely viewed as a problem. It is a problem, however, because now we know humans must learn in a concrete way with contextually specific associations first, and only later gain generalizations (abstract knowledge) after experiencing different contexts enough times to develop both automatic skills and new resources for simulation that work well in specific contexts of application and across them (Barsalou, 1999a, b, 2008, 2020; Bergen, 2012; Gee, 2004; Glenberg, 1997; Glenberg & Gallese, 2011; Glenberg & Robertson, 1998; Kwon et al., 2021).

Example 1: *Boxer*

Andy diSessa (2000) successfully taught the algebra behind Galileo's principles of motion to sixth grade children using a computer programming language called *Boxer*. The students type a set of discrete steps in the *Boxer* programing language. For example,

if the student wants to create uniform motion, she might first tell the computer to set the speed of a moving object at one meter per second. Then, as a second step, she might tell the computer to move the object. And as third step, she might tell the computer to repeat the second step over and over. Once the program starts running, the student will see a graphical object move one meter each second repeatedly, a form of uniform motion. The student will also see the relationships between the steps in the programming language (symbols) and actual events happening on the screen (ones that resemble real-world movement). The student will eventually realize that the program is a model of aspects of the world.

The student can keep elaborating her program with more steps and watch what happens at every stage. In this process, the student, with the guidance of a good teacher, can discover a good deal about Galileo's principles of motion. The student is seeing, in an embodied way tied to action, how a representational system less abstract than algebra (namely, the computer programming language) "cashes out" in terms of motion in a virtual world on the computer screen.

The student has come to understand the situated meanings for algebraic representations in a specific context of application. Her knowledge is too narrow, but, nonetheless, vivid. As she sees algebraic representations spelled out in new and different specific contexts of application, she will, over time, gain general knowledge and see how representations apply across contexts and, thus, take on general more abstract meaning.

Abstract systems originally get their meanings through such embodied experiences. An abstraction (at least in many important cases) rises gradually out of the ground of

situated meaning and practice and returns there from time to time, or it is meaningless to most human beings.

Example 2: *Dragon Box*

As another example I will turn now to a video game designed to teach algebra. Look at the two images below.

(1) $a = x + 2 + (-2) + b + (-b)$

(2) **Figure 7**

A screenshot from Dragon Box (1)

(1) is in the language of algebraic equations. (2) is a picture made up of smaller pictures. If you know how to interpret each image, you know that they say (much) the same thing. Image 2 is from a game for children as young as 5, a game called *Dragon Box 5+* meant to teach the beginnings of algebra.

At the beginning of *Dragon Box 5+*, the game uses pictures of several different kinds of cards. Some are like dice (with dots on them) and some have pictures of different creatures on them. Each card—dice or creatures—has two sides, a day side and a night side. The card with a picture of a box on it is the *Dragon Box*. The goal of the game is to get the *Dragon Box* all alone on one side of the gameboard by using a few simple rules.

One rule is this: if you move a day card onto its night card, the two cards disappear. Once you do this on the game screen above, you are left with the dragon box on one side, alone. Since the dragon box is alone on one side, you have won this round of the game. You get extra points if, when the dragon box is alone, you have left nothing on the screen that could have been removed. In *Dragon Box* this amounts to discovering that the answer to the original puzzle (pictured above) is "shell creature = dragon box" (where "=" in *Dragon Box* is represented by the line down the middle of the game screen).

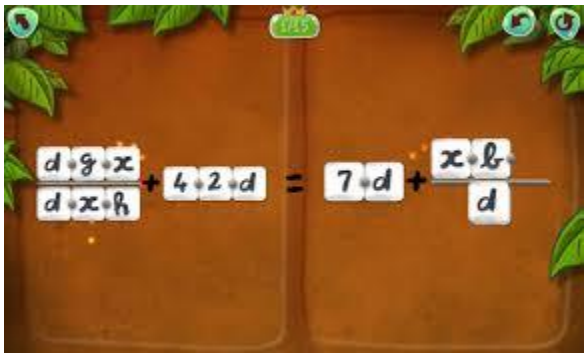
To solve the algebraic equation in (1) we can use the mathematical rule that the addition of any positive number (the equivalent of a *Dragon Box* day card) and negative number (the equivalent of a *Dragon Box* night card) equals 0 (the equivalent of disappearing in *Dragon Box*). So, we get "a = x" (or "x = a" by equivalent rules in both algebra and *Dragon Box*). This solution to the equation is the algebraic equivalent to the answer "shell creature = dragon box" in *Dragon Box*.

Within a few hours of play, *Dragon Box* moves players from pictures to full-blown algebraic equations, some of them quite complicated (see 3 below). The player has learned that the algebraic symbols and the pictorial symbols are like different words in

different languages that translate to the same meaning or concept, where meaning here means recipes for doing not just knowing.

(3) **Figure 8**

A screenshot from Dragon Box (2)



In the game the dice and creature pictures—and the rules for manipulating them—are a concrete imagistic way to see the meaning (the "semantics") of algebraic symbols and rules. In the first parts of *Dragon Box*, rules become movements and algebraic symbols become images that are meaningful outside of the realm of numbers and mathematics. At a deeper level, *Dragon Box* is teaching players that solving equations is a form of pattern recognition and pattern manipulation, a basic set of skills we use in many parts of our lives.

Dragon Box is teaching, but it is, of course, not a human being teaching. While it is digital, it need not be. It could also be played as a card game in a physical space, as are games like *Magic the Gathering* and *Yu-Gi-Oh!* that are played both ways.

Lessons Learned

A mathematical expression like "2 + 2 = 4" is not just an image. It is a set of symbols with its own grammar, thus, a language. It has meaning (here "adding 2 to 2 gets you 4"). But that meaning is only available if you know the action the expression is inviting you to do (namely add). If you do not know how to add, you do not know what the expression means. Meaning follows action.

The same is true of the printed sentence "The brown fox likes the blue one". It has a meaning, but that meaning is available only if you know how to read, an action, in most cases, amounting to being able to say the sentence in sounds. And, of course, the same is true of oral language. Any spoken sentence is meaningless unless you can "translate" into your web of associations.

Expressions like mathematical ones, printed language, or oral language are understood (interpreted, given meaning) through doing. They are recipes that those who understand them can use to do things. Notice, too, when someone asks me at dinner to pass them the salt, this is a recipe for an action. You normally do not answer the request "Can you pass me the salt?" with just "yes".

The trouble with learning any symbol system is that we most often have to manipulate the symbols in our minds—something learners cannot yet do—we usually cannot move them around physically. Furthermore, the symbols have their own grammar which makes them a language, one the beginner does not yet know.

Both *Boxer* and *Dragon Box* start with a simplified version of algebraic language and one that can be manipulated physically in the world by the learner. Both offer the learner a physical version of algebra that can be sensed and acted on much as how we act

in the world. And both offer a version of algebra that does not look intimidating and, thus, may not trigger fears and stereotypes learners bring with them to instruction.

