WHAT IS ARTFUL COGNITION?

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Duke Huan was reading a document at the upper end of his hall, and the wheelwright Bian was making a wheel at the lower end. Laying aside his hammer and chisel, Bian went up and said, "Dare I ask my lord what words you are reading?"

The duke said, "The words of a sage."

"Is the sage with us?"

"He already is dead."

"Then, isn't what my lord is reading just the dregs of a man of ancient times?"

The duke said, "When I read a document, how do you get to discuss it? If you can explain, OK; if you cannot, you die!"

The wheelwright said, "I, your servant, observe from my own work. In making a wheel, if I go slowly, it is easy but not a solid [fit]; if I go quickly, it is toilsome and [the parts] do not go together.[1] Neither too slow nor too fast, I get it with my hands and respond with my mind, but my mouth cannot speak [of it]; there is a skill I maintain in this: I cannot teach it to my son, and my son cannot receive it from me. In this way, I am now seventy and have grown old making wheels. The ancients—and what they could not pass down—are dead. Thus what my lord is reading is just the dregs of the ancients."[2]

I offer the story of Bian the wheelwright (translation by Professor Michael Fuller) in order to remind us that the tension between embodied and performative ways of knowing and symbolic and textual ways of knowing is longstanding. This tension was brought to our attention by philosopher Michael Polanyi: He famously said "we know more than we can say" and called it "tacit knowledge."[3] The notion of tacit knowledge asserts that there are

[1] Cf. A. C. Graham's translation: "If I chip at a wheel too slowly, the chisel slides and does not grip; if too fast, it jams and catches in the wood." Angus C. Graham, *Chuang-tzu: The Inner Chapters,* reprinted (Indianapolis: Hackett, 2001), 139–140.
[2] From *Zhuang Zi,* "The Way of Heaven," trans. Michael Fuller. Unpublished. Personal e-mail communication.
[3] Michael Polanyi, *The Tacit Dimension* (New York: Doubleday & Co, 1966).

aspects of certain kinds of knowledge, for instance that required to play a violin or ride a bicycle, that are not capturable or transmissible via spoken language or text. Or in the wise words of, as far as I know, an anonymous sage: "The difference between theory and practice is greater in practice than in theory."[4]

Like most of us, I am a practitioner, if not an adept, in a range of bodily practices. I ride a bicycle, I sail a boat, I garden, and I cook. I trained as a sculptor. I've worked hot metal at the forge and cold metal at the mill. I use a variety of tools. In all these things "I get it with my hands and respond with my mind, but my mouth cannot speak [of it]."

Well, that's not entirely true; I'm a teacher and a writer and I labor to translate the substance of these experiences into language, written and performed. But these exercises are bounded by a conundrum—the texts produced remain in some sense "dregs" or residues of a kind of knowledge that is held in bodily practice. Today I am going to attempt to do the impossible, and will therefore necessarily fail. Given the brevity of this opportunity, I must ask your forgiveness for what, inevitably, is less of an academic paper and more of an elevator pitch.

My argument here today is that the intelligences of the arts are largely, or primarily, the kinds of bodily intelligences of which the essence remains incommensurable with text and spoken language. Historically, the upshot of this has been bad for the arts, at least in the modern period. As Western science and Western culture increasingly have dealt in the currency of mathematical and linguistic symbolic abstraction (numbers and letters) so, increasingly, the conception of intelligence has been framed in these terms. By this token, the arts have been marginalized. One can be "stupid like a painter" but not "stupid like a mathematician." This trend has been reinforced by a vein of stubborn anti-intellectualism in the arts.

Zen commentator Alan Watts once said, "Most people think a body is something you have"—an idea often glibly referred to as Cartesianism, though to attribute it to Descartes is perhaps unfair as his ideas on the subject were far more subtle than the simplified notion that has become a structuring idea in Western thought of the last two centuries. The dualism that bears his name asserts that the person is made of two parts, a physical body and an immaterial "thinking thing," and the thinking thing drives the body like a bus driver drives a bus. There are historical reasons for this contorted idea, not least, I suspect, his concern not to suffer the same fate as Giordano Bruno or Galileo. The resounding influence of the mind/body construction is all the more remarkable for its having no basis in fact and not a shred of scientific evidence to support it.

