Homo Oeconomicus is a Cognitively Modern Human Being: Activation, Motivation, and Persuasion at Human Scale

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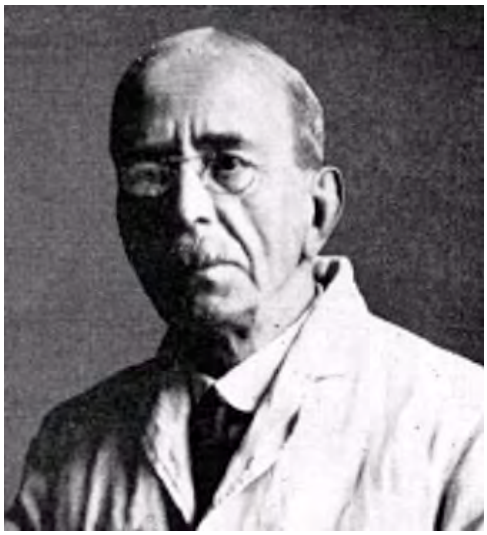
Conceptual integration, also known as "blending," is a basic mental operation. (See Fauconnier & Turner 2002 and http://blending.stanford.edu.) Cognitively modern human beings are capable of the most advanced form of blending, known as "double-scope" blending. Human beings use conceptual integration to transform diffuse ranges of information that are not at human scale into useful and congenial human-scale scenes, to activate, motivate, and persuade. Integrating diffuse conceptual arrays to achieve a scene at human scale enables us to understand and manage such diffuse conceptual arrays. The integration resides in a "blended" mental space, commonly referred to as "the blend," which is connected to the full conceptual network of input spaces. We do not lose the diffuse arrays that are integrated; they remain part of the conceptual integration network, accessible through the structure of the blend. It is in virtue of their connections to the blend that working with the blend can give us a purchase on the diffuse mental arrays that are succinctly accessed through it. If we could not achieve a blend at human scale, the diffuse arrays would in many crucial cases not only lie beyond our conceptual powers but also remain alien to our psychological dispositions. Technological instruments and designed environments play an important role in such human-scale integrations. Among other things, technological instruments and designed environments help us to achieve a human-scale concept of self. This human-scale concept of self guides our dispositions and our conception of what we are and what we are doing in life: learning, contemplating, deliberating, and choosing.

In 1971, when I first began to code natural language processing routines in LISP, there was no discussion within artificial intelligence of differential brain activation. Actually, there was no discussion of brains at all, except for the common observation that brains were after all computers, so if we wanted to understand human thought, we should study computers. It is difficult to recapture at this remove, even for those who were engaged in the field, the seemingly commonsensical ring of that assertion. We conflated the broad study of computational activity with the study of symbolic programming. What were we thinking? At the same time, in my study of neurobiology, brains were discussed constantly, but only at the mechanical level of ion pumps and myelination, cranial nerves and spikes, pyramidal cells and glial cells, mitochondria and synaptic plasticity, as if a thorough knowledge of the plumbing would precipitate into an understanding of thought, so long as we did not get distracted by actually investigating thought, which was mildly taboo. In the field of artificial intelligence, there was an implicit assumption that the system was always the same and that the differences in its working were driven by what it was working on. For example, if we fed the system a linguistic string, it would work on it. But the system itself did not change. Indeed, what

would it mean for the system to change? It did not occur to us to strive for a system that would sometimes work one way and sometimes another, whose abilities changed.

But that is how actual brains seem to work. Our mind is not constant. This has been understood in some technical detail within cognitive neuroscience at least since the work of Sir Charles Sherrington, who died two years and twenty days before I was born. Famously, Sherrington referred to the brain and the central nervous system as an "enchanted loom" where "millions of flashing shuttles weave a dissolving pattern, always a meaningful pattern, though never an abiding one" (Sherrington 1906.)



Sir Charles Scott Sherrington
English neurophysiologist, born 27 November 1857,
died 4 March 1952, Eastbourne, Sussex

The mind is dynamic in two senses. First, it does dynamic work. Think of a drill; the drill does dynamic work. It goes fast, goes slowly, drills here, drills there. Surely the mind is dynamic that way, but it is dynamic in another way that the drill is not: the mind itself changes from second to second, minute to minute. Its powers, dispositions, and cast change dynamically. The drill is the same tool whether it turns slowly or quickly. But the brain is not a fixed tool. It is a shifting pattern of activity. The cast of mind we have is dependent upon what is active in the mind. What is active varies.