Both *Boxer* and *Dragon Box* let the learner manipulate a simplified version of algebra and then almost immediately see what happens on a screen. The learner clearly sees the correlation between a change they have made (in the *Boxer* programming language or in the *Dragon Box* game) and a change in a world they can sense, in this case, a virtual world. Thus, change in the representational system is coupled with change in the world. The learner begins to form associations between the two, which is what it means to learn a representational system and to learn it in a way that you see it as a way to act on the world.

Two other crucial elements enter in this coupling of change in representational system and change in world in these approaches to teaching and learning. First, the human web of associations, based on experience, is a prediction engine (Seligman et al., 2016), humans learn best when they have a goal to accomplish (a problem), one which they care about, in a situation where they can predict what will happen and then act, get a result, and see if their prediction was right or wrong (Gee, 2004, 2017).

Second, humans need to know how to assess the results of their actions. They need to know, when they have acted, whether the result they have gotten is good, bad, or somewhere in between and whether they should stop or go on. The standards of such judgements very often reside within social identities connected to groups of people who have evolved standards and values in distinctive domains of practice. For example, in algebra, it is not good enough to solve an equation, but leave unnecessary elements in it, even though this does not affect the "truth" of the equation. Learners need to learn what we can call an

"appreciative system", a system of values by which one knows what is a good or bad result and when it is appropriate to stop and settle for what you have achieved and when it is not (Schon, 1983). Different social identities engage in different sorts of work or play (or both) and therefore have different sorts of appreciative systems.

Both *Boxer* and *Dragon Box* can trigger learner's predictions about what will happen and allow them to test these predictions. If their prediction is wrong, both *Boxer* and *Dragon Box* allow them to try again and guide them with "rules" about what is a good result and when it is fine to stop and call it a success and when not. One way *Dragon Box* does this is to assign stars to an answer. Three stars means your answer is technically right, but not the shortest, least redundant, version of the equation you could have reached. For that, you get four stars.

In *Dragon Box*, learners start with symbols and pictures that have no apparent tie to algebra but which are, nonetheless, recipes to do algebra. As they learn, the game transitions them gradually to algebraic symbols. Eventually they get a mixture of *Dragon Box* images and algebraic symbols. Then they get all algebraic symbols, but still in the tiles they have learned to move around and manipulate. Finally, they just get algebraic symbols and see them as recipes for action and making change in the world. They have learned a new language. The four screenshots from *Dragon Box* below show this progression.

(4) **Figure 9**

A Screenshot from Dragon Box (3)

Of course, in the case of *Boxer* and *Dragon Box*, learners have learned a somewhat different language than actual algebra as a representational system. To go further in "language acquisition" here they need to learn to translate between the system they have learned and "real" algebraic representations. But this is relatively easy because they have already learned to meld "prediction, change in representation, change in world, appraisal of results" and that same process will work for the more formal representations of algebra.

In the end, the learner forms associations among predictions, changes in representations, changes in the world, and an assessment or appreciation of the results within the value system of a particular social identity. In the act, learners learn to make

better predictions, to automatize some skills, and to be able to simulate in order to learn new things and engage in discovery.

Conclusions

Now the teaching and learning process we have discussed here is not germane just to mathematics. It is very much how children learn their first language and how people learn second languages the best. It is even how people learn art. In learning to paint, you are asked to paint, say, a sunset. You try something, predicting what will happen. You see the result. You correlate what you did with paint and what happened on the canvas. As you learn, a teacher of some sort guides you as to how to assess your results and when to stop and settle, at least for the time being. Different teachers will guide students to different appreciative systems (Schon, 1983)—thus, there are different "schools" of art. The learner is learning how paint can be used as expressive system (a term that can sometimes replace the term "representational system").

There are, of course, differences in terms of how things work in different areas, but the basic process is the same, because the process is the core of how humans learn. Below I offer a simplified list of some of the core features of the approach we are advocating here (Chi & Wylie, 2014; Clark, 1997; diSessa, 2000; Gee, 2003, 2017):

1. Generate caring that creates relevance and, thus, guides attention.

2. Use a simplified version (a model, a simulation, a pared down version) of the "real thing".

3. Remedy misconceptions and fears learners may have gotten from previous attempts to learn.

4. Correlate four components in approaching a problem: prediction, change in representation (or expression), change in world, and appraisal.

5. Use failure coupled with actionable feedback as a form of learning, not a form of personal failure or judgment.

6. Order problems so that the initial problems learners face are "generative" in the sense that they set up good hypotheses (predictions) that will be fruitful when they face later, harder problems.

7. Teach learners—and socialize them into—appreciative systems.

8. Give learners lots of practice with needed skills in the context of larger actions meant to accomplish clear and meaningful goals.

9. Do not use time as the measure of learning (unless this is part of what is being taught).

10. Give verbal information "just in time"—that is, small blocks of verbal information when the learner needs it, can use it, and can see how it applies in action.

11. Offer large blocks of verbal information "on demand"—that is, when learners need it, feel a need for it, and can make use of it out of the context of immediate action.

12. Build better predictive skills, new forms of embodied correlations (automatic pilot), and new capacities for simulation, as well as ever more sophisticated powers of articulation in the representational or expressive systems being learned.

These principles—and tools like *Boxer* and *Dragon Box*—can be used to give students good experiences in new domains. They can be used to teach useful/functional knowledge; or to allow students to explore/play; or to try on a new social identity (more on that in the next chapter); or to help them find meaning by coming to see how mathematics fits into the larger scale of things intellectually, socially, and historically; or even to give some students a sense of wonder and even beauty. And, of course, algebra, geometry, and other branches of mathematic have and can fuel physical experiences in the world in terms of mapping, designing, building, and landscaping.

CHAPTER 17

BECOMING

Becoming and School

In much of life, learning is a meld of doing, knowing, and becoming. Performance (doing) before competence is the norm (Barnett, 2007; Ito et al., 2012; Lave & Wenger, 1991). No one asks babies to keep silent until they know the language.

With guidance and feedback, learners act (do) and eventually learn how to use certain tools, norms, values, and information (know) to enact a certain social identity (become). Learning to become a biologist as a member of lab works this way, as do law schools when they are training lawyers, at least in their clinics. A new graduate student in biology, being mentored as a member of a senior researcher's lab, needs to know just enough of the language of biology so that the professor and other lab members can mentor her into the full academic language of the branch of biology they study, as well as into the practices, norms, and values that give meaning to this language.

Learning anything deep takes so much time and effort that only a desire to become something can create enough motivation for deep success. Surely, no one would watch thousands of hours of anime if they did not want to become an anime enthusiast and they would learn little if they were forced to watch all this anime without a desire to become such an enthusiast.

