Externalizing Memory Made Modern Civilization and Created Modern Humans

WALTER B. WEIMER
Professor emeritus, Pennsylvania State University

Abstract: How did our present distributed social cosmos, as a complex process of organization of cognition and civilization, emerge from more primitive directed taxis forms of primates and earlier hominins? Nothing resembling modern civilization or present-day humans existed until 15 to 10 thousand years ago. In that "blink of an eye" (compared to 200 million years of mammalian evolution) a spontaneously originated complex process of social organization emerged which enabled all modern knowledge and technological power over nature. This change in social organization and personal interaction resulted from one fundamental shift in functional cognitive organization or intellectual capacity, found extensively (as yet) only in *H. sapiens:* the externalization of memory capacity from activity internal to individual brains (including their inherited or "instinctive" organization) into a shared, dynamically evolving, social milieu. Transferring memory (and retrieval) processes and contents from brains into externalized storage out in the econiche has the twofold effect of: allowing brain capacity previously burdened with storage of particulars to be freed for other, more abstract cognitive tasks; simultaneously, it vastly increases processing capacity in and/or for other cognitive systems and functions. It is as if, to use a computer metaphor, we suddenly became equipped with external hard drive storage units of vast capacity when we had previously been limited to internal RAM in our brains.

These simple but profound changes brought us from separately naming individual particulars through counting on our fingers and then calculation machines to quantum computation in less than three millenia. Tomorrow the same processes will continue shaping our unforeseen future, without our ever intending them to do so, or even being aware that they do so.

Human evolution has occurred in an already occurring spontaneously ordered complex social matrix. To be spontaneously originated it must depend *only* upon the co-occurrence of simple but very powerful processes or "mechanisms" that are found (*already available* or given) in the environment in the absence of deliberate planning or choice (in other words, individual agency is not involved). We are (as Hayek 1979, 1983, 1989, noted) the *products* of that matrix rather than its deliberate creators. It is that spontaneous (by definition: unplanned, uncoordinated, unintended, not comprehended in its entirety or effects) confluence of events that has produced (and continues to produce) us and has enabled our civilization and its advances. Even when we have

had intentions and engaged in deliberate or "planned" conduct, it is the *unintended* consequences of behavior that most often enable us to achieve novel outcomes (as Ferguson put it in 1767, the results of our actions but not our designs). No one understood this as clearly as Hayek, who argued that it has not been human intelligence and deliberation which created our morals and social organizations, but rather the other way around: our social framework and its "unconscious" or not deliberate structures have led to the evolutionary matrix in which our conscious and seemingly "rational" behavior has arisen as its byproducts. As he said:

> We do not owe our morals to our intelligence: we owe them to the fact that some groups uncomprehendingly accepted certain rules of conduct—the rules of private property, of honesty, and of the family—that enabled the groups practising them to prosper, multiply, and gradually to displace the others. Man was never intelligent enough to design his own society, but the practices that helped him to multiply his numbers, spread for just that reason. It was a process of cultural selection, analogous to the process of biological selection, which made those groups and their practices prevail (1983, p. 47).

This is the framework in which our more recently discussed and debated psychological and political memory became externalized into the social milieu (see Wegner and Ward and associates).[1] Since that process was the result of action but not design, we at first rationalized it as being the "deliberate" effects of the intentional design of a mythic genius of the imagined prior "Golden Age," making our morals and rules of conduct the gift to us of a Solon or a Lycurgus (See Hayek, 1960, 1973; Weimer 2022a). That same context of evolutionary constraints, although *very* recent in its presence, is what has made us "modern" humans and given us our knowledge and control of nature. Making meaningful content available in the econiche simply by looking or listening (instead of having to try to remember it from internal CNS sources) has revolutionized our nervous system organization, the organization of society, and terraformed the planet. We have recently studied our most complex characteristics—development of language, market orders, political and similar systems—but have not yet understood that they all are entirely dependent upon the incredibly simple yet amazingly powerful evolutionarily emergent strategy of externalizing memory (and hence control systems for knowledge and behavior) *outside* the purview and limits of the individual brain.

Symbolism is not the issue here. Everyone recognizes that humans are symbolic creatures, but that power to make and use symbols is not actually the key to modern civilization. Life itself, from the use of the genetic "code" as a symbol manipulation system (Franks 1974, Pattee 2012) on "up" through species evolution to the development of spoken or "natural" languages is inherently symbolic. Presaged by greater and greater verbal fluency and more abstract thought, the crucial step was from the spoken word as a short-lived temporal symbol to a means of storing and accessing symbolism beyond its initial physical-temporal duration. This was adequately accomplished only when alphanumeric writing mapped letters and numerals onto phonemes (discussed below). Whatever is found in memory is inherently symbolic to begin with, and the issue is not the presence of symbolism but the manner of storage, which must be both correctly symbolic and readily and quickly retrieved. Hominins have always been symbolic creatures. They have only recently become market order civilized, through a process of externalization of memory functions in usable symbolic form, and subsequent storage in the econiche in a form which is almost instantly retrievable. We write things down or draw pictures.