There is another aspect of the mind's dynamism, less obvious but as important. Our cast of mind is dependent not only on what is active but also on what is inactive. It is well known that negative events such as inhibition and cell death influence the working of the brain. Activating a cast of mind is a matter not merely of activating certain patterns but also of not activating and sometimes even inhibiting certain others. Activating a cast

of mind involves not only activating some patterns but also not activating or even deactivating some others.

Why is this point less obvious? The answer, I think, is that cognitively modern human beings have a basic mental disposition to understand the world through human-scale stories of interdependent agency and causal action. Accordingly, it is natural for us to suppose that causal efficacy in thought results from a kind of linear sum of neuronal activity in the brain, and this affects our interpretation of cognitive scientific data. For example, brain-imaging data, which typically show location or interval of activity (location of paramagentic variation from relative oxygen depletion in hemoglobin in the case of fMRI), does not focus on what is inactive. We need to take this bias into account. What is not active is as important as what is active.

Such attention to the variable, momentary, situated mind has increased dramatically in cognitive science since the early days of artificial intelligence. For example, there is a recent tradition of studying the ways in which spatial environments we inhabit and instrumental complexes we deploy interact with our thinking. (Hutchins & Palen 1997, Kirsch 1995, 1998, 1999.) What mind do we have? The minds we have are contingent upon our conditions and our environments. The system does not remain the same.

This is no surprise, is it? Each of us knows for certain that our thinking varies according as we are awake, asleep, sober, inebriated, hungry, satisfied, uncomfortable, in pain, praised, stressed, attacked, entertained, bored, massaged, supplied, clothed, at the front of the lecture hall, seated in the lecture hall, conducting a videoconference, dining, listening to the baroque harpsichord music of François Couperin or to a modern electric guitar ballad or to the 1960s extended rock of Lou Reed and the Velvet Underground performing "Sister Ray." We are equally certain that for any behavior at which we are successful, we have learned and developed personal routines for putting ourselves in the right frame of mind, with the rights sorts of attention. Before driving, entertaining, teaching, learning, writing, conversing, running, playing a musical instrument, sleeping, reading, cleaning, balancing our financial accounts, seeking to prove a theorem, computing our taxes, or installing software, we all engage in often-unconscious patterns of self-adjustment to tune the mind, to activate the right mind. And we equally rely on routines to maintain our behavior during these performances. My old LISP programs did not need to be tuned to the right cast of mind to start and needed no self-maintenance routines. I just hit "enter." Data came in, product came out. It is easy to idealize rational actors as behaving in the same way.

But homo oeconomicus is subject to the same principles of activation and variation as any other cognitively modern human being. Human beings are built to work at human scale. There are only certain ranges and configurations in which their minds are naturally activated, motivated, and persuaded. When a child falls out of a tree and cries in

front of us, we have no hesitation. The sobbing child with the broken arm sets a human-scale scene before our eyes. The scene brings direct and powerful activations and motivations. But what happens when the facts to be confronted are not at human scale? Let us consider an example.

In 1989, Bill McKibben published a book, *The End of Nature*, previously published as a long piece in *The New Yorker*. Leave aside all the politics, ideology, controversy, and science behind his argument about "the greenhouse effect." Let's just look at the cognitive problem, and not get distracted by what we might think is the scientific value of his assertion. McKibben wrestles throughout the opening sections of *The End of Nature* with a conceptual difficulty: the temporal and spatial scales on which human beings affect our entire planet are not scales that are congenial to our thinking. The planet is just huge relative to any one of us. Any one of us has seen almost none of it, no matter how we jet set around. The same is true of the temporal sweep of generations. Any one of us sees one or two or three, maybe four, at most five generations. The scales at which any one of us can bring about an effect for the planet are very small. Certainly they do not stretch over vast forests, mountain ranges, great lakes, plains, seas, transcontinental rivers, oceans. McKibben, to try to make his point, he hit upon a trope, "the end of nature." We think of Nature, he proposed, as something that is larger than we are, spatially, temporally, causally. But that, he argued, is over. We have brought about the end of Nature, at least that kind of nature.