Now, take school. Across the school years, a learner is supposed to learn arithmetic, algebra, geometry and, perhaps, trigonometry and calculus. But why bother? Being told you can be a better citizen or a better consumer if you know mathematics is hardly all that motivating. When *Second Life*, a simulated world where players could

landscape the environment and build all sorts of structures, was popular, people were eager to build with the 3D tools *Second Life* gave them, though these tools demanded they learn enough geometry to make self-supporting structures. Players, using performance before competence, guidance from better players, and player-made tutorials often got quite good at—and liked—geometry, even if they had failed it in school as a school subject (Gee & Hayes, 2010). However, they were learning geometry not to be a geometer, but to become a *Second Life* designer, a social identity that used geometry in certain ways. Some *Second Life* designers went on to make significant amounts of (real) money building for others, including companies and institutions that wanted to have a presence in *Second Life*.

The fact that lots of schooling involves learning information without much doing or, at least, any very authentic doing tied to social identities is why school is so good at what economists call "economic signaling" (Caplan, 2018). Economic signaling means that schools signal to prospective employers which students have proven themselves conscientious and conforming, attributes many employers want (most businesses do not want lots of employees who are renegades). The employers trust that school grades will select the most acceptable employees and that thereafter they will learn what they need to do the job on the job. It is as if, as is the case with college football and basketball, schools ran the minor leagues for employers at their own expense (note baseball has to pay for its own minor leagues).

Since schools function well for economic signaling, it is hard to see how this would change, because it is exactly the function lots of businesses and political institutions want and need them to serve. This is not meant as some sort of conspiracy

theory; many businesses and politicians are quite upfront—and quite unapologetic--about the matter. In turn, this means today that many young people turn to interest-driven affinity spaces (Gee, 2017; Ito et al., 2012) outside of school to learn under the guise of doing and becoming so that their knowledge is effective in the world and in their own lives.

This, of course, means access to such affinity spaces is a new crucial site of concern over issues of access and equity. Some social identities are good (graphic designer) and some bad (identity theft expert). Some lead to skills that are transferrable in the world, including in employment. This is surely true of graphic designing and, alas, probably true of expertise in identity theft, given the popularity of scams and so-called "legal crime" in our economy (e.g., credit default swaps and other "financial weapons of mass destruction").

Becoming in School

We have seen that doing, knowing, and becoming as a form of learning is often easier to do out of school than in it. However, there is a way to create becoming at school or in more formal educational settings. This approach was pioneered by David Shaffer (2006, 2017) and James Paul Gee (2004, 2011) in work they did together (Gee & Shaffer 2010; Shaffer & Gee 2007) at the University of Wisconsin-Madison.

Any social identity—whether a scientist of a certain sort or a gang member of a certain sort—is composed of the following:

1. A **problem space**: This is the sorts of problems people with the social identity seek to solve. It is what fuels their doing.

2. **Practices and methods**: The ways they go about doing what they do.

3a. **Norms and values**: These are the standards they have allegiance to in doing what they do and being who they are.

3b. These norms and values, in addition to other functions, lead to an **appreciative system**, that is ways to use these norms and values in practice to judge what is a good or bad result of actions taken on the way to solving a problem.

4a. **Tools and technologies**: These are the supplements to sensation and action they use to do what they do and be who they are.

4b. A crucial tool is the style or styles of language and other symbol systems people with a given social identity uses to get their "work" or "play" done. These different styles of language, associated with specific tasks and social identities have been called registers or **social languages**.

5. **Identity markers**: Social identities usually have a variety of identity markers, that is various symbols, ways of dressing, doing, talking, writing,

> using tools and technologies, and occupying characteristic spaces that, whatever else they do, also signify that one has allegiance to a given social identity.

Shaffer (2006a, b, 2017) has pointed out that this set of things constitutes what he calls an "epistemic frame", that is a way of orienting to the world and organizing how, as a "clan" (social identity), people carry out (and further develop or transform) their work or play. Gee (2004, 2011) has called this set of things a "Discourse" with a capital "D" ("Big D Discourse"), because, just as individuals can communicate with each other (engage in discourse), social identities, across time and space, can communicate and interact with each other (engage in Discourse). Discourses and their relationships constitute the social geography of a society.

Epistemic frames look at social identities via the lens of knowing. Discourses look at social identities via the lens of social recognition and communication within and across different social identities. In the framework I have adopt in this book, we can see both as aspects of how an individual couples with a sensing position as both a place and a place occupied by a specific sort of sensing being (in terms of species, clan, and individuality). We might also say that social identities come with epistemic frames that allow them to communicate and interact both in terms of individuals and as historically and socially meaningful identities.

I have talked a good deal in this dissertation about the human capacity to simulate. Learners can "play" an identity in the world and in their minds. Indeed, play often leads to becoming and even sometimes melds with work. Shaffer (2005) points out,

> The content of a knowledge domain takes on a new life when learners pursue meaningful ends within a coherent practice. ... More than that, though, when learners engage in socially-valued practices toward ends they value—that is, when learners use real tools and methods to address issues they care about—motivation and learning tend to follow. (p. 79)

He and Mitch Resnick have described learning in which this kind of connection takes place as "thickly authentic". By this they mean that “activities are simultaneously aligned with the interests of the learners, the structure of a domain of knowledge, valued practices in the world, and the modes of assessment used” (Shaffer, 2005, p. 1; see also: Shaffer & Resnick, 1999).

Shaffer (2004a, 2004b) has argued, as I am here, that participation in a social identity involves participating in that social identity’s ways of doing, being, caring, and knowing. He also points out that lots of social identities have their own well developed ways (what he calls “practicums”) to socialize newcomers and reproduce themselves. Lawyers know how to make new lawyers; birders know how to make new birders; gamers know how to make new gamers; gang members know how to make new gang members. These practicums can give educators insights into how to developed thickly authentic learning, not by copying them, but by enhancing them for learners at different levels and from different backgrounds.

Shaffer developed what he called “epistemic games”, a game like simulation that is one example of taking on an embodied simulated social identity. An epistemic game is

a form of play, but like lots of play it does not exist just for pleasure or fun. Play can allow children and adults to enter simulated worlds (in games or in their heads or in classrooms) and work out ways of doing, knowing, and being that they cannot yet—or may never really—do in the "real world".

One example of Shaffer's epistemic games is *Madison 2200*, a learning game developed at the University of Wisconsin-Madison by Kelly Beckett, one of Shaffer's students (Shaffer 2006b). In *Madison 2200*, high school students learn about urban ecology by simulating the work and identity of an urban planner in order to redesign State Street, a downtown pedestrian mall in Madison.

Urban planners help keep urban ecological systems in balance by developing land use plans that meet the social, economic, and physical needs of communities. As is the case with many social identities, urban planners use distinctive tools and technologies to develop solutions to their problems. For example, geographic information systems (GIS) give urban planners an external platform—much like a virtual world—where they can test their ideas and see how various decisions might play out.