Information is not the issue either. Economists (and to a lesser extent, psychologists) emphasize that the modern brain is a distributed information processing device. Market orders are immensely powerful because a tremendous amount of information (semantic or useful information) is made available or distributed to all who participate in the market process, and it is the combination of having that information summarized in convenient form (as a price) in conjunction with the local (not distributed) information

available only to the participant that is the basis of our current prosperity. But where did that information come from so that the market can then come into existence? Hominins were both symbolic creatures and also information processors long before markets or writing originated. At issue is how the information became distributed in the first place. Again, the answer lies in the externalization of large amounts (compared to that available in a single or individual brain) into the external to the body environment. We put our information "out there" and pick it up as needed. No other species routinely does so.

Social and individual origins: opportunistic evolution and enablement, not conscious and rational creation. Do you take notes to help retrieve things you want to remember? Do you read things in print or listen to audio broadcasts to learn new things? We all do this, routinely and incessantly, without any thought to its function or import. This function of *external record keeping* is part of the *very* recent social milieu or cosmos (as Hayek 1973, p. 37, introduced the term). That now pervasive cosmic or "ready-made" process or structure has enabled or produced us as we are today. No hominin prior to *H. Sapiens* had that or a similar context of constraints available to further its evolution. We are products of a series of "lucky" (from our present perspective) and incredibly recent accidents and co-occurrent events. We need to be aware of that mixture of (now frozen) happenings and their co-occurrent enablements, because they have been the precursors (if not linear "causes") or antecedents to what we have become today, and they foreshadow what we shall become tomorrow.

The first (lucky!) accident was the development of language beyond the level of expressive and signaling functions (to use Bühler's 1934 distinctions. See also Popper 1963). No other animal uses vocalization to *describe* the world beyond immediate needs (emphasized by Bühler) or to *argue* about a position or theory (Popper). How did this come about? By accident of co-occurrent events—evolution adopted a path in hominin reproduction to mitigate an *unrelated* problem that, as what we today would see as an unintended consequence, led to the emergent development of language capabilities beyond vocalizations of other primates. The problem to overcome was the increasing size of the hominin head as a competitive response to selection pressure from an increasingly more complex and hostile environment.

Language is mainly the unintended result of our having developed fatter heads, which resulted from increased brain size in earlier hominin development. Heads were growing too large for female pelvic capacity to expand to accommodate during birth. Evolution (as nothing but blind variation and selective retention) stumbled upon neoteny to stave off the increasing birth defects in the offspring and debilitating injuries or death in mothers, by initiating "premature" birth (in comparison to prior primate species). The fetus and newborn of primates have big brains relative to body size, flat faces, thinner or smaller eyebrow ridges, smaller (or baby) teeth, sparse hair and lighter colored skin. Only *H. Sapiens* have retained all those features as adults, along with the front-to-back head axis of the trunk, which allows horizontal line of sight when erect. And fundamentally different from all other mammals, fetal development is not completed in utero. In all other mammals, fetal development is completed in utero and what is born is (at least minimally) a smaller, but survival worthy, adult. Human infants cannot survive unaided: it takes years of mother—infant interaction and tuition to complete development of the nervous system to a point where the infant can even begin to coordinate movements into survival worthy behaviors (Porges 2011). Our species is "deliberately" (with respect to other primates) born prematurely with respect to neural development and cranial functioning (and also concomitant muscular development), and also requires considerable interaction between mother and offspring to develop the prosocial behaviors which allow for this completion. A definitive characteristic of humans is this difference between our extra uterine development and the entirely intrauterine development of all other species. To keep female pelvic structure from splitting, evolution (without direction: nothing more than blind variation and selective retention) *externalized* the process of making bigger heads— final neural and skeletal muscular growth and development became "farmed out" from the calming interior of the uterus to the cold harsh light of day. In so doing our evolution began to incorporate exosomatic factors into our evolutionary development. We changed our neural function and organization:

> The brain wiring that occurs in the last phase of fetal development provides the neurological basis for the mental models that the organism is going to use throughout its life. If that phase occurs in a highly stable and reproducible environment of the uterus, the operations of brain wiring follow a pre-established sequence of steps and generate a modeling system that has been highly conserved in evolution. In our species, however, the last phases of fetal development have been progressively displaced outside the uterus, in a radically different environment, and that created the opportunity for a radically new experiment in brain wiring. That was the precondition for the evolution of the uniquely human modeling system… (Barbieri, 2010, p. 215).

That unique modeling system (creating our knowledge of ourselves and the external world) incorporates far more malleable and plastic mechanisms for learning from experience than are found in the "instinctive" or more fixed behaviors of other species. That modeling system is unique in the fact that it is based upon natural language and its symbolism. Instead of trying to cope with our econiche by developing more "innate" or built-in neural circuitry, we developed experientially based (learned) approaches dependent upon language, now centering on fewer general principles or rules of determination for coping with unforeseen variability rather than, as earlier hominin species did, increasing the numbers and size of particular neural circuits for particular situations.

Language, developed in the necessity of communication (for coordination of behaviors) between mothers (and proximate caregivers) and helpless infants, rapidly expanded beyond this initial function of mother-infant bonding and care to the myriad tasks it now performs. Language both aids our performance of cognitive tasks and also performs them. We went from babbling to vocalizing to talking to parents and close relatives, to talking to larger groups and then unknown strangers, and from discussing concerns of our immediate situation to the abstract non-here and not-now of the counterfactual and the theoretical. That transition initially produced, and then began to transcend, our extended face-to-face or tribal society, leading extremely recently (with a warmer climate and settled agriculture about ten thousand years ago, when the ice age waned) to the beginnings of market orders.