Many readers of *The New Yorker* at the time admired Bill McKibben's prose. He had, after all, for many years, written much of the section of the magazine titled "The Talk of the Town." But his attempt to lead his readers to reconceptualize nature and change our sense of our relationship to it was much less successful than he hoped. Fifteen years later, in *Granta* magazine, McKibben, astonished that we are not motivated, not persuaded by the facts, asked how this could be. The answer he offers is essentially this: the facts are not at human scale, so useful conceptual networks are not activated. Accordingly, we are not motivated or persuaded. No child lies crying before us with a broken arm. No tsunami is sweeping through a range of human-scale time and space.

> For fifteen years now, some small percentage of the world's scientists and diplomats and activists has inhabited one of those strange dreams where the dreamer desperately needs to warn someone about something bad and imminent; but somehow, no matter how hard he shouts, the other person in the dream—standing smiling, perhaps, with his back to an oncoming train—can't hear him. This group, this small percentage, knows that the world is about to change more profoundly than at any time in the history of human civilization. And yet, so far, all they have achieved is to add another line to the long list of human problems—people think about 'global warming' in the way they think about 'violence on television' or 'growing trade deficits', as a marginal concern to them, if a concern at all. Enlightened governments make

> smallish noises and negotiate smallish treaties; enlightened people look down on America for its blind piggishness. Hardly anyone, however, has fear in their guts.
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> Why? Because, I think, we are fatally confused about time and space. Though we know that our culture has placed our own lives on a demonic fast-forward, we imagine that the earth must work on some other timescale. The long slow accretion of epochs—the Jurassic, the Cretaceous, the Pleistocene—lulls us into imagining that the physical world offers us an essentially stable background against which we can run our race. (McKibben 2003: 7).

But blending allows us to achieve a human-scale scene that produces different activations. McKibben, in the passage above, provides an example. Consider the diffuse range of conceptual information about the environment that forms McKibben's actual subject. Now consider a quite different, human-scale scene—not a child falling out of a tree, but this time someone about to be hit by a train from behind who cannot hear your shouts of warning. In addition to the gut fear activated by an impending train collision and death, add in the special gut fear so common in dreams of persistent paralysis and failure. The scene of fatal collision and warning and the anguished scene of dreamed incapacity are very much at human scale. Now, blend them with the diffuse ranges of information that are McKibben's actual subject. In the blend, we now have a human-scale scene for the environmental issue. The attention and action of all of humanity in the input space of environmental change is projected to a single person in the blend, a single agent, who is oblivious and not taking action. Nature is projected to an oncoming train. Journalistic, political, and scientific discourse is all projected to a single shout from a single person. The diffuse range of environmental consequence is projected to a single fatal collision. There is powerful emergent structure in the blend: the small percentage of people who are aware of the danger are the person who shouts, but notice that if the oblivious man is wiped out, then so is the person shouting. In an actual scene like this, the person shouting would not be hit, could even run away. What does it matter for the fate of humanity if one person is run over? But in the human-scale blend, the shouting person shares the same fate as the oblivious person, because the oblivious person is, in the blend, all of us as a unified agent.

In Book 3, chapter 11 (sections 1412-1413) of *The Rhetoric*, Aristotle stresses the importance for the rhetor of making the audience "see" things, of "bringing before the eyes." By "bringing before the eyes," he means essentially presenting human-scale scenes of activity. In *The Way We Think*, Fauconnier and I give the example of a politician's vetoing a foreign aid bill. The foreign aid bill is an immensely complicated matter, involving many agents and categories, and its politics and consequences extend over many countries. But suppose we say of the politician, "He's snatching the rice bowl out of the child's hands." Then we have a blended human-scale scene that connects to the diffuse range of political consideration.

Another classical rhetorician, the unknown author of Περὶ ὕψους (*On the Sublime*), which is usually attributed to the third-century CE figure Longinus, contrasted argument that struggles over diffuse conceptual arrays with persuasion that offers a human-scale scene. In linear argument, he wrote, "inventive skill and the due disposal and marshalling of facts gradually emerge from the whole tissue of the composition." But in sublime style, "a well-timed flash" "scatters everything before it like a bolt of lightning and reveals the full power of the speaker at a single stroke." A well-timed flash of lightning is at human scale.