In one implementation of *Madison 2200*, high school seniors worked with a graduate student in an urban planning workshop. At the start of the workshop, the students received a (fictional) directive from the mayor addressed to them as city planners to create a detailed re-design of State Street. They were also given an informational packet that included a city budget plan and letters from concerned citizens about issues such as crime, revenue, jobs, waste, traffic, and affordable housing. Students also watched a video about State Street, featuring interviews with people about the street's redevelopment, and then walked to State Street to conduct a site assessment. Then

the students worked in teams to develop a land use plan. They used MadMod, a custom-designed interactive GIS model of State Street that helped them assess the ramifications of proposed land use changes.

For example, if a student wanted to increase the number of jobs available on State Street, she might make the decision to place a new retail business on State Street. The model would show whether that proposal would raise or lower the number of jobs predicted for the neighborhood. However, the model would also show how other issues were affected by the same land use choice, thus leaving students with a decision to make regarding the overall impact (and therefore the utility) of alternative land use proposals.

After completing a land use plan in MadMod, students entered their decisions into an interactive map of the State Street area. In the final phase of the workshop, students presented their plans to a representative from the city planning office. Data collected in pre- and post-interviews show that in playing this game, students began to develop ways of thinking and doing characteristic of urban planners: they formed—or started to form—an epistemic frame of urban planning. Students developed their understanding of ecology and were able to apply it to urban issues.

During post-interviews, all of the students said the workshop changed the way they think about cities. Students consistently referred to the MadMod simulation model and urban planning practices when explaining their understanding of the interconnectedness of urban ecological issues.

The *Madison 2020* let the students inhabit an imaginary world in which they were urban planners. They first entered that world because they had volunteered to participate in an experimental workshop. But the world of *Madison 2200* recruited these students to

new practices, identities, interests, and understandings as part of a new way of seeing the world.

Conclusions

I am not arguing here for learning through games per se. I am not advocating any one approach to teaching. Rather, I am arguing that students can learn through embodied simulations of authentic practice. These simulations can go on in their minds, in the classroom and, perhaps, outside it, as well as, often, in virtual worlds created by various sorts of technologies.

Students learn ways of doing, valuing, and knowing connected to a given social identity, an identity they can now recognize and empathize with, even if they are not going to take it on "for real". They will, however, be able to use this form of learning both to appreciate the relationships among various social identities (and their ways of doing, valuing, and knowing) in society and to fuel further learning connected to that identity in the future should they need or want to. This latter idea has been called "preparation for future learning" (Schwartz, Bransford, et al., 2005; Schwartz, Sears, et al., 2007) and, in a fast changing world, is one key goal schools should have.

CHAPTER 18

AN EXAMINED LIFE

I have discussed the dilemmas of learning to become (attaining an identity) especially in school. Learning to become is how we acquire social identities throughout life. A human life is a trajectory across the possible social identities society and history make available (Boyer, 2018; Haidt, 2012; Junger, 2016; Klein, 2020; Moffett, 2019; Tomasello, 2019). Across a lifetime, people take on, change, and sometimes drop specific social identities. They have social identities as members of families, local communities, ethnic groups, religions, institutions, occupations, and interest-and-passion driven groups. People can socially identify with special needs or capacities they have, causes they advocate, political parties, sports teams, shared histories, or even their illnesses. When they do this they make a social identity out of what others just take to be happenstance.

Social identities compose the warp and weave of a society. They constitute its social geography. For any person, the social identities that they have access to in a given society and time in history are profoundly consequential. This is so, because certain social identities in a given society, at a given time in history, offer people important social goods and powers. This is why learning to become, that is, to be able to sample and choose certain social identities, is crucial to the development of any individual and is, at heart, a profound issue of equity and fairness.

When we rise above the level of individuals and look at all the social identities available in a society at a given time in history and who these identities are open to—or sometimes imposed on—then we are studying the social geography of history and society. Social identities, like places in space, are connected and partly defined in relation

to each other. A person cannot become a college student without having been a high school student. A person cannot become a doctor unless she was a college student who got into a medical school. There was a time in which being Jewish, African-American, or a woman limited your opportunity to go to a medical school quite seriously. Further, what sorts of college and medical school student identities you acquired and enacted have consequences in terms of how your medical career unfolds, if it unfolds at all.

We do not always choose our social identities. We do not choose our birth family or the country we were born in. We do not choose whether others will "define" us as "white", "black", "female", "gay", or "special needs". For most people, even social identities that are, in principle, available to them are hard to access because either they come from backgrounds that know nothing about them or do offer any early preparation for them.

The nature of society and the way opportunities are distributed in society offers another important goal for teaching and learning, but one which is controversial. How important is it, for individuals and for society, to teach people to understand the workings of identity and opportunity in their society, across different societies, and across history? How important is it for a people not just to lead their lives—and even struggle in them to overcome barriers and prejudice—but to understand the workings of humans as special sorts of beings within their societies and their histories? This used to be called "living an examined life" (Dizikes, 2018; Loban, 1970) and was once seen as a key purpose of education, especially higher education, and, in particular, of the humanities and social sciences. However, it also came to seen, by many, as elitist. It seemed the preserve of

those with enough resources and time to "think" and not those who needed to spend their time and efforts getting enough resources to live.

The literary critic Northrop Frye (1912-1991), a major figure in his time, argued that certain forms of education gave students

> … the ability to look at contemporary social values with the detachment of one who is able to compare them in some degree with the infinite vision of possibilities presented by culture. One who possesses such a standard of transvaluation is in a state of intellectual freedom. One who does not possess it is a creature of whatever social values get to him first: he has only the compulsions of habit, indoctrination, and prejudice (Frye, 2020, p. 324 [org. 1957]).

Some will see the word "detachment" as a problem here. They will argue that there is no such thing as detachment—we always come to anything with our own personal and cultural predispositions. Some will argue that we should never treat things, people, and causes we do not like in a detached way, but oppose them with all we have. However, we need only argue here that when we want to understand something, even something that at first seems repugnant, we first need to step back and see it from multiple perspectives, including those of others. We need to "size it up", if only then to fight it intelligently. Of course, there are limits here. Many would find this hard or impossible to do in the case of Nazis. Yet, no one would have changed their views on things like homosexuality, racism, social justice, politics, or even new types of food or

other people's cultures, if they did not sometime set aside, as well as they can, old feelings and beliefs for at least a simulated try out of new ones.

Frye is saying that just as in the case of physical space we cannot go to new places without getting a feeling for what is out there and how to get there—which sometimes means just trying out a new path—so, too, in social space we cannot know what experiences, opportunities, and social identities are available and worth trying to attain—even to fight for—without engaging with the "big picture" beyond our own "compulsions of habit, indoctrination, and prejudice". Further, it is only by engaging with how social identities relate to each other in society—for better and worse for others and for other life on earth—that we can choose which ones to drop or not seek.