The mind/body dual is related to, but certainly not the same as, the brain/body dual, which is equally problematic.[5] Put simply, we know important stuff happens in the

[4] This aphorism is a pithier paraphrase of "in theory, there is no difference between theory and practice. But in practice there is." Attributed to Jan L. A. van der Snapscheut, among others.

[5] See also Robert Hanna and Evan Thompson, "The Mind-Body-Body Problem," *Theoria et Historia Scientiarum: International Journal for Interdisciplinary Studies* 7 no. 1 (2003): 23–42.

brain, but that stuff would not happen without the rest of the human, not only as metabolic support but as part of complex feedback loops that involve but extend beyond the neurological. With Watts, we can note that we customarily refer to "my hand" and "my foot" as if the "me" who owns the foot is not in the foot. One might respond, "Ah, but if I lose my foot I don't die and I don't lose my mind. But if I lose my head I surely do." To which I would respond that while it is evident that the brain is a "thing," it is also composed of many parts with specific functions (we might call them organs) and you can surely lose one of these and suffer impairment—like losing a foot—but you are still substantially you.

The idea that things can or must have separate thinking and doing parts—Descartes called them the *res cogitans* and the *res extensa*—is insidious and has permeated through our culture. For instance, the idea has been implemented technologically as the software-hardware binary.[6] The separation of matter and information emerged over the second half of the twentieth century with the rise of digital computation. Digital computation reifies dualism. The *res cogitans,* the thinking thing, is digital, the world is analog, and the acts of perception and action constitute a translation from analog to digital and back again. This linear, serial, industrial process of input-processing-output is fundamental to the architecture of the von Neumann machine (the core of the modern computer). In this context, the discipline of artificial intelligence emerged, making the astonishing claim that "thinking" could be implemented in machines that manipulate symbols. And if this is the case then, ipso facto, the brain is a computer.

This thinking is rather circular and mutually reinforcing—machines think and brains compute, and the currency in which these exchanges occur is symbols that are manipulated by logical rules, or algorithms. This gives rise to the complementary double of artificial intelligence: the discipline of cognitive science (or at least that variant that is sometimes referred to as computationalism or cognitivism). Implicit in this are two dangerous ideas. First that sensing, thinking, and action are separate and separable operations, and secondly that thinking happens in an enclosed space of computation isolated from the world, where symbolic tokens are manipulated according to mathematical rules.

As an intellectual pastime, the manipulation of symbolic tokens according to logical rules has preoccupied great minds for centuries. Indeed, the system of logical rules implemented in modern computing was devised by George Boole, who died nearly a century before the first computers. These rules are implemented in machines. These machines are given tasks to prove they are intelligent, such as playing chess. And when these machines can beat humans at chess, they are deemed to be intelligent. (Note that there is no evidence that human intelligence or biological thought operates according to such systems of logical rules.)

[6] It is worth noting that this binary is not explicit in Turing's original work, and that the idea of software as immaterial formalized reasoning matured slowly. The notion was not so cut-and-dried even in the early 1970s, probably because programming, even then, was such a tangible process—pushing punch cards into readers in the right order.

Chess is a game whose rules can be entirely stated in logical terms within a logically defined universe (as described by Kurt Gödel in his incompleteness theorem). Such a logically defined universe is isomorphic with the logical environments defined in computational systems themselves.[7] So here again is that circularity—systems of reasoning according to logical rules are developed (and indeed they are creditable testaments to human intellectual achievement). And surprise, surprise (!), they are successful in managing tasks compatible with those closed systems of rules.

But most things in life are not so cleanly delineated. From choosing what to have on a pizza to strategizing a route across town in peak hours to managing a relationship, attempting to solve such problems by implementing systems of logical rules would be farcical. Tasking a computer to discern the better of two chocolate cakes is a far more challenging task than playing chess. Indeed, even identifying a chocolate cake among a rubber replica, a carob cake, and a photograph of a chocolate cake might be a challenge.