Antonio Damasio, in *Descartes' Error* (1994), described the role in human reason of what he calls *somatic markers*. A somatic marker is a bodily feeling that we use to mark an image. Reaction to a lightning strike, for example, is a somatic marker. Somatic marking depends directly upon activating a human-scale scene. For diffuse conceptual arrays that are not at human scale, there is no somatic marking. But blending gives us a way to bring somatic markers to them. If they serve as inputs to a blend that itself activates somatic marking, then the conceptual integration network has the benefit of somatic marking. How can the blend activate somatic marking if some of the inputs do not? There are two possibilities. First, one of the other inputs is at human scale and activates somatic marking; structure, including somatic marking, for that input is projected to the blend, providing the blend with somatic marking. Second, the kinds of compression and emergent structure that arise in the blend can in some cases create or enhance the human scale quality of the blend and make it eligible to activate somatic marking at a level higher than that of any of the inputs.

Consider again the example of the man who will not hear us as we warn him that he is standing in the path of the oncoming train. This is an example of a blend that presents a human-scale scene that activates somatic marking, and McKibben uses it to provide the environmental issue with a human scale scene that activates somatic marking. As McKibben laments, the environmental issue in its own right does not present such a scene, and fails to activate the preferred motivations. Edward Slingerland, in his new book, *What Science Offers the Humanities: Integrating Body and Culture* (in press), offers a different example from *The Mencius.* In this example, the educating of pupils by the teacher is blended with the growing of shoots by the farmer. The blend is especially intricate, as Slingerland shows. At one point, Mencius argues against certain educational practices. He claims that they do not suit the pace of human learning, and so fail. This assertion sounds like Longinus's idea of "linear argument." The argument proposes a diffuse consideration. Mencius provides it with a human scale scene and somatic marking when he says that hurrying students is like pulling on shoots to try to make them grow. Mencius thereby brings before the eyes the scene of a farmer who tries to make his shoots grow by pulling on them. Certainly this does not help them. In fact, it rips them

out by the roots. The human scale scene is immediate; it lies in the blend; and it activates a response for the entire conceptual integration network.

Such attempts to create a human-scale blend as an instrument of activating, motivating, and persuading are familiar in environmental debates. The term "greenhouse effect" is itself an attempt to transform to human scale the vast ranges of space, time, and causality involved in climactic change. A greenhouse is something at human scale, in fact something that human beings have built. A greenhouse has immediate consequences, which we can feel without mistake. Outside the greenhouse, it's cooler. Step in, and it's warmer. It warms up fast, too, and stays that way. We have all seen greenhouses and probably all had the experience of stepping inside them. The causality involved is at human-scale: the sun heats the interior surfaces, which heat the air, and the heated air is trapped by the glass walls and the roof. The greenhouse stops convection.

"An Inconvenient Truth" is the film version of Al Gore's slide-show presentation on global warming. Near the end, Gore shows a picture of the Earth as what he calls a "pale blue dot." The Earth is a single pixel on a huge cosmological screen. The picture was taken from a distance in space of 4 billion miles. Gore says, "Everything that has ever happened in all of human history has happened on that dot. All the triumphs and tragedies, all the wars and all the famines, all the major advances. That is what is at stake—our ability to live on planet Earth, to have a future as a civilization." He concludes the film with this conceit: "Future generations may well have occasion to ask themselves, 'What were our parents thinking? Why didn't they wake up when they had the chance?' We have to hear that question from them now."

Gore is attempting to create a blend that is at human scale. We respond to what is in our field of vision. We respond to language directed at us. We can feel an immediate responsibility for what is before our eyes. Those we are harming and those who doubt us can speak directly to us, and we hear them and respond. To achieve this human-scale blend, Gore relies on the human experience of vision: when we back away from something, it grows smaller in our visual field. When we blend this experience with the bit of earth that is actually before our eyes, to create a blend in which we are zooming away from the earth, then, once we run this impossible imaginary blend long enough, the earth can become a pale blue dot. This great mental performance of blending is helped by a material anchor: scaled representations of many kinds—such as maps, sketches, zoomed still photographs, time-lapse photography, fast- and slow-motion films—can place something before our eyes, actually contained within our focal field of vision, that is not