The real problem with Frye's position is that it and others like it became institutionalized into schools and colleges. Experts told others what constituted "competent" interpretations, what was truly worth honoring and what was not. They dictated taste, values, and meanings as a profession of experts. This is much like advocating "freedom of thought" in religion but demanding you listen to and follow the dictates of priests (who, alas, do not always agree on what is true, right, or moral any more than English professors did in Frye's time).

So, we can advocate Frye's "standards of transvaluation as a way of life, but not as an institutional process—as a way of life even if goes on in school. It is a journey towards truth and goodness that has, perhaps, no final destination; it is composed of the best attempts we can make and the best recoveries from failure we can manage in the service of flourishing for ourselves and all life.

Some will object to the term “value” here—in “transvaluation”—arguing either that values are relative and there is no way to choose among them or that values are just things people with power impose on others without it. However, I have argued in this dissertation that values flow from the nature of being a living thing, a living thing of a given kind, and sometimes a living thing in a clan. Any living thing is built to value the world in just the way it needs to in order to survive and hopefully flourish and this valuing is expressed as internal sensations, feelings, and emotions.

I argued earlier that there is a criterion that raises above relativism. This criterion is flourishing (measured, at the very least, in terms of allostatic load). I argued that a living being that is not flourishing is stuck, for whatever reason, at a level of health and wellbeing that can be improved. I also argued that ensuring that a living being—especially in the case of humans—is flourishing makes them safer to themselves and others and, thus, improves flourishing for all. This is the minimum criteria for transvaluation and the most basic level of values for humans as living beings.

CHAPTER 19

ATTACK ON TITAN: FROM SENSATION TO SENSE MAKING

Introduction

In this chapter I use the anime *Attack on Titan* (AOT) to study how media can design experiences for viewers that enact and build big ideas "bottom up" out of sensation. AOT has drawn worldwide attention to how it engenders thinking about—and much open discussion among its fans of—political, historical, and philosophical ideas of the sort that appear in academic curricula. However, it treats these ideas more in the way we used to think of living an examined life—reflecting on the meaning(s) of life at the level of core ideas—than does many an academic class today. AOT does not deal with ideas using texts, abstractions, or academic language. Rather, it creates reflection on and simulating (imagining) of the implications of such ideas via the design of sensations, feelings, and emotions that come to both embody these ideas and transform them into concretely felt realities. In this chapter I will consider the theme of "walls", first as it has played out in history and then in how it plays out in AOT at the level of designed experience.

Walls

David Frye's book *Walls: A History of Civilization in Blood and Brick* Frye' shows that ever since humans began to congregate in larger settlements they have built walls to keep outsiders—what they call "barbarians"—out. In turn, the barbarians despise wall dwellers as weak, effeminate, and cowardly and, sooner or later, they bring down the walls and the people behind them, often with great displays of horrific violence. Frye

points out that during the nearly two thousand years between the first great invasions in Eurasia of the Scythians in seventh century BC and the Mongol invasions of the thirteenth century AD, thanks to innovations in warfare, “the capacity of the steppe peoples to wreak havoc upon Old World civilizations approached the apocalyptic” (p. 50).

The story of Alexander the Great expresses well how this divide historically affected the psyche of wall dwellers. A former student of Aristotle’s, in 334 BC Alexander, the king of the ancient Greek kingdom of Macedon, invaded the Persian Empire, conquered all of Asia Minor and later invaded India in 326 BC. Ironically this conqueror became a mythic hero of wall building. After Huns, in the 390s AD, executed devastating raids into Mesopotamia and Syria and appeared also on the edges of the Roman Empire, Alexander’s biographers began to create mythic tales about him as the great defender of civilization. As Frye points out:

> A messianic aura soon shone over the putative defender of civilization. In an anonymous Christian variation of the popular Alexander Romance, Alexander is depicted with divine horns. Gog and Magog, meanwhile, have become kings of the Huns, endowed with all the standard characteristics of steppe horsemen. Like most of the feared barbarians of antiquity, they are given blue eyes and red hair. Their armies arrive on horseback, Amazonian women at their side, towering over civilized folk. Their customs are abhorrent. They are unclean and clad only in skin. They feast on corpses and blood. Upon receiving reports of the beastly duo, Alexander commands a great iron door be built in the Caucasus Mountains. (pp.

78-79)

> This tale spread throughout the Old World. In the Quran, Alexander became "Dhul-Qarnayn, 'the two-horned one,' who builds an iron barrier against Yajuj and Majuj (Gog and Magog) in the space between two mountains". (p. 79)

The themes of Alexander's story are ones that spread across every part of the globe. Walls were the precondition of civilization since they allowed lots of people to engage in tasks other than fighting. Walls gave people the security to think, invent, and form institutions. However, they also gave rise to divisions of labor and status that many people came to see as coercive, confining, and detrimental to freedom. Often, in history, some people inside walls have wondered whether the walls were, in reality, a prison.

"Civilians versus barbarians" sets up the premise of the beginning of the AOT story: Three massive walls encircle the island where those who are thought to be the last humans huddle in fear. These all-encircling walls, each fifty-meters in height, were constructed to protect human territory from a species of human-devouring giants, namely Titans. Titans are, though morphologically similar to humans', much stronger, substantially larger and taller, and far more powerful than humans.

As in many a walled city, in the AOT world the three massive walls have "deskilled" the population living behind them. Civilians leave the fighting to soldiers who trust the walls. The Garrison Regiment is responsible for the safety and maintenance of the three walls. However, one hundred years of peace within the walls has left these

soldiers lazy and incompetent. In the first episode of AOT, viewers see Garrison members, rather than fulfilling their duties, drunk and disorderly. Seeing this, Eren, a child, gets furious and asks one of the Garrison members, Hannes, how they, in such a sloppy shape, can fight the Titans. Hannes replies that given the strength of the walls they are not actually prepared to fight:

Eren: You're not actually prepared to fight them at all?!

Hannes: Nope!

Eren: What?! Then drop the "Garrison Regiment" name for "Wall Construction Squad" instead!

Hannes: Not a bad idea. But you gotta understand, Eren. If a soldier's doing his job, things have seriously gone to hell. It's better when everyone's calling us useless freeloaders; it means peaceful times for us all.

Eren: Sure, we can stay inside the walls our entire lives and do nothing but eat and sleep! But that basically makes us cattle!

(S1E1 "To You, in 2000 Years")

Even the brave soldiers of the Survey Corps, soldiers who leave the walls to fight Titans, get little sympathy from the public. Some accuse the Survey Corps of being a waste of taxpayer money. Better to stay behind the walls and ignore the barbarians outside.