Market orders enabled rapid transition to "modern" civilization. The market order could develop only when language was fully in place, and when population density increased beyond the point at which the members of the tribal group could be known and directly supervised by the tribal leader (or his or her cronies). At that point a crisis of knowledge and organization arose. Out of sight meant out of mind for the leader, and for the recalcitrant follower, allowed insubordination and incoordination to occur. The structure of tribal dictatorship began to break down: members of larger groups no longer knew all the other members of their group, and with the increase in division of labor and knowledge, they began to trade more impersonally and anonymously among themselves, and similarly among unknown members of other groups. Markets began to arise for transactions beyond face-to-face barter. When this happened groups of individuals who adopted the social order resulting from this primitive market interaction gradually came to displace those groups of individuals who did not. This occurred due to nothing more than traditional factors of Darwinian evolution—blind (but not at all random!) response variation, and selective winnowing by an indifferent environment. This process of competition is the key to all our exosomatic evolution: a "mechanism" (better: a process) by which individuals have been able to utilize knowledge and skill that greatly transcends the capacity of any of the individuals who have participated in creating or utilizing it. The market as an *epistemic* phenomenon is a form of organization that is so simple and simultaneously so powerful that without any conscious direction or thought we have become able to externalize our knowledge and its productive capacity beyond the limits of the cognitive abilities and memory capabilities of single individuals. In so doing that summary total of knowledge is made available to all who participate in the market order in which it is embedded. With the replacement of face-to-face barter by the impersonal market order, humans unintentionally created a knowledge creation and transmission process or "system" that, because it is far more economical and parsimonious in its function, allows us to avoid both responding to an indefinite number

of inputs and holding an infinite number of particulars in our individual memory. Additionally, through concomitant neural reorganization, we became able to access that "stored" externalized memory through symbolic processing. This is the *economy* of knowledge of market orders, and it has changed our neurophysiological structure and function. We no longer needed to develop bigger and bigger heads with dedicated neural circuits to "hold" more and more particulars of knowledge, and as a result human brain size is now decreasing (Stibel 2021, 2023; DeSilva et al. 2021). We have come to be able to utilize the external environment as, to use the prevalent computer metaphor, an indefinitely powerful (because extendable) hard drive storage system by externalizing our memory requirements. We have enabled brain functioning (not just perception of particular stimuli) to do other things, and do things better— by concentrating upon a smaller number of abstract or general "rules of order" (general programs, not algorithms) to aid in coping with and rendering intelligible the indefinite welter of stimulus situations or environmental contingencies. By following the same simple but powerful general rules of order we guided production of an infinitely nuanced and variegated series of responses to those indefinitely extended situations and contingencies. This procedure is indefinitely more powerful and efficient than attempting to deal with welters of particulars as particulars. With the aid of externalized (physical or exosomatic) memory devices—making external things cues or symbols for complex contents—(which literally become separate "hard" drive physical entities outside our bodies), first as language heard by others to remember and process, and then with writing (and writing began with the memory task of listing or record-keeping, Goody 1986; Schmandt-Besserat 2015), our knowledge and productive output has increased exponentially. This has become a quasi-Lamarckian evolutionary process operating in addition to traditional Darwinian processes. Exosomatic memory storage and knowledge in an abstract and impersonal framework is quite literally what has made us the humans we are today. Externalization of memory is the basis of present civilization. What economists and Scottish moralist social theorists appropriately called the twin miracles, the division of labor and its concomitant resultant, the division of knowledge, are the result of adoption by groups of individuals of the market order of social organization. This adoption was gradual and never intentional, and it was never recognized or understood by those groups who adopted market orders. It is, as Hayek has emphasized, merely the case that groups of individuals who have adopted that social order, especially the forms of record keeping enabling and resulting from market interaction, have come to displace those groups of individuals who did not.

Two kinds of complexity in social order. A market order is a spontaneously arisen complex phenomenon. Its incredible power is due to extreme simplicity of operation. It is an instance of *simple* complexity. To be *spontaneous*, which means without deliberate or conscious direction on the part of any agency, it must be governed by (consist in the operation of) very simple yet incredibly powerful *already available* constraints. The constraints have got to be simple in the sense that no extraordinary measures are necessary to bring them about: they must already be there in the econiche, concomitant or co-occurrent, due to the presence of other things that were simply going on at that time. They are the equivalent of "frozen accidents" or constraints in physical theory, not the result of what physicists have separated out as initial conditions, which occur only due to the intervention of agency. These "simple" constraints must result in complexity of output greater than they themselves provide. Spontaneously arisen complexity involves two seemingly contradictory factors: simplicity (great simplicity) in the operation of the rules of constraint producing the order; and complexity and productivity in the output of the order that occurs when the rules are present (Pattee and Sayama 2019). All complexity and variability of the *products* of the spontaneous order depend upon the simplicity and uniformity of application of the rules of order (constraints) producing those products. As Pattee and Sayama put it, we do not have "open ended" evolution (meaning that the processes of evolution change into new ones), we always find evolved "open-endedness" as a result of following uniform rules that are already available. The rules of evolution (blind variation and selective retention) remain simple but powerful constraints—it is their products that are novel, unforeseen and complex. It is important to emphasize how the simplicity of what can be called an order's "operational instructions" (analogous to software programming for a computer) can produce novelty and complexity as a result of employing recursive func-

tions. This is how languages (genetic or natural), with already available finite rules of production and finite vocabulary items, can produce an infinite number of meaningful functional sentences. This recursion is how externalization of memory, once it occurred, has been so amazingly powerful and widespread.