This circular technological story has contributed to the privileging of symbolic abstraction. Such privileging extends throughout our society. The academy, the university, the institutions that support and validate scientific knowledge, play a major role in this construction. The ivory tower is built around the valorization of abstraction and the power of generalization, be it in philosophy or physics. Even our intelligence tests emphasize the extraction from the world of abstract truths that can then be manipulated in the immaterial realm of mental computation. We might take as an alternative the science of pataphysics devised by Alfred Jarry: "Pataphysics will be, above all, the science of the particular, despite the common opinion that the only science is that of the general."[8]

The rise of quantitative mathematical methods in the late nineteenth century and the demonstrable power of these techniques led to a shift in many disciplines toward the numerical and symbolic. We can see this beginning with the mathematization of engineering and the sciences in the late nineteenth century, and it accelerates after World War II with the rise of digital computation and automated algorithmic reasoning. Around that time, we see the rise of poststructuralism and the linguistic turn in critical theory, cognitivism in psychology, and similar effects in other areas of the social sciences and conceptualism in the arts. In 1967, Donald Judd proclaimed, "Everything sculpture has, my work doesn't." The emergence of consumer grade computational technology carried such notions into diverse aspects of culture previously somewhat insulated from such conceptions. One might well ask why these trends arose in the same period, but whatever the forces acting, the second half of the twentieth century seems to have been under the sway of a neo-Cartesian zeitgeist.

[7] The computer upon which Deep Blue's chess program ran in 1997 was ten million times faster than the Ferranti Mk1 upon which Christopher Strachey's chess program ran in 1951.

[8] Alfred Jarry, *Exploits and Opinions of Doctor Faustroll, Pataphysician,* trans. Simon Watson Taylor, introduction by Roger Shattuck (Boston: Exact Change, 1996), chap. 8.

The aspect of this technological incursion that concerns me most and that is most relevant here is the influence of computational procedures and computational rhetorics upon cultural practices. While I in no way support the kind of boneheaded anti-intellectualism of some quarters of the arts, it does concern me that the double effect of the linguistic turn and cognitivism has pulled art(s) thinking in the direction of "conceptual thinking" and, in the process, has elided the embodied and materially engaged aspects of practices. This is no doubt an ongoing dialectical process, and an intellectual engagement with the larger sociopolitical world was a timely and appropriate antidote to the romantic individualism of early twentieth century art.

Here are three take-home ideas about cognitivism:

1. Human thinking occurs via algorithmic manipulation of symbolic tokens.
2. Human thinking, or acting in the world, consists of a serial process of perception, cogitation, and action.
3. Human thinking occurs in a closed physical or logical space.

I put it to you that this formulation is a crock with no (or minimal) evidence to support it. I advocate for an alternate conception:

1. Human intelligence resides at the intersection of the body and the world—in our fingertips and our bellies and the muscles around our knees.
2. Sensing and action are inseparable; sensorimotor loops hold our *umwelts,* our "experience-worlds," together.
3. Action in the world is characterized by iterative feedback loops and close integration of body and world. (In the autopoietic tradition, this is called "structural coupling.")

If you'll tag along, then we are drawn to a conclusion that has significant implications for the place of the arts in human culture and the way human intelligence has been constructed over the past two centuries. As such, we must seriously engage the aspects of human intelligence that are not easily reduced to text or numbers. And prime among such intelligences are all sorts of cultural practices that engage embodiment, materiality, artifacts, and the spatial and sensorial world directly. Sociologist of science Andrew Pickering calls this kind of engagement the "performative idiom" and he contrasts it with symbolic encoding, which he refers to as the "representational idiom."[9] Pickering made these observations with respect to scientific research, but I think the idea is as relevant if not more relevant for the arts.[10]

In order to bring these questions into focus, let's consider the case of the potter at a wheel. The clay is pushed and pulled and stretched in tight, dynamic, muscular play. There is a

[9] Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (Chicago: University of Chicago Press, 1995).