Ideas Bottom Up from Embodied Vicarious Experience

AOT plays on historical and mythic themes, walls being one example and giants another. It problematizes notions of race/ethnicity/nation and social identity. It deals with issues of ideology, propaganda, and deception that keep people divided and submissive. It raises deep issues about choice, freedom, free will, morality, and the nature of human beings. It deals with concerns that are as prevalent today as they have ever been in history. But AOT is not a political, historical, or philosophical text. It deals with ideas bottom up as they arise from the experiences and interactions of the characters vicariously lived by viewers.

I have argued in this dissertation that the human mind is composed primarily of associations formed from experience and that humans use these associations to think, remember, plan, decide, and act. AOT as a designed experience, constructs experiences for its viewers (or readers of the manga or gamers of the games) and continually shapes, shifts, and changes these experiences so that viewers think, remember, and imagine in new ways, ways that are relevant to real world concerns. These associations, though garnered from AOT as media, join, augment, and change people's current associations, that is, they potentially change their minds.

In this chapter I want to give one example of how AOT sets up thinking about—and can fuel discussion of—intellectual concerns of the sort associated with living an examined life via designed inner and outer sensations that constitute vicariously lived experiences that are "tools for thought". I will analyze one short segment from AOT, the first one viewers see.

The Prologue

AOT starts with a prologue before the title sequence comes on for the episode. This prologue is the first thing people new to AOT see. It is composed of two segments. One (57 seconds) shows us the first time a Titan attacks the walls of Paradis Island. This is followed by second segement (45 seconds) which is a fast and furious battle outside the walls between members of the Survery Corps on horses and a large Titan. The two segments could hardly be more different in how they are filmed. The first is set to eerie music and unfolds slowly shot by shot. The second is a rush of blurred action. The first is a meditative short movie, the second looks like a clip from an action video game. I will analyze only the first segment of the prologue here, which I will just call "the prologue" for short, though it is just the first segment of it.

The prologue is thematic in the sense that it depicts events in ways that are not same as they are depicted later in the episode itself. This is so because it is using images, motion, and sound to express major themes that are developed in great detail across AOT as a whole. The prologue is truly a sensual design meant to set off thematic stirrings in viewers' minds, one that will be ever deepened as they watch AOT to the end (87 episodes in all).

The prologue will mean quite different things to people watching AOT for the first time than it will to those watching it again after having seen episodes of AOT. Indeed, it will mean different things depending on how many episodes one has seen, since AOT continually changes what viewers and the characters know or think they know. In any case, the prologue is a masterful "introduction" to AOT visually and

thematically and to how AOT designs sensations and experiences to create feelings, emotions, and meanings.

I will analyze the the prologue in the context of our discussion about walls. Below I have storyboarded the AOT prologue (first segment). Of course, these shots are not static in the anime. Movement is created as one shot morphs into another. In the storyboard, I give a description of each shot and also state whether it is a bird's eye perspective or a perspective from someone on the ground. I also give an English translation of the narrator's voice over when and where it occurs. There is no narration until shot 10. Until then viewers only hear eerie music and otherwise experience a silent sense of apprehension and foreboding.

Figure 10

A Series of screenshots from AOT

1. *Eerie music … until 8*

Geese flying across the sky

Bird's eye view: With the geese

2.

Eren's eye showing image of geese flying across it

Ground view:
Looking into Eren's eye

3.

Townspeople stare

Ground view:
Turning to look at townspeople

4.

Dog barking

Ground view:
Looking back and down on dog

5.

Geese fly past tower

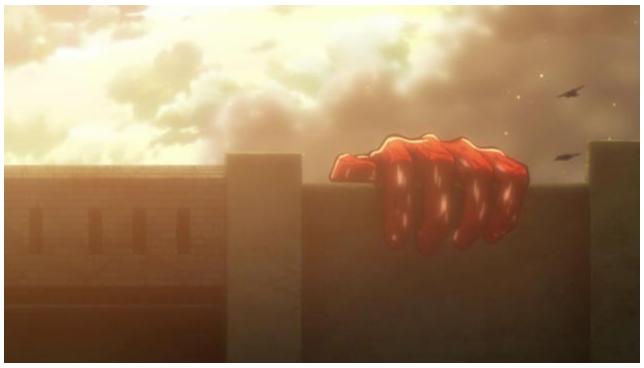
Ground view:
Looking up with townspeople

6.

Geese fly above wall

Ground view: Looking up with townspeople

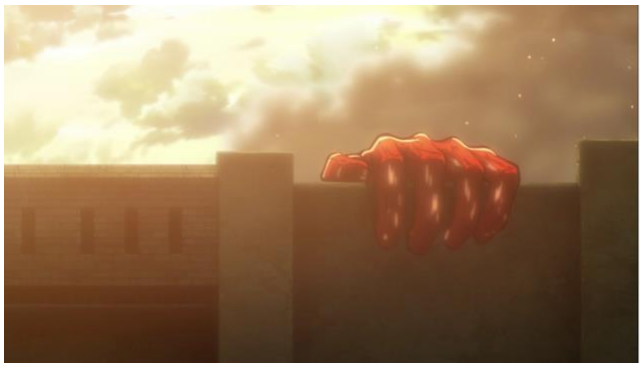
7.



Geese fly over and past massive Titan hand

Ground view: Looking up with townspeople

8.



Titan hand alone

Ground view: Looking up with townspeople

9.

Mikasa, Eren, and Armin stare

Ground view: Standing to the side and a bit back

10. That day

Mikasa, Eren, and Armin with townsfolk from back

Ground view:
Standing behind the group and looking at them

11. Humanity remembered

Camera rises to show smoke coming off Titan

Ground view:
Standing behind the group and looking up

12.

Shadow of Titan head rising

Bird's eye view:
Looking back

13.

Shadow of Titan head fills screen

Bird's eye view:
Looking back

14.

Titan head rising

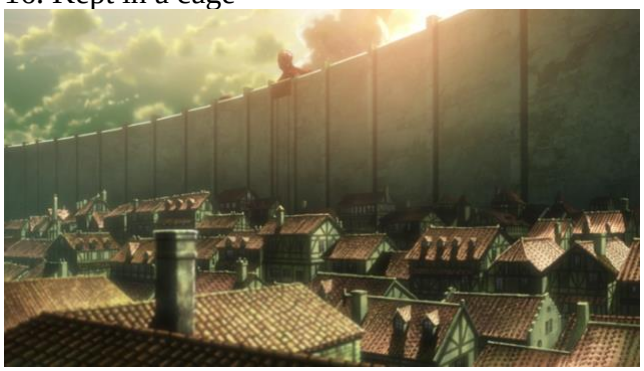
Ground view:
Looking up from town

15. the terror of being ruled by them

Titan head towers above

Ground view:
Looking up from town

16. Kept in a cage



Long shot of Titan looking over the wall at the town

Ground view:
Standing far to the side inside the town

17. Humiliated

Eren stares

Ground view:
Looking into Eren's eyes

18. *Dramatic music*

Titan seen from the back towering over the town

Bird's eye view:
Looking back

19. *Dramatic music*

Camera moves back and higher

Bird's eye view:
Looking back

20. *Dramatic music (Crashing sound and cut to action segment)*

Town and Titan

Bird's eye view: Looking back

Three Journeys

These images capture, in a quiet artful way, what I will call three journeys. The three journeys are not given separately, but, rather, interlaced. One journey is what is seen and experienced from a ground level perspective. I will call this the ground journey. I will show below that this is a spatial journey the viewer takes vicariously as fellow townsperson. The ground journey is captured below:

The Ground Journey

3.

