Biology, Evolution and the Global Brain

By Howard Bloom.

A History of the Global Brain I

Sara Rogenhofer

A recent issue of Telepolis carried a from Peter Russell's book, The Global Brain Awakens. In this excerpt, Russell predicted the coming of a worldwide intelligence networked by computer web.

It might come as a surprise to the British computer scientist, experimental biologist, and physicist to discover that the researchers and theoreticians who specialize in evolution would sneer at the fundamental assumptions underlying this vision. The reason for the evolutionary community's contempt? A concept called individual selection. An idea which has provided powerful new ways of looking at human behavior since it was first codified roughly 30 years ago. But a concept which since then has partially degenerated from an intellectual lens to a set of blinders.

This article will expose the shaky roots of individual selectionism. And it will summarize one model- my own- which could provide a missing bridge between the skeptics - evolutionary scientists - and the believers- computer specialists who envision a planet pulsating with shared information. A planet, as Russell puts it, which has grown a global nervous system.

The scientific credentials of those who predict a worldwide intelligence are impeccable. Peter Russell studied mathematics and theoretical physics at Cambridge, worked with Stephen Hawking, obtained a post-graduate degree (once again at Cambridge) in experimental psychology, and also has a degree in experimental psychology. , author of the 1986 book Le Cerveau Planétaire (The Planetary Brain), has been Director of Research Applications at the Pasteur In-

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The Lucifer Principle

stitute, a research associate in biology and computer graphics at MIT, and was instrumental in the creation of France's Center for the Study of Systems and Advanced Technologies. Valentin Turchin, a key member of the international "Global Brain Study Group," holds three degrees in theoretical physics. Gottfried Mayer-Kress, author of The Emergence of Global Brains in Cyber Space, holds a doctorate in theoretical physics from The University of Stuttgart and has been associated with such prestige institutions as CERN, Los Alamos National Lab, and the Santa Fe Institute. , another catalytic member of the "Global Brain Study Group," possesses a doctorate in physics from the University of Brussels and is, among other things, associate director of Brussels' multi-disciplinary Center Leo Apostel.

Why, then, would an international fellowship of equally august specialists be likely to deride as naive pseudo-science the notion of superorganismic intelligence?

The individual selectionists who dominate today's "Neo-Darwinism" believe that all human and animal behavior is the result of genetic avariciousness. Even the most seemingly self-sacrificial deed is the result of a hidden calculation of genetic costs and benefits. A gene sufficiently greedy to guarantee that two copies of itself make it into the next generation will rapidly expand its numbers. Genes which program for self-denial will give up resources to help others. As a consequence, some of these group players will launch no copies of themselves. The population of unselfish genes will dwindle generation after generation until the contributors to the larger good have philanthropized themselves out of existence. And the long-term survivors will be pre-programmed to commit an act of cooperation only if the price of what they are forced to relinquish pays off in a genetic profit.

Meanwhile, another school of evolutionary thought has been driven underground. It is known as group selectionism. Those few evolutionary scientists willing to admit to their belief in group selection aver that individuals will sacrifice their unique genetic legacy in the interests of a larger whole. Such a need to cooperate and converge would be necessary to make the global brain and the planetary nervous system possible. On the other hand, if the individual selectionists prove correct, humans will be unwilling to share knowledge which might give others an edge. The cyber-ocean of the worldwide web and its technological successors will be a barracuda pit rather than a meta-intellect.

Numerous academics in journals which shun emotionally biased language have labeled group selectionism "a heresy." Robert Wright, the chronicler of individual-selectionist evolutionary psychology, is more gentle in his condemnation. Group selectionism, he says, is simply a seductive "temptation."