[10] In my opinion, a major aspect of the visionary importance of the Exploratorium is that it respects the performative idiom and engages a dialog between the representational and performative modes.

feel, and when the feel is right, the material can be encouraged to do remarkable, unnatural things, like stand up on a thin wall. As Michael Mateas (originator of a style of applied AI he calls "expressive AI") put it felicitously, "you push against the materials and the materials push back." And sometimes, if you don't have the feel, or as psychologist Mihaly Csikszentmihalyi might say, the *flow,* it all collapses in a soggy pile.

At this point I often have the sensation of leaning out into a void. Having set myself the task of arguing for the validity of this kind of direct intelligent engagement with the world, the very ineffability of what I am attempting to talk about leaves me, like Bian the wheelwright, speechless. There could be at least two explanations for this: Either (a) such awarenesses are inherently beyond words, or (b) our normal language and the concepts that inform and structure it has been so formed by the idea of mind as inner, and of the valorization of abstract representation, that we have no words to use.

I am no linguist, but I suspect the latter is the case. Comparative linguistics gives us some cause for hope. The language of the Himba of Kaokoland in northwestern Namibia has an entire vocabulary and set of cultural practices based on peripersonal space, a kind of space we as Westerners can only gesture at in a vague way as "body language."[11] But I suspect the problem goes deeper than mere vocabulary: A vocabulary of words that pertain to a bodily self would be incompatible even with grammatical structures. To return to "my foot," we might attempt "I foot." Who knows, it might catch on.

Tacit knowledge, embodied knowledge, the intelligences of the arts—these things remain ineffable while we remain locked into a cognitivist worldview. Happily, in recent decades, the neo-Cartesian construction of computationalist cognitive science has started to crumble, and there has been an explosion of work in various flavors of postcognitivist cognitive science and embodied cognition. The new postcognitivist paradigms offer useful and explanatory perspectives. Common to the postcognitivist approaches are the following:

1. A (variously qualified) rejection of the notion that cognition, reasoning, thinking, intelligence, mind, or self are located—locked—inside the cranium
2. An understanding that the human being is not divisible into the *res cogitans* and the *res extensa* but exists suffused throughout the biological body (at least) and does not trade in what neuroethologist Malcolm MacIver calls "an invidious distinction between bone and brain"[12]
3. A commitment to the materialist idea that cognition is biological and does not require magical explanations

[11] Sandra Blakeslee and Matthew Blakeslee, *The Body Has a Mind of Its Own* (New York: Random House, 2007), 109.

[12] M. A. MacIver, "Neuroethology: From Morphological Computation to Planning" in *The Cambridge Handbook of Situated Cognition,* ed. P. Robbins and M. Aydede (New York: Cambridge University Press, 2009), 480–504.

Within these broad terms, various approaches address particular aspects. The *enactive approach,* developed by Francisco Varela and Evan Thompson on the foundation of autopoietic biology[13] and developed by, among others, Alva Nöe, Kevin O'Regan, and Ezequiel Di Paolo, emphasizes such ideas as these:

1. The fundamentally biological nature of cognition as a defining aspect of the living
2. Cognition as constituted by temporally ongoing and iterative structural coupling with the world (Francisco Varela borrowed the phrasing "laying down a path in walking" from Buddhist philosophy to capture this quality of the enactive approach.)
3. The inseparability of perception and action in sensorimotor loops

While the enactive approach focuses on holistically embodied cognition, others have pursued the idea that cognition is not bounded by the body membrane but spreads out into the world of designed spaces, artifacts, and social organization. Lucy Suchman's *situated cognition* was an early foray into such studies.[14] Under a banner of *distributed cognition,* Edwin Hutchins and David Kirsh have explored the way certain kinds of cognitive functions are supported by or only occur with the use of specially structured artifacts, resulting in what David Kirsh calls "epistemic action."[15] Hutchins has shown that cognitive activities often occur as group activity in the context of richly developed social organization.[16]

This is what is so exciting: The current revolution in cognitive science provides grounds for a paradigm shift that will allow new ways of speaking about embodied action and embodied intelligence and thus has the potential to level the (academic) playing field that has for so long been tilted in terms of the abstract and the symbolic. I am not saying that there is no room for analysis and symbolic representation.[17] I *am* saying that a filter that extracts and privileges analysis and symbolic representation from bodily practices may have thrown away the larger and richer part of the intelligent behavior in question.