Townspeople stare

Ground view: Turning to look at townspeople

4.

Dog barking

Ground view: Looking back and down on dog

5.

Geese fly past tower

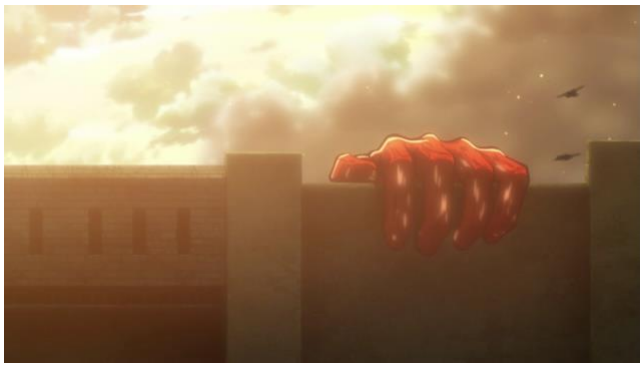
Ground view: Looking up with townspeople

6.

Geese fly above wall

Ground view: Looking up with townspeople

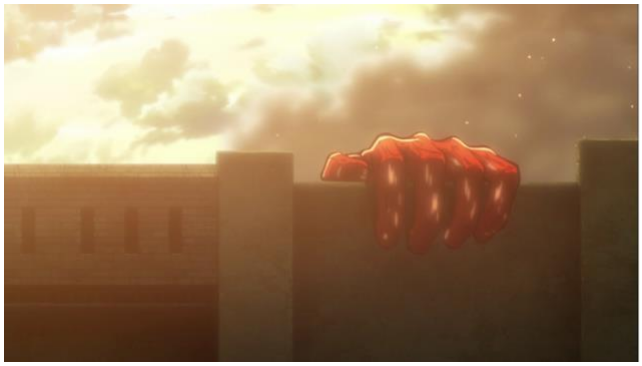
7.



Geese fly over and past massive Titan hand

Ground view: Looking up with townspeople

8.



Titan hand alone

Ground view: Looking up with townspeople

9.

Mikasa, Eren, and Armin stare

Ground view: Standing to the side and a bit back

10. That Day

Mikasa, Eren, and Armin with townsfolk from back

Ground view:
Standing behind the group and looking at them

11. Humanity remembered

Camera rises to show smoke coming off Titan

Ground view:
Standing behind the group and looking up

14.

Titan head rising

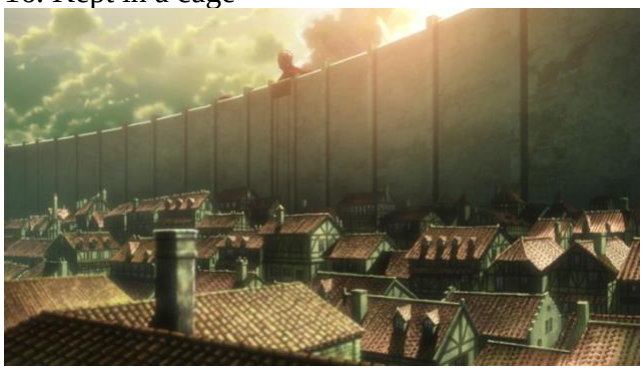
Ground view:
Looking up from town

15. the terror of being ruled by them

Titan head towers above

Ground view:
Looking up from town

16. Kept in a cage



Long shot of Titan looking over the wall at the town

Ground view:
Standing far to the side inside the town

In this journey the viewer is positioned as if she is an unseen moving character in the scene. In Chapter 15 I talked about different sensing positions. There I pointed out that humans can imagine what it would be like to sense from a different position than the one they are actually in. For example, a hiker might be tiring on her way up a high mountain and then imagine what she will see from the top and how she will feel up there. This simulated view from the top is what I called an "alternative first-person sensing" position. Such positions can activate (automatically or purposefully) sensory neurons and, thus, can have the same sorts of effects as "real" first-person sensing. The ground journey sets up just such an alternative first-person sensing position where the viewer can sense and feel outside themselves.

In (3) the viewer is standing a bit to the side and in front of the woman wearing the white hat and turns to look at her and the people with her. For reasons I will get to in a minute, in (4) the viewer moves past the woman and looks down at a barking dog. Moving past the dog, the viewer looks back and up and in (5), (6), and (7) sees geese flying past a tower, across the wall, and over the Titan's hand grasping the wall. The viewer is moving her gaze following the geese and in (8) her gaze settles on the Titan's hand.

In (9) the viewer is in exactly the same position as she was in (3) when she was looking at the woman with the white hat. Now she is looking at Eren, Mikasa, and Armin. In (10) she has moved behind Eren, Mikasa, and Armin (and the group they are with). Note we can see the woman wearing the white hat in front of the group (see enlarged piece of the picture below). This is why I say the viewer is moving backwards from where she started (looking at the woman).

Figure 11

An enlarged portion of picture 10

In (11) the viewer raises her gaze above the group to look at the steam coming off the Titan's head. As she watches, she sees the Titan's head (in 14 and 15) rise above the wall. In the final shot (16), the viewer has moved much further back and far to the side of the town, looking at the Titan above the wall, from afar, seeking safety through distance. She is withdrawing further into the walls.

We do not hear words until (10-11) when we hear "That day…humanity remembered…". Then at (15) we hear "the terror of being ruled by them". Finally, in the distant shot from the back corner of the town, we hear "kept in a cage". It is easy to hear these words as the thoughts of the viewer as a co-participant in the event, herself among one of the townspeople, though internally voicing what the others also feel and think.

The Bird Journey

The second journey is lived and felt in the air. It is a bird's eye view. In this journey the viewer becomes a bird. The bird journey is captured below:

1. *Eerie music …*

Geese flying across the sky

Bird's eye view: With the geese

12.

Shadow of Titan head rising

Bird's eye view: Looking back

13.