If modern brains operate by taking advantage of "streamlined" rules of order (simple but powerful—recursive—patterns of activity) that result in greater complexity and novelty of output (and in so doing require equal or less amounts of thermodynamic work to sustain them), then we can explain how present superior "intelligence" can co-occur with physically decreased brain size. We are using more efficient and powerful "programming" to produce more complex outputs. We need to understand that task complexity must be somewhat increased (as is done by the development of consciousness), while memory for the welter of possible effects of an infinite domain of possible particular outcomes must be externalized into the equivalent of the Internet cloud, simplified to a bare minimum by abstract rules of determination (roughly equivalent to search terms and algorithmic search procedures) that do not require us to manipulate or store countless particulars. Through competition, evolution has been ruthlessly efficient in simplifying the development of sapience. Increasing external memory allows smaller, more efficient brains to do and know more. And with the distributed information capacity of the common environment all individuals who gain access to that material can use it at their "will" (their agency's choice). Our physically smaller brains are now functionally more powerful than when they were bigger but operated with less efficient organization and could not take advantage of distributed information and competitive cooperation. This answers the apparent paradox found by in anthropological literature (Stibel, 2021, 2023; DeSilva et al., 2021): there is no paradox at all, only increased efficiency due to different functional organization which resulted from the externalization of memory.

There is a second kind of complexity in agency in "higher" organisms. This is "complex" complexity in comparison, and it involves the nervous system acting recursively as a series of self-initiating and continuing constraints underlying agency. The closure (realization, bringing about) of given constraints results in the operation of other constraints, which in turn initiate those same constraints over again. Agency (whether as self-control or self-awareness) is self-initiation by recurrent closure of constraints, so that organisms can be defined not in terms of physical properties that exist at any given moment in their lives, but as (recursive) functional processes—organisms *are* what they *do*, as Mossio and Bich (2017) succinctly put it. What counts as causality in agency is thus entirely functional. It is a series of circular loops that are self-contained as parts of each other so that the overall system is self-producing. As Montévil and Mossio (2020) put it, biological organization is the closure of constraints which are in themselves parts of other constraints. This effectively merges internal and externalized memory into a feedback system operating upon itself.[2]

Writing as an unintended consequence of language. A breakthrough in the externalization of memory, at least as great as the development of language itself, is the invention of writing. Here is another case in which development immediately occurred that went far beyond its initial function of listing items in a class (listing or enumeration as record keeping is fundamentally a memory aid externalized or taken away from other brain functions) or calming infants.

Our immediate awareness is apparently limited to the magic number 7 plus or minus 2, the title of Miller's (1956) well-known article. Our capacity to remember immediately given items is, like that of almost all other animals, very short. We cannot hold in immediate awareness (consciousness) anything near the amount of information necessary to support the complexity of modern society. We have had to develop and rely upon a much longer term (or span) of attention and memory capacity, which involves longer and longer linear strings of spoken language that can refer not only to the immediately given here and now but also to indefinitely extended times and places (Fitch 2010; Barbieri 2010). Consciousness itself has developed as a memory extension function: a hominin without consciousness could not comprehend a sentence this long: it would lack the immediate memory capacity to do so. Now we have only to write it down.

> Writing is incredibly recent. No one wrote anything 10,000 years ago. That is all but inconceivable to us today, when we could not survive without it. Writing is humankind's principal technology for collecting, manipulating, storing, retrieving, communicating and disseminating information.… Phonetic signs, introduced to transcribe the name of individuals, marked the turning point when writing started emulating spoken language and, as a result, became applicable to all fields of human experience (3000—1500 BC) (Schmandt-Besserat 2015, pp. 1-2).

Alphanumeric writing is only 5000 years old.

Consider a further comment from Schmandt-Besserat:

> Development from tokens to script reveals that writing emerged from counting and accounting. Writing was used exclusively for accounting until the third millennium BC, when the Sumerian concern for the afterlife paved the way to literature by using writing for funerary inscriptions. The evolution from tokens to script also documents a steady progression in abstracting data, from one-to-one correspondence with three-dimensional tangible tokens, to two-dimensional pictures, the invention of abstract numbers and phonetic syllabic signs and finally, in the second millennium BC, the ultimate abstraction of sound and meaning with representation of phonemes by the letters of the alphabet (Ibid., p. 1).

I cannot imagine a clearer example of the fact that cognition (function, structure, capacity), like the acquisition of knowledge, is in fact *driven* by technological advance. An example is the development of mathematics, which would be inconceivable without the written number (and symbols) as an abstraction. The technology of writing was an enablement (discussed below) of language, which in turn enables opening the door to unbelievably rapid growth and progress in unforeseen directions and fields, all of which having been due to the equally unbelievable increase in our ability to store and then gain access to items in memory because of the external storage function of written accounts (and the ease with which it can be retrieved).