Robert Wright calls individual selectionist psychology "the new paradigm." But the concept of individual selection is showing the rigidity of age. The view that all behavior is ultimately based on self-interest began its climb early in the 20th century. Cloaked as "the survival instinct," it dominated another questionable orthodoxy-the fight or flight syndrome hinted at by William McDougall in 1908 and popularized by Walter Cannon in 1929. As research psychologist Robert E. Thayer says, "certain aspects of the fight or flight response were never supported by scientific evidence." What's more, the fight or flight model can be only partially correct. Creatures confronted with an overwhelming threat are frequently immobilized by anxiety, resignation and a variety of related physiological mechanisms. In other words, instead of battling or running to save their lives, they leave themselves open to the jaws of the predator. So much for the ubiquity of the survival instinct! Yet fight-or-flight remains gospel to this day. Over thirty years after Cannon, however, W.D. Hamilton and others had the courage to face at least one small fly in the self-interest ointment. If individual survival is the be all and end all of existence, how could one account for altruism?

During the early '60s, Hamilton focussed on the selfless manner in which female worker bees sacrifice their reproductive rights and chastely serve their queen. His triumph was a mathematical demonstration that the workers were carrying essentially the same genes as their queen. Hence when an individual lived out her life on behalf of her monarch, she only appeared to be ignoring her own needs. By pampering the colony's egg-layer, each worker was coddling replicas of her own biological heritage. Altruism, asserted Hamilton, was genetic self-interest in disguise.

Hamilton's ideas and those built upon them have contributed mightily to our understanding of evolutionary mechanisms in fields from medicine, ecology, and psychology to ethology-the study of animals in the wild. But roughly 25 years after the Hamiltonian epiphany, examination of real world bee colonies demonstrated that William Hamilton's mathematics did not correspond with fact. There was far more genetic variety in societies of unselfish insects than the equations would allow. Individuals were not abjuring their interests simply to protect near-clones of their own genomic material. Apparently something else was going on.

Nonetheless, concepts based on what became known as individual selection hardened into dogma. And many of those tempted to posit non-Hamiltonian approaches have been stopped by the quiet threat of exclusion from professional respectability, of expulsion from career advancement, and of prohibition from the achievement of academic tenure.

In the mid-90s a growing group of scientists have risked ridicule by arguing for the simultaneous validity of

group and individual selection. State University of New York evolutionary biologist David Sloan Wilson, who has produced papers championing group selection for over 25 years, is this band's acknowledged pioneer. I have been the organizer of one of its guerrilla brigades - "The Group Selection Squad." And my theoretical work indicates strongly that the social and biological sciences may benefit enormously from a selectionist reappraisal.

David Sloan Wilson has pointed to over 400 studies which support the group selectionist point of view. He has concentrated his attention on research indicating that among humans, those who pool their reasoning usually make far better decisions than those who keep their thoughts to themselves. I've focussed my efforts elsewhere, introducing to the debate a scientific discipline whose data individual selectionists refuse to take into consideration. This obdurately-overlooked field is psychoneuroimmunology - the study of the interplay between physiology and conditions in the "mental" or psycho-social environment.

As we've already seen, individual selectionists insist that a creature-be he man or beast-will only sacrifice his comfort if the payback to his genes is greater than what he gives up. His self-abnegatory behavior must benefit close relatives, the carriers of genes like his own. This is called "kin selection." A living thing can give up an aspect of its welfare on behalf of a non-relative...but only if it has reason to expect that this favor will be returned. This theoretical loophole is known as "reciprocal altruism."

Yet as long ago as the early 1940s, researchers like Rene Spitz were already discovering that among humans the genetic survival instinct had a counterpart of an unexpected nature. It was a physiological twin of Freud's supposed Thanatos, the death wish. The new empiricists lacked Freud's genius for coining catchwords. They merely noted what occurred and came up with separate labels ("anaclitic shock," "learned helplessness") for each instance they identified. In my book The Lucifer Principle: a scientific expedition into the forces of history, I've taken the liberty of introducing a blanket designation. Each investigator from Spitz to Harry Harlow to Lydia Temoshok to Martin Seligman and Robert Sapolsky has unearthed an example of a "self-destruct mechanism."