Shadow of Titan head fills screen

Bird's eye view: Looking back

18. *Dramatic music*

Titan seen from the back towering over the town

Bird's eye view: Looking back

19. *Dramatic music*

Camera moves back and higher

Bird's eye view: Looking back

20. *Dramatic music (Crashing sound and cut to action segment)*

Town and Titan

Bird's eye view: Looking back

In (1) the viewer—as a fellow bird—is positioned alongside the geese in the air, is one of them, a member of the flock. We know from the ground journey that the townspeople have watched these geese fly behind a tower, across the top of the wall, over the Titan's hand, and disappear. The view seen in (12 to 20) is what the birds see as they fly off and up and away into the distance behind the Titan. They see the shadow of the Titan's head as they fly up and away (they see more of the shadow as the rise higher), then they see top of the Titan's body (the body looks smaller as they get higher and further away), and then they see the whole town as they fly off above the clouds covering the town. This is an aerial journey. Just as the ground journey ends with the viewer

seeking escape by moving to the far edge of the town, the bird journey ends with birds leaving the town to its own fate as they fly off “free as a bird”.

The Eren Journey

The third journey is different. Here there is no physical movement. Rather, the viewer takes an internal journey into Eren’s body, mind, feelings and emotions. I will call this the Eren journey. It is captured in the two close shots of Eren’s face, seen below:

2.

Eren’s eye with image of geese flying across it

Ground view: Looking into Eren’s eye

17. Humiliated

Eren stares

Ground view: Looking into Eren’s

In (2) the viewer looks into Eren’s eye and sees the reflection of the geese flying across it—see blow up view below:

Figure 12

An enlarged portion of Eren's eye in picture 2

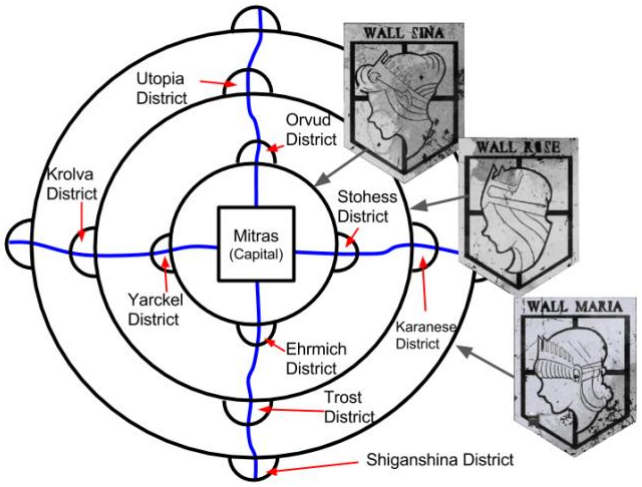
In (17) the viewer sees both of Eren's eyes, this time reflecting no images, but hears the words "humiliated". In (2) Eren is watching the flight of the birds as they go free and in (17) he is staring at the Titan's head above the walls and "sees" (realizes) the fact that humanity is not free—not even safe--behind the walls. They are like birds locked in a cage formed by the town's walls. This shot of Eren is strategically placed right between the end of the ground journey (16) and the end of the bird journey (18-20). If we juxtapose what Eren is looking at—namely the full face of the towering Titian in (15) and the image of the birds flying across his eye in (2)—we can conclude while confronting the visage of the Titan he is thinking of the possibility of flying with the birds free, rather than encasing himself deeper inside the walls, as the ground journey has done.

Eren's journey—the insight the viewer realizes he has—is the opening move in Eren's further journey in AOT, across all its episodes, to become the bridge between the ground journey (moving deeper into the walls in the search for safety—there are, after

more walls the townspeople can hide behind—see image below) and the bird journey (flying free of walls into the wider world). Eren realizes, what all wall dwellers in history, have sooner or later come to realize, that freedom beyond the walls means facing the barbarians, fighting them, perhaps only to become like them, monsters of violence, and, then, facing yet other unknown dangers in the outside world where there are no walls, in order to live free of walls.

Figure 13

The Map of Walls and Districts in AOT (Fandom contribution)



Note. Paradis has three walls with towns attached to parts of them. Shiganshina District is where Titans made the first hole in Wall Maria. For those who survive, they must get behind the next wall and hope the Titans cannot breach that one.

Eren bridges the ground journey and the bird journey because he sees that he cannot just work for his own freedom, but needs to work for the freedom of all his fellow Paradis islanders as well. He must retreat further behind the walls and defend them, must join the Scouts and attack the Titans outside the walls, and he must change the consciousness of his people if he is to free himself and them as well. His mission—with a great many twists, turns, and surprises—is born as it looks open eyed at the Titan who first breached the walls of Paradis.

Meaning Bottom Up

As viewers, in the prologue, we have sought, in fear, to escape further into the walls, seeking safety in the face of their fragility. We have stared in amazement and horror at a Titan. We have stood among and shared the fate of the townspeople. We have also lived a different perspective as we have flown over the walls and away in freedom, as birds, citizens of a much wider world than the humans on Paradis Island can inhabit. Finally, entering Eren's mind and feelings, through his eyes, we have sensed a longing to leave the walls, face the Titans, and claim the wider world as a birthright of those who will not be caged.

If one is viewing AOT for the first time, the prologue is designed to create sensations, feelings, and emotions that will guide the viewer's long journey through AOT. We might say that these designed sensations, feelings, and emotions are *sensual markers* of meaning. Walls as protection and cages, citizens versus soldiers, Titans as barbarians, truth and deception, freedom and choice, the nature of humanity, the politics of war, the risk of discovery and the limits of our worlds—these are concepts which in

the prologue are just starting to get sensual emotive meanings. These meanings will build and transform into vividly sensed and felt questions, ideas, and theories that never lose their ties to the viewer's embodied experience, here beautifully designed experiences meant to engage simulation and therefore thinking, as well as discussion among viewers outside the anime.

If one is viewing the prologue again after watching some or many episodes of AOT—and AOT demands rewatching—the prologue's sensual markers vibrate with new and deeper meaning and even with controversies discussed in the fan community. This is an excellent example of how both sensual experiences and words take on ever deeper meanings—trigger ever wider and deeper associations in our brains—as we learn.

To take just one example: When we see the birds fly across Eren's eye and realize his open-eyed stare at the Titan is not (just) fear, but hope, we wonder how Eren could ever fly free as a bird along with his fellow Eldians. After all, outside the walls there are giants—God and Magog, Huns, barbarians. What could such freedom even mean for a child and his friends? Why does this child, unlike the viewer-citizen on the ground journey, look out and not in? Who has it been in history that, faced with monsters, left their walls to face them? What happened to them in the act? Did they become more human or monsters themselves?

And now think, if you have not yet watched AOT, what you will make of the prologue, when much later you find out that Eren actually becomes a Titan within the walls. The wall dweller has become a barbarian first to protect the walls then to take his people beyond them.

Figure 14

When Eren first becomes a Titan

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