Enablements are not causes, they are co-occurrences. Language did not cause the development of market orders—it enabled that development. Writing did not cause mathematics or computers—it enabled their occurrence. We need to explore a crucial distinction in the development of such complex systems: the co-occurrences that enable these novel things to emerge do not *cause* them in any classical or physical science sense. They create an opportunity space—a change in an econiche—in which other things can now emerge unbidden by physical necessity.[3]

Agents make choices which, operating through generations by downward causation (Campbell 1974), harness the physical world (including their own bodies). We are engaged in terraforming our own "physical" and mental environments to produce novel outcomes. We do this by thinking, talking and externalizing memory through writing—for example, drawing blueprints for new highways, buildings and cities, then changing the ground and building the highways and buildings. The inhabitants who move to those cities continue to do co-occurrent unanticipated things: perhaps the buildings may include a medical research and teaching facility which then produces medical advances that extend human life expectancy and perhaps increase food production. All such novel behavior and the acquisition of new knowledge and terraforming of the planet is a co-occurrence of human exosomatic social activity and it is equally an enablement of the novel and unforeseen, because it simultaneously opens up what Kauffman (2019) and other biologists (Longo et al. 2012; Mossio and Marino 2010; Montévil and Mossio 2020; Mossio and Bich 2017) have called "adjacent possibilities" of econiches in which agency arises and sustains its own activity. The tremendous explosion in this pattern of behavior in the last few thousand years is the result of the exosomatic factor of externalization of human memory into the impersonal social milieu, which enables but does not directly or physically cause not only the change in our brain structure and size but also created all of modern society beyond the face-to-face organization of the family and tribe.

Kauffman uses the example of the development of a swim bladder in fish to show how novel emergent possibilities arise. Water got in the lungs of some fish, and that resulted in a mixture of air and water which for some reason developed into swim bladders. With the swim bladder's emergence, a new *function*—not a physical phenomenon—came into existence: neutral buoyancy. At this point:

> Might a worm or bacterium evolve to live only in swim bladders? Yes of course. So the swim bladder, by existing, opens a new crack in the floor of nature, to borrow from Darwin, and a worm can live in that new crack.…
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> And there is still more: does the bladder *cause* the worm to evolve to live in the swim bladder? No. The bladder enables the worm to evolve to live in the swim bladder—a subtle but crucial difference.… The mutation in worms that is part of the evolution of the capacity to live in swim bladders is itself a random quantum event. Much of the becoming of the biosphere has to do with *making possible*.… Natural selection played a role in "fashioning" a working swim bladder. But did natural selection fashion the swim bladder such that it constituted an adjacent possible empty niche in which a worm could evolve to live? NO! But that means that without selection accomplishing it, evolution creates its own possibilities of future evolution! Evolution, without selection achieving it, evolves its own future pathways of becoming (Kauffman 2019, pp. 116-117)!

Within the physical sciences we cannot formulate any measure or explanatory account of how this should be necessitated: biosphere emergence is enabled, not caused. It cannot be pre-stated, predicted, measured, or probabilified (except after the fact). Our understanding of such enabled phenomena is always in terms (and after the fact) of what Hayek (1967) called explanation of the principle involved, and it can never be of all the infinitude of particulars that somehow "went together" to make up those general regularities.

The development of society occurs primarily as a result of social co-occurrent enablement. The unintended consequences of human action change not only humans themselves but the non-conscious (actually, non-agency based) econiche in which they are found. This realm of the social (which is the not conscious) as opposed to the social psychological, is "caused" only by enablement. That is to say, there is no physical causality whatsoever: we could never pre-state in any physical science account the ever-changing phase spaces of ever new functionalities that arise in that domain. Thus, we cannot do what physical science does: write laws or equations of motion for that which emerges. There is no avoiding the fact that since we cannot integrate the equations of motion in a single relevant phase space, we do not have entailing laws as physical science provides. This was first pointed out in economics and social "theory" by Hayek, who argued that general or abstract rules of behavior compatible with (but not causal of) observed results are all that we can hope to find. Kauffman applied similar reasoning to the economic domain as well. Consider the development of computers. After von Neumann invented it, IBM made a few commercial machines, which sold better than their initial expectations. Then, independently, computer chips were invented (and replaced vacuum tubes), which paved the way to the smaller personal computer. But the big mainframe did not cause the invention of the personal computer—it enabled it. Then independently came the spreadsheet as a programming application, which complemented the personal computer in the sense that each one helped the other gain increasing sales. Again, the personal computer did not cause but rather enabled word processing, and enabled but did not cause companies such as Microsoft, and it did not cause but enabled the existence of the Internet and World Wide Web, which in turn enabled but did not cause the existence of companies such as eBay and Amazon, and then Google and a plethora of present-day search engines. That enablement continues today. As Kauffman said, "I note again that goods and services as contexts do not cause, but enabled the invention and introduction of the next good or service. ' Enablement' is not a word used in physics" (Ibid., p. 132).

On growth and form. In 1917 Darcy Thompson published an influential book with that title, making the case that evolution must follow the purely physical-mathematical rules according to which molecules can come together to form the only possible basic forms of biological structures and even whole organisms. The physical shape organisms take is "determined" in *the physical realm* by mathematical and physical constraints (such as gravity and surface tension) on putting things together. In psychology Kugler and Turvey (1987) extended this approach to physiological functioning underlying psychological processes. One hundred years later, Thompson still commands respect and guides research (Briscoe and Kicheva 2017). But does that mean that the principles of evolution should be discarded in favor of hard science explanations? Against that one-sided approach, Thompson was criticized by theorists who emphasized that evolution is not a physical phenomenon but rather a functional (biological and semiotic) fact of life. How can one get beyond either one sided account? It is only in the functional realm that, as Polanyi (1969) was the first to emphasize, life *harnesses* physicality, and in so doing transcends physicality alone. That is the perspective from which Kauffman's use of enablement, as well as the perspective of this essay, stem. Understanding both life and its emergence, and civilization and its explosive growth, demand both physical and functional accounts. But in the genesis of society and civilization, the functional realm now is totally dominant.

A different perspective on Polanyi's tacit dimension. A mainstay of the revolution against the old entirely explicit and conscious conception of rationality (stemming from the Euclidean-Cartesian approach to epistemology) has been Michael Polanyi's insistence that all conscious thought and awareness is preceded by and grounded within a tacit dimension of nonconscious and implicit processes. He is, with Hayek, one of the coiners of the concept of spontaneous order. What is explicitly available to conscious processing in focal attention stands out as such only against a background of subsidiary activity of which one cannot at that time be aware. Knowing is a from-to relational structure: we attend from the background in order to have the focal material brought into consciousness. Articulate knowledge rests on tacit "commitment" (presuppositions) in a framework that is not explicitly rational (in the Cartesian sense) or consciously articulated. We are what Polanyi called comprehensive entities, based on both at once, in the sense of life harnessing the physical domain by imposing functional constraints (Weimer, in press) on it. Here we have focused on the fact that any such higher order functional constraint system in hominin groups depends upon externalization of symbols into the econiche.

Externalization of memory has been responsible for moving this tacit process of knowing and doing from the individual nervous system out into the econiche (within the individual, tacit processing involves the influence of temporally prior activity upon subsequent neural patterns). This is what has made the human social cosmos more than Grassé's stigmergic activity found in the group insect world. Stigmergy refers to the indirect coordination of behavior by environmental cues which organize what we regard as "collective" activity. Stigmergy replaces the untenable idea of groups as "super organisms" or deliberate collectives. This is a simple feedback mechanism: traces left in the environment by organisms then feedback to influence their subsequent behavior. Social insect colonies record (totally unintentionally) their activity in external environmental effects and then use that record to organize seemingly "collective" behavior.

> Various forms of storage are used: gradients of pheromones, material structures (impregnated or not by chemical compounds), or spatial distributions of colony elements. Such structures materialize the dynamics of the colonies' collective behavior and constrain behavior of individuals through a feedback loop. Stigmergy also solves the coordination paradox: individuals do interact to achieve coordination but they interact indirectly so that each insect taken separately does not seem to be involved in a coordinated, collective behavior (Theraulaz and Bonabeau 1999, p. 111).

No doubt stigmergic activity coordinated the behavior of earlier and smaller primate groups (such as earlier hominins like *H. Erectus*), but it could not possibly be stretched to account for the explosive development of society after the last Ice Age. That requires development of symbolic record-keeping devices such as al-

phabets based upon phonemic transcription, and, in order to enable the retrieval of information, functional reorganization of brain patterns to read the letters and their combinations as representing what is available in spoken language. This is anticipation and expectation, a matter of feed forward, not backward (Weimer 2021, 2023a, 2023b).

Competitive cooperation maximizes social externalization of memory. Economists emphasize competition as a discovery procedure by which new knowledge is uncovered and goods are produced. But competition is a found or already given process for making maximal utilization of memory that is externalized and thus potentially available in the econiche of the social order. The "selfish" activity of taking advantage of one's unique position in the social milieu to make market transactions for one's own betterment is, in the present organization of social interaction, an enablement, which happens to be a maximally effective means of picking up and utilizing externalized information that has been compactly summarized in the single chunk of "information" provided by a price in the market. The recently evolved procedure of competitive interaction in market ordering is far superior to tribal central direction of resources (and controlling or limiting of information for a particular purpose) when it comes to the task of harnessing the externalized memory capacity found in society. The insolubility of the "distribution problem" in centrally directed economies is an indication of the superior utilization of externalized memory present in decentralized economic systems. This is why the history of the last few millenia is a history of the increasing spread of economic market ordering from initially small and isolated "backwaters" to larger and larger blocks of more dominant social groups (including countries and sometimes the majority of a continent) bound only by common operating systems that, in the last analysis, are means of improved utilization of indefinitely extended externalized memory, and as such, of more decentralized control allowing increased creativity and productivity.