actually what is represented but is mentally blended with what is represented. It is completely impossible for us to be 4 billion miles from the Earth, and if we were, we would in fact be far outside the range in which our physical action could have any consequence for the earth, but in the blend the Earth is now entirely before our eyes, at human scale, in our field of vision. It is not exactly a child who has fallen out of a tree in front of us, but we are getting into that range of human-scale activation. There is another way in which this blending to produce a human-scale pale blue dot affects what is active. We have the human-scale sense that we cannot do anything immediately and bodily about what is incomparably larger than we are. If I do not like hurricane season, I cannot sweep my hand across the Caribbean Ocean and eliminate it. I cannot speed up the formation of galaxies, or hurry up the evolution of human beings. But we are much more likely to feel that we can have responsibility and even power over what is in our visual field. Gore uses the human-scale blend because he wants us to activate our disposition toward responsibility and action. All humanity is compressed to the viewer. The earth and all its diverse and diffuse events are compressed to an object before the viewer.

His temporal blend works in the same direction as his spatial blend, to bring the diffuse conceptual issue to human scale. Non-existent members of future generations are blended with an actual living person, so that, in the blend, those unified members can think and voice their questions to us. "We have to hear that question from them now." In the human-scale blend, there is a normal human mechanism for activating ethical consideration: we have been challenged by those we have harmed, and we need to respond. Moreover, in the blend, we are the parents of those we have harmed. This is not just a child with a broken arm crying because it fell out of a tree. Now, it fell out of the tree because we were so negligent as to make a tree house that had a faulty floor, and our child tumbled through. This human scene comes with a freightload of parental guilt, the sort that human beings have endured forever. But the point of the blend is not actually to induce guilt. The point is to induce action, and this motivation depends upon some crucial emergent structure, possible in the blend but not in reality. In reality, when people challenge us for the harm we have done through action, we cannot actually erase the action. We have already committed the action. We may attempt to palliate or remedy or compensate, but we cannot actually arrange for the action to have never happened. In the blend, we are being challenged for not waking up when we had the chance. The challenge would normally presuppose that it is true that we did not wake up. Yet in the blend, the scope of possibility for choosing our action is different. In the blend, those issuing the challenge are speaking about what lies in their past but in our future. This is not possible in reality, but it is possible in the human-scale blend, where, mirabile dictu, we still have the chance to wake up. Activating these dispositions, and this reasoning, to result in this persuasion, is the purpose of creating this human-scale blend.

In this talk, I will explore other such cases and the consequences for human thought, judgment, and choice of packing conceptual arrays to human scale.

Human thought is, as cognitive scientific inquiries have shown in a variety of fields—language and gesture, inference and discovery, vision and audition, social cognition and personal identity—, far more complicated and diffuse than one would believe on the basis of our folk-theoretic, commonsensical understandings of what we are and what we do. Actual human thought is not something that is compressed to human scale. We are not designed to look into what we are and how we operate. If anything, there seem to be impediments to our self-knowledge, and why not? What evolutionary benefit is there to being able to analyze our grammatical or judgmental competence, as opposed to deploying it? To make sense of ourselves, we must do work to manufacture understandings at human scale. We manufacture a sense of stable personal identity with a few changes, despite the manifest evidence of discontinuity and variation across our individual lives. Moreover, despite the swarm of detail in which we are embedded, we manufacture small narratives of ourselves as agents with stable personal identities. It happens that looking at two paths, or a few fruits, or a few people, and, as a result of invisible cognitive work, acting in one of the potential directions, is something that consciousness is set up to understand. These things are at human scale, although they are superficial and manufactured understandings. In such scenes, we think of ourselves as individuals with interests, who choose. These are small narrative scenarios of personal identity. We also think of ourselves as agents of technology: we command instruments such as language, voice, writing, physical protheses, and machines to enact our preferences. When we try to understand what a human mind is, and how it operates, we naturally blend diffuse ranges of data with these human-scale little narratives of decision, choice, and judgment. Homo oeconomicus, the self as stable identity with preferences that drive choice toward outcomes, is itself a human-scale narrative blend. It is marvelously useful, since it is instrumental in activation, motivation, and persuasion. It is a human-scale scene, a useful fiction, that helps us grasp ranges of reality that are far more diffuse and complicated.

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