

Human Cognition and
the Advent of a Global Knowledge Base

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Abstract

This focuses on the effect of the Internet's evolution and the subsequent developing availability of a globally comprehensive knowledge base. The impacts of this are seen in the twin lights of the macro/anthropological view and the micro/cognitive view. Garrido and Kvalvik examine the impact (on an evolutionary scale) of sharing the human knowledge base uniformly, over the coming years, to all of those who have access to any simple PDA. Alternately, they will discuss how current theories of brain function—from Gardener's multiple intelligences, and the cognitive science definitions of Michael Imbert and Steven Pinker , to Minsky's "Society of Mind"—assist us in understanding the scale of change that a hyperlinked planet may represent. With this dual anthropological/cognitive perspective they discuss possible effects and consequences of this significant shift in, education, technology, and culture.

The dual authorship of this work is itself a result of an *electronic connection* of Brazilian author, Susane Lopes Garrido, at Unisinos (Universidade do Vale do Rio dos Sinos) in Sao Leopoldo and Kevin Kvalvik, Harvard graduate, presently at Univ. of MT, Western.

Human Cognition and the Advent of a Global Knowledge Base

In physics, the Holy Grail is the Unified Field Theory: a way of taking the large view of the universe and the submicroscopic view of quantum mechanics and understanding both with the same set of rules. On a smaller scale, this paper looks at human cognition in the twin lights of the macro/anthropological view and the micro/cognitive view. This examines the impact (on an evolutionary scale) of sharing the human knowledge base uniformly, over the coming years, with all of those who have access to any simple PDA. Alternately, this discusses how current theories of brain function—from Gardner’s multiple intelligences theory, and the cognitive science definitions of Michael Imbert and Steven Pinker, to Minsky’s *Society of Mind*—assist us in understanding the scale of change that a hyper-linked planet may represent. With this dual anthropological/cognitive perspective there is a worthwhile model to view the possible effects and consequences of this significant shift in, education, technology, and culture.

The Macro View

On an evolutionary level the past 2 million years have been quite remarkable for Homo Sapiens Sapiens. The advances, from walking erect to making simple tools, have progressed at a very expeditious pace (in terms of anthropology). The past 6000 years have been marked by an exponential increase in our ability to make these stone tools and their antecedents, computers. All conversation about knowledge sharing, acquisition and use must be seen in this an anthropological frame, as Homo Sapiens Sapiens have not been around very long. In this process of development we gained what is arguably the most humanlike characteristic: sentience. Because we are sentient, we can *consider* our very being, our intellect, our progress. Nonetheless, being sentient also makes us a bit preoccupied with the tick of the clock where we happen to appear. One might say from a broader perspective, this gives us a rather skewed universal view.

When discussing human advances in various media, there is a tendency to think only as far back as the caves in Lascaux, France. But actually, the timeline that

we should consider goes back much, much further and (one would hope), goes forward much further as well. Our evolution began long before the *media record* and should, minimally, include all of the fossil record. Just moments ago, on this larger timetable, we began to pin down our perceptions on paper and call them facts. It is about 6,000 years ago that the media record begins. Our cognitive evolution is altered significantly by the twin advantages of our use of complex symbol sets and the surprise advent of technology to assist us in cognitive endeavor. Global electronic interconnectivity (presently the Internet) is also posed to have very significant impact on human evolution.

With all of the media available, and all that will be available online, it is the storage of the human condition and perceptions in discursive symbol sets paired with convenient universal access that will be the most significant advance of this millennium. However, seen in the truly long-range view of millions, not thousands of years, the ability to write and print and compute all happened within the same commercial break in history.

As Kurzweil (1999) points out at length in his text, *Spiritual Machines*, the *Moore's-law* conception of the exponential increase in processing speed—and thus information use—extends forward from early mechanical computers to our present terabit processors; and it also extends backwards to the beginnings of time itself. (p.32) The existence of the Internet is not fully anomalous in this time frame. As Langer (1951) intimates in her work, *Philosophy in a New Key* (which, incidentally, was a great influence in Gardner's thinking) it is the discursive symbol set that was the real big shift in cognition. (p.18) If instead of only being able to access the data that was kept in the collective memory of the village or community, humans could now have a much greater, and vastly more reliable knowledge base. (Yet this was a self-filtered environment for those who could read, the smaller number of those who could publish, and those to whom access was given.) The rapid expansion to religious records, academic congress, and finally inexpensive duplication and information sharing that followed Gutenberg (or Wang Chen some 400 years earlier) were, of course, more significant than

the rapid access possibilities that the Internet has provided, because one is foundation for the other.

The primary difference that the Internet provides, initially, is the immediacy of the information¹. This replaces trips to libraries or correspondence for academics. Perhaps its cost-effective convenience replaces the more immediate but less textual information gathering of the telephone for the non-academic. Each of these is a response to *topical inquiries* to inform a *specific line of questioning*. As such, it does not include the mono-directional and perhaps overrated media of film and television. The ubiquitous and expeditious qualities are significant for reasons covered later, but the true marvel of the Internet will be its depth.

In his book, *The Road Ahead*, Bill Gates (1995) said that there was no information superhighway, and, of course, he was right. (p.5) This was several years ago now, but this superhighway is still a myth. There is not the continuity and structure, or for that matter, the linearity for that model to become a reality. There is the cliché that the Internet is an “ocean of information an inch deep.” This will only be true in the days of its infancy: yesterday, and the day after tomorrow. It is profitable to recall that the initial value of the printing press was seen in the *short run*, with its cost-effective method of printing the pamphlet: spreading little bits information much more efficiently—spam in the middle ages.

A New Model of the Cyber Ocean.

The Internet is indeed an ocean. It is a vast body of data with all of the mud puddles, and streams, and tributaries, and finally rivers of information flowing down into it.

Every minute, new people access the Internet, new computers are connected, new data is fed into the web. The more the cyberspace expands, the more universal it becomes, and the least united information in the world becomes available... This event is effectively changing our

¹ As I write this paper, each time I have a question about dates, time, authorship, or reference info, I do a two-minute search online to verify details. This is a new model, an immediate model for just-in-time research.

society's life condition. However, we are talking about an unknown universal that intends to remain like that, because each new knot in constant expansion in the web can become a producer or a sender of new unpredictable information. And it can also reorganize part of the global connectivity by itself. (Levy, Pierre; 1998, p.1)

Each computer has some information that can be shared with the electronic collective. This functions like **evaporation**, with data slipping up into cyberspace. Peer-to-peer file sharing is a primitive example of this. Each person online has some data, some wav or mp3 file to offer. The company, Napster, made quite a stir in the computing and recording industries in the late 1990's by allowing users to trade data files with one another. By any standards before or after, this is not new. Only in the infancy of a medium is the fact that individuals are not living in isolation a surprise. (What enabled this was the fact that storing the location of these files is the easy part for computers that can process at some odd gigahertz per second.) Once the data is cleared from the single CPU somewhere it may exist in dozens, hundreds or millions of locales. Each addition to the current of data slipping out to a tremendous common cloud of information adds to the incremental volume of this vast array of information. From this analogy the extension is that **evaporation** is this ongoing *data leak* from millions upon millions of hard drives across the planet. The intentionality of this process is irrelevant. It still occurs: All one's recipes, and all of the family photos, and all of Shakespeare in one pot.

Condensation occurs when it is absorbed, to be percolated and considered anew. This process is not like looking for a needle in thousands of haystacks. The logic-driven, intuitive search engine makes this process mathematically complex yet transparently simple for the user. Users look for information through a twenty-questions model, filtering a subject from the seemingly infinite to the exact response for the specific inquiry. The size of these *tools of connectivity* is already becoming handheldable. It is no stretch of imagination to assume that they will be resident in the watches or as implants in the very near future. This

implies that the saturation of this reservoir of information is and will be “virtually” universal. This is **condensation**.

Precipitation occurs when new data flows back into the sea of information that is collecting. Creativity may not be enhanced in-of-itself, but the raw data will be exponentially more accessible and in a vastly more time-effective manner. As this is digested again and again by the countless minds resident in any one generation, the resultant altered information will rain back into this gigantic knowledge base. Clearly analogies collapse under the weight of overuse, but this seems a fair model to describe this expedited phenomena. Finally, the oceans are left with the salient nature they possess as the minerals are left behind during all of the ongoing cycles. The very nature and volume of the human knowledge base is likely to be altered greatly, and it is possible that it will change in quality as well as quantity. This is truly a new model in our anthropological timetable.