The dark side: tribal instincts and desires thwart competitive cooperation and decrease reliance on impersonal knowledge. Despite externalization of memory functions, our present larger social groups are still based on the gut level and lower to midbrain organization of our primitive mammalian ancestors (Weimer 2022b). The "higher" cortex of hominins (as well as sharper separation of hemispheric function and "quasi-independent" identity or agency of hemispheres) is, like market ordering, a recent and co-occurrent addition, not always compatible in goals or functions with the rest of the CNS and the ANS (autonomic nervous system). Our emotions and sense of comfort arose in the intimacy of face-to-face benevolence and tribe provided care giving. The abstract society of external, rather than personal stimulation and cues for behavior, has no such comfort to us. This has led to disaster as well as progress. We have vastly increased the destructiveness of war and aggression (and armed stone age barbarians against civilization with "surplus" arms sales and tribalistic doctrines such as socialism and communism), aided theft and rape in conquest, used religion to advance the sacredness of life for the purpose of breeding more of "us" so we can with a clear conscience engage in genocide against the "infidel" other (whom it is quite alright to kill), and sought desperately to go back to the comforting organization of the tribe to avoid the alienation and malaise of modern abstract society. We deny at all costs the benefits of competitive market cooperation in favor of the tribal morality of benevolence and the dictator's beneficence. This double-edged sword aspect of market ordering has been recognized for centuries. Consider Ferguson (1767/1995):

> The latest efforts of human invention are but a continuation of certain devices which were practiced in the earliest ages of the world, and in the rudest state of mankind. What the savage projects, or observes, in the forest, are the steps which led nations, more advanced, from the architecture of the cottage to that of the palace, and conducted the human mind from the perceptions of sense, to the general conclusions of science.… Without the rivalship of nations, and the practice of war, civil society itself could hardly have found an object, or a form.… The intellectual talents of men have found their busiest scene in wielding their national forces, to overawe, or intimidate, or, when we cannot persuade with reason, to resist with fortitude, are the occupations which give its most

> animating exercise, and its greatest triumphs; and he who has never struggled with his fellow creatures, is a stranger to half the sentiments of mankind.… (pp. 13; 36).

Ignored in such cases (and completely unknown to the majority of individuals) are the positive aspects of competition and rivalry which come into play when we consider the division of labor and its resultant, the division of knowledge. As Ferguson said, the activities of individuals "are made, like the parts of an engine, to concur to a purpose, without any concert of their own; and equally blind with the trader to any general combination, they unite with him, furnishing to the state its resources, its conduct, and its force" (Ibid., pp. 278-279). But the unavoidable conflict between the undeniable advantages and benefits of the impersonal society based upon externalized memory and market orders, and our ancient and incredibly powerful tribal morality and internal memory and instincts, goes on, increasingly enabled by the products which those same markets have provided.

The fall of public man. This is a popular book title (Sennett 1974). Its theme is that the prior (tribal up to end of feudal) public presentation of ourselves to others, the public stage with face-to-face interaction and mutual caring upon which countless earlier generations interacted, has given way to a private interior mental stage of today's self-absorbed alienated moderns. This would make sense, since we long for the internal memory-based benevolence of tribal existence for our gut level emotional satisfaction and comfort: we are attempting to manufacture what is perceived to have been lost. But Sennett argues our communities have become uncivilized in the process. The archvillain, as portrayed by Sennett and progressivists schooled in the then New Left, was and is the horror of capitalism.[4] This is the assumption:

> [T]hat impersonality is a summation, a result, a tangible effect of all the worst evils of industrial capitalism.… Industrial capitalism, we all know, divorces the man at work from the work he does, for he does not control his own labor, but rather must sell it. Therefore, we all know, the fundamental problem of capitalism is dissociation, called variously alienation, non-cathectic activity, and the like; division, separation, isolation are the governing images which express this evil.... The very idea of the unknown can modulate into seeming one form of the problem of capitalism; just as man is distant from his work, he is distant from his fellows (Sennett 1974, p. 295).

Public man (as opposed to present day private, narcissistic and self-interested humanity) was a structured (scripted) and "formal" way of interacting with others (the requirement of always having good "manners") intended to keep violent disagreement at a minimum, to preserve the amiable form of tribal or face to face interaction. More than pleasantries, such ritualistic behavior allowed disagreements to be minimized and smoothed over to accomplish our transactions. It was, in effect, a ritualistic extension of how poisonous snakes who would kill each other by biting, now fight by wrestling rather than killing each other by injecting venom.

Should we look forward to impersonal cooperation based on externalized record keeping and symbolic interaction, or backward to "public man" face to face intimacy and mutual beneficence? First, is the description of capitalist "evil" correct? No. We do *not* "all know" what the Left has presumed to be true. It is not the case that (to note only Sennett's example) a worker is "divorced" and "dissociated" because he or she "sells" labor. That interaction is a market order exchange by contract, not force or coercion by another. An individual *owns* their own labor as an item of private property, and *chooses* to use it one way or another. Slavery, an institution of tribalism, robs the individual of their property and freedom, not capitalism as market order interaction, which is based upon individual freedom of choice among alternatives. What of the unknown and unforeseen as "unique" to capitalism? Does it distance one from fellows? Certainly no more so than for the tribal member cast out on a hostile hunt or flight from enemies is facing unknown consequences. So the "problems" of modern society are not actually those found in progressivist accounts.

Problems proffered by the Left as the alleged result of market economy and impersonal social organization turn out to have nothing to do with the economic order that replaced feudalism and tribalism. Those problems are inherent in restrictions imposed by larger populations per se, and the lack of interpersonal contact and bonding except that now found in individual voluntary association. Here the contrast is revealing: the labor union imposed upon workers, an instrument of tribal "benevolence" opposed to apparent interests of the "owners," is a typical example of alienation and malaise from following progressivist policy, because the union members have nothing in common except their work situation and the desire for more money. As a result, union members have no respite from alienation, isolation and malaise. In contrast, voluntary associations, based upon commonly shared interests, are what can combat that unpleasant situation, and unite those of disparate economic and social circumstances, while providing a welcome return to the camaraderie of the gut feelings of the tribal group (Weimer 2022b) within the larger context of the impersonal society. The externalization of memory that has shaped our society has not as yet managed to change our gut level emotionality.