To argue that cognition is supported, enhanced, or enabled by artifacts and procedures developed by people over years, generations, or centuries is to argue that cognition is cultural, and that human culture functions to propagate postevolutionary cognitive abilities. This draws us firmly into realms of anthropology and archeology and the work of the likes of Merlin Donald and his concept of the *exogram*—the notion that cultural artifacts

[13] Francisco J. Varela, Evan Thompson, and Eleanor Rosch, *The Embodied Mind: Cognitive Science and Human Experience* (Cambridge, MA: MIT Press, 1991).

[14] Lucille Alice Suchman, *Plans and Situated Actions: The Problem of Human-Machine Communication,* 2nd ed. (Cambridge: Cambridge University Press, 1987).

[15] David Kirsh and Paul Maglio, "On Distinguishing Epistemic from Pragmatic Action," *Cognitive Science* 18 no. 4 (1994): 513–49.

[16] Edwin Hutchins, *Cognition in the Wild* (Cambridge, MA: MIT Press, 1996).

[17] Indeed, a prime mystery of human cognition from this perspective is that there is intercourse between the spatially, socially, and materially engaged kinds of cognition and kinds of cognition that engage mental representation (whatever that is)—cultural practices being prime examples.

are transgenerational information storage systems—and from such work to the cognitive anthropology of Tim Ingold, and the cognitive archeology of Lambros Malafouris.[18]

Anthropologist Michael Tomasello has proposed that an evolved capacity of imitation is the biological armature that supports complex human culture.[19] Excitingly, such work negotiates and modulates the tired old nature/nurture debates in ways that can bring us to new and productive positions regarding the relation of culture and biology that challenge dogmatic biological and genetic determinism as well as social constructivism.

There are at least two axes about which this conversation turns. One is around the status of performative knowledge vis-à-vis representational modalities, and a second is around the nature/nurture, biological determinism/social constructionism debate. And in both cases, a fruitful "middle way" seems to be in the offing.

For our concerns regarding "art as a way of knowing," these new paradigms of cognition offer us a new way to pursue an understanding of cultural practices that involve the construction of artifacts, organized spaces, and systems of gestures and movements among people as cognitional in a rich and sophisticated way. The kinds of intelligences deployed in the arts have been relegated to the *merely artisanal* simply because they engage materiality directly and do not traffic primarily in the symbolic notations that have become the lingua franca of our age.

By leveraging these new perspectives, three complementary goals can be achieved. First, and in my mind most importantly, such practices can be brought into new focus, which revalorises these aspects of intelligent human activity. Secondly, such reconsideration of embodied intelligences might encourage a timely broadening of the notion of intelligence in our culture. Thirdly, such a consideration can bring to cognitive science rich contexts for further research.[20]

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[18] Merlin Donald, *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition* (Cambridge, MA: Harvard University Press, 1991).
Tim Ingold, *The Perception of the Environment: Essays on Livelihood, Dwelling and Skill*, reissued ed. (London: Routledge, 2011).
Lambros Malafouris, "Before and Beyond Representation: Towards an Enactive Conception of the Palaeolithic Image" in *Image and Imagination: A Global Prehistory of Figurative Representation,* ed. C. Renfrew and I. Morley (Cambridge: The McDonald Institute for Archaeological Research, 2007), 287–300.

[19] M. Tomasello, *The Cultural Origins of Human Cognition* (Cambridge, MA: Harvard University Press, 1999).

[20] As an example, in recent years David Kirsh has been working with the Royal Ballet on distributed cognition in choreographic development. (See footnote 15.)