The Micro View

Seeing the march of time and cognition as inevitable and unalterable belies the possible impact that human self-intervention may have on the process. It is this that should be considered as it relates to this larger, truly historic perspective. One method for looking at this larger framework with some objectivity is to go to the other extreme: taking this larger vision and then looking for the smallest element in the picture, brain function.

As Gardner (1983) pointed out some years ago there are discrete intelligences that can operate and flourish or flag separately from each other. In his studies, initially set in a Veteran’s hospital, he noted that damage to one part of the mind was often isolated in specific operational faculties, both physical and cognitive, and in some cases affective. The reasoning that Gardner used in 1983 opened many doors for research into brain function that called into question theories that viewed the brain as a single functioning organ like the heart or kidney. Marvin Minsky goes much further than this in his text, *Society of Mind* (1985) to describe the brain as more than a *computer analogue*, but as an *actual computer*. (p.40) In this text he describes the operation of hundreds of brain centers—composed

of thousands of lines of code—which operate in unison, in harmony or fully separate from one another as needed. His *Society of Mind* is reference to the myriad of separate agents, which war for attention or work in combination to allow humans to function in a cohesive fashion. The primary point here is that the heuristic assumption about the brain’s similarity to other less complex organs is largely incorrect. The human mind is comprised of independent components that function without volition or cooperation from some unseen consciousness or personality.

These disparate elements all combine to support the following line of reasoning: if we are evolving mentally, and our minds function not as single personalities, but as groups of laborers assigned different tasks wherein they apply their efforts in different combinations; then one could arrive at the conclusion that the mind of the human has always been a “collective.” This is no leap of logic, and neither is it a figure of speech.

If one agrees with Gardner’s and then Minsky’s basic assertions, then it is reasonable to see that the term “personality” or “mind” *in the singular* is more a theological belief, or a convenience of speech referencing a biological fact not a reference to actual cognition. Minsky (1985) states that brains are organs, and “minds are simply what brains do.” (p.288) This point describes the mind as a verb, relating to the body as legs relate to the term “run.” If the mind is the brain or mind is part of the brain.... the crucial point here is that Putnam (1970) as well as Nagel (1995 In: Teixeira, 2000) and Chalmers (1996) have as their aim to make one worry about getting to know oneself better.

If one could physically parse the mind out into its varying functions and tasks, one would observe a massive collection of separate parts, or identities joining and separating according to the assignment or moment. Perception, thought, memory, imagination, emotion and so forth all interacting in an elaborate ballroom dance throughout an enormous palace. That palace is the brain and the waltz is the mind.

A method neuroscience has used to approach the issue of individual workings within the brain is with infrared technology. By using relatively new technology in the 1990's science could measure heat and blood flow to different parts of the brain during certain mental activities. This seems like measuring the activities within an art museum with a thermometer. If one could measure brain function (as they attempt to in the realm of artificial intelligence) in the strictly binary, rule-based language of our present understanding of computing, it still does not take into account all of the endless combination of synapse firing in beautiful unseen interior patterns, snowflake-like with no two being the same.

Each of these models for thought sees the mind as contained in a location. If the various parts do not all know one another then the question arises: What is the difference between unique conclusions drawn by one discrete logical part of the brain and used by another section, and information read from a text, and then used by the other section of the mind? This question addresses whether the community of intelligences can discriminate between three sources of information: 1.) what they perceive through the senses, 2.) what is stored in memory and, 3.) new ideas that creativity generates from existing data. The difficulty, as pointed out by Minsky in lecture, is that we have a *belief* in personality when this is all a function of largely random combination of changing agents acting out *not like* a computer *but as* the computer that it is. If there is no one singular mind, then not only are *minds societies* within themselves, but they are citizens of a much larger corporate collective of intelligences throughout both space and time.

To restate: If these two inferences are correct (A. that there is not a cohesive single concept of a mind or persona, B. that the data created or acquired is used by the sections of the mind in the same fashion as knowledge already possessed) then one can see human interaction in the same light of the misused

simile: it is not like we are thinking as a group, but we are necessarily some kind of collective.²

A New Model for Knowledge Use and Management

During almost all our philosophical studies, we have pursued the control of knowledge, the singular possession of wisdom. We are facing a new paradox. If historically, the use of information was designed to control or dominate, now, this way of thinking changes. How will educators deal with these many alterations in dealing with students, cognitive functions such as memory, imagination, perception, comprehension, and logical thinking? Does this access to our collective electronic knowledge base provide knowledge to some in the politics of cognitive segregation? Is education now preparing people to continue this process of knowledge management that is appearing? Will access to the electronic knowledge base enhance or act as a further filter for *the have and have-nots*? In the short-run, impediments like computer access and copyright law seem critical. Yet, on an evolutionary scale the huge reserve of knowledge that will be created will be unaware of these initial impediments. To mix a metaphor, the movement of information to this common trough is more like a tide than a bucket. Over the course of years, centuries and millennia the shift of information will be so pervasive that any hindrances put in place will be historical footnotes. Viewing the effort of some groups to impede information flow makes this more readily apparent. Galileo's heliocentric theory was not as broadly known as he would have liked. The church had significant issues with his insight and his efforts at publishing these findings in Latin or Italian.. Regardless, the ability of any group to prevent information flow is limited at best. Our opinion of the world rotating around the sun is largely unchanged by the earlier efforts of the Catholic Church.

The *collective* of information does not imply a better use of that information, but the collective access to this knowledge does seem to imply more universal

² This clearly has a large anthropological implication and one could study it in that light, but neither that nor neuroscience are the emphases of this paper.

wisdom, or at least unique combinations. For this type of analysis we first need to see the world after cyberspace. If the knowledge of frontiers, of cultures and from people is aggregated, then the possible relationships become virtually infinite. Then new information, new styles of thinking and the knowledge of simulations that belong neither to the logical deduction nor to the induction from the experience appear. (Levy; 1998). After static text became the dominant method of educating, the individuality of the people and the knowledge was given shape from an era before. However, in this world of connectivity the interaction and collaboration become more natural.

Taking the example from the previous section of the paper, individuals who are separated by distances as great as, say Brazil and Montana, now find interaction not only convenient, but immediate. The resources that we may draw upon are also shared. Academics have long communicated from country to country, but this model is shifting into a higher gear. Whether this community “chat environment” is used uniformly (across cultures, genders, educational, social levels) or not is still in question. Nonetheless, imagine a thousand, thousand sets of intelligences being able to connect in one for more fashions with another thousand, thousand sets of intelligences and you don’t have to be a rocket scientist (or as Gardner said, correcting himself, “a ballerina”) to understand that the results of this on a global and anthropological scale are staggering.

“In this digital era, knowledge cannot be mistaken for information. Using the Internet as a place of only bibliographical searches, or using CD ROMs, electronic books, and visiting sites as mere observers is a way of looking at this paradigm today with the eyes of the ... past.” (Ferreiro, E.: 2001) The information itself does not have characteristics of days before. A sender can be the addressee, a mediator, the end or the middle of a message, and from this point everything can start again with another order. This is what Roy Ascott defined as a flood, a flood of information. (In: LEVY; 1998) The WEB gives the information/knowledge a new, atypical, collective, not temporal meaning, which is different from everything we have known so far. Everything has been changed forever, the language, coding and decoding signals and symbols.

Hypertext does not allow us to only read in the two-dimensional plane. Further, the nature of hypertext is only a model for what is actually transpiring: connections between unlikely sources, unlikely partners, unlikely reasoning. This exists apart from standard inductive and deductive reasoning. This is a new model for changing information into knowledge as part of a global mind: a collective evolving intelligence. If one takes the early suppositions that we think collectively, and pairs that with this collective of thought, the possibility of a richness of ideas and creativity is dramatic. This new interaction and creation technique seems more random, less linear, less planned and ultimately more organic. Perhaps this million years will truly be something worth writing home about.

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