SUMMARY

Modern impersonal and abstract society has resulted from an enablement, an unintended consequence, of our very recent ability to move the burden of record keeping and memory functions from the limited internal patterning of neural activity within the individual brain out into the econiche, where all members of our now enlarged group populations have their own access to that content. We have created an intersubjective realm in addition to our individual experiences. We have made exosomatic objects and processes the repository of vast amounts of information and knowledge, capable of supporting an indefinitely extended range of behaviors and new functions. This change in social organization, of memory beyond the capacity of the individual and the momentary present, has enabled society to become impersonal (intersubjective to the philosopher) and transcend time rather than being limited to personal interactions with known individuals in the specious present. A spontaneously organized complex society emerged from, as the recent example of writing in which letters represent phonemes of spoken language provides, a means of externalizing knowledge and memory from individual brains to the indefinitely extended econiche we have created in the process of that externalization. Anyone who has access to records (written, spoken, however embodied or symbolized) can now participate in a vastly extended domain of knowledge and "information" by engaging in the resultant market ordered systems. "Public" man or woman may have fallen from view in the market orders of present abstract society, but the benefits of small group living can still be found in voluntary association and mutual benevolence in personally meaning filled forums provided by voluntary association and cooperation. Externalizing memory creates the impersonal social order we now find ourselves within, but it does not destroy or repudiate personal meaning and human satisfaction. Those "human" factors and concerns are now being relocated into spaces chosen by individuals rather than dictated to us by tribal proximity.

NOTES

1 Scant mention of memory externalization in the literature focuses on the very recent examples of computer and internet instances (Wegner, Ward, and associates, e.g., 2013, 2021). Empirical studies center on how the internet bombardment of content has affected the consumers of that content. These studies take memory externalization for granted, and as only a contemporary phenomenon. One important result is that people mistake the internet's knowledge for their own: we now seem to internalize the external. There is no attempt at historical or developmental understanding of externalized memory or its enablement in these studies, nor discussion of its origin in the spontaneous social cosmos, or actual significance in having shaped our rapid development in society and intellect.

2 Agency as recursive closure of functional constraints depends upon pickup of information from both internal and external environments. What was external becomes internalized in a new functioning of a constraint operation. Agents initiate new internal constraint patterns as a result of picking up information that is external to that constraint's own operation, which then becomes internal (remembered) information used in other constraints in order to pick up and operate upon new (externalized) information leading to new constraint initiation. This is how we are what we do. This is why agency does not entail consciousness, which (found only in the highest primates) is a more recent self-constraining organization pattern that lengthens internal immediate or short-term internal memory enough for cognitive processes to begin to "see" what we are doing in being agents.

3 This relates to the age-old contrast between invention and discovery. Do we *invent* mathematical systems such as calculus or linear algebra, or *discover* them in some abstract conceptual space upon which we have stumbled? Usually we assume that if it is "intuitive" in some sense (involving a sense of familiarity) then it "must" be that we "invented" it, while if there is no readily available context, we think it was a new "discovery" by some intellectual explorer. For example, in the case of Cantor's work on the mathematics of infinite totalities we find it so unprecedented and unique in the history of thought that it "must" have been discovered by his genius, whereas any algebra is now, because of context, seen as "obviously" an invention.

This contrast even entered the political arena with discussion of the "social origins" of mathematics. Cartesian constructivists (as Hayek 1979, 1983, 1989, used the term) assume that all mathematics must be deliberately arrived at, an invention resulting from some felt need. Lancelot Hogben (1937), writing with the Marxist socialist's "clear Cartesian common sense," portrayed the entire history of mathematics as a matter of deliberate making of systems to fulfill a need that society *already* had to have. Writers of a classical liberal bent regard this as absurd, arguing that the development of mathematics is almost always a matter of the unintended consequences of other action rather than deliberate design or felt need.

When viewed as enablement co-occurrent developments in a spontaneous intellectual order these either-or approaches are of little utility, because both are usually involved to varying degrees.

4 Sennett followed the cultural Marxist shift of nearly all academics in the 60's:

> I put the matter so strongly because I and many other writers in the New Left during the last decade so erroneously believed that the rebuilding of local community was the starting point for politically rebuilding the larger society.… Even if the idea of building a community sharing intimately new forms of experience had been initiated by the oppressed, or sustained by them, I think the results would have come to the same dead-end. For what is wrong about the notion of building a community against the world is that it assumes that the very terms of intimate experience would indeed permit people to create a new kind of sociability, based on the sharing of their feelings (Sennett, 1974, p. 296).

The correct "villain" is also the source of our progress and hope for the future—the adoption of market orders as an enabled result of the externalization of memory. Market orders have absolutely no deliberate suppression of any participant. The continual socialist focus on oppression, alienation from one's immediate tribe, making money and wiping out all competitors, loss of the morality of beneficence, etc., ignores all the advantages that accrue to competitive cooperation in an impersonal society.

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