Let's take a typical example. Numerous investigations performed by scientists of widely varying points of view have revealed that the hospital patients who need help the most-those submerged in depression-are the least likely to receive aid. At first glance, it appears to be their own fault. Depressed patients behave in a manner which makes doctors and nurses avoid them. They become incommunicative and irritable. They upset others through every means from facial expression and verbal intonation to body language. An individual selectionist would explain that such self-damaging behavior must be the result of an adaptive response-one which relieves close relatives of a burden or confers upon them a benefit ("kin selection") or one which stores up the good-will of someone who will compensate the self-victimizing individual or other carriers of his genes in the future ("reciprocal altruism").

However empirical studies show the opposite. The patients with the greatest number of relatives and friends are the least likely to be depressed. Instead they tend to be the cheerful souls who, even in the face of death, remain charming and bring doctors and nurses flocking sympathetically to their bedside. So those who according to the individual selectionists could benefit replicas of their genes through their demise are the least likely to be stricken prematurely by the axe of death.

On the other hand, both animal and human studies demonstrate that depressed beings flirting with the grim reaper are those the individual selectionists would least expect-those least likely to benefit genes similar to their own. Their family ties are either malformed or non-existent. The immune systems of creatures with few or no friends and intimate kin shut down, while the immunological resistance of those who are part of a social web remain far more vigorous. In other words, isolated individuals undergo a strictly involuntary surrender to disease and bodily dissolution. They are seized by something akin to the suicide mechanism called apoptosis, a sequence of self-destruct events pre-programmed into nearly every living cell and activated when the cell receives signals that it is no longer of use to the larger community of which it is a part. Between their self-crippling immune-systems and their self-defeating conduct, isolated individuals vastly increase their odds of death. The payoff to copies of their genes is likely to be zero. None of this squares with the elaborate dogma of individual selectionism.

When caught in a bind, individual selectionists frequently claim that we are witnessing an instinct which was helpful during our days in hunter-gatherer tribes-an instinct which, under Pleistocene conditions, genuinely did enhance the survival chances of those with similar genes. However, these apologists proclaim, what benefitted the genes at our core in the days of the first stone axe has been perverted in its purpose by modern industrial civilization.

This argument is unlikely to hold water. The isolation of chimps, dogs, laboratory mice, and a wide variety of other animals leads to depression, a down-shifting of the immune system, and a failure to either see or use avenues of escape. Like us, creatures without industrialism dramatically increase their odds of death when they are severed from their social bonds, not when

their disappearance stands to benefit the carriers of genes like their own.

This is where the new model of the evolutionary process I've introduced in The Lucifer Principle and will elaborate further in an upcoming volume called The Irrational Invention Machine may come in handy. Let us suppose for a moment that group selectionists are correct. Individuals will sacrifice themselves for the good of a larger whole. Those larger wholes compete. When groups struggle, the ones which boast the most effective organizational, strategic and technical advantages win. Individuals who contribute to their group's virtuosity will be part of the team which survives. And in this manner does evolution proceed.

Now let's add to the group selectionist claims another concept-one familiar to the mathematicians of complexity. Complex adaptive systems are learning machines made up of numerous components. Neural nets and immune systems are particularly good examples. Both apply an algorithm best expressed nonmathematically by Jesus of Nazareth: "To him who hath it shall be given; from he who hath not even what he hath shall be taken away."

The neural net has an extensive population of individual switch points-electronic nodes whose connection to the larger grid can be increased or radically diminished. An immune system takes the principle a step further. It has between ten million and ten billion different antibody types alone. In addition it possesses a flood of entities known as "individual virus-specific T cells." Both the immune system and the neural net follow the Biblical precept. Elements which contribute successfully to the solution of a communal problem receive resources and influence. But deprivation is the lot of those elements unable to assist the group. In the immune system, T cells encounter the MHC insignia of an invader. A small proportion of the would-be defenders discover that their unique receptors allow them to help defeat the attackers. These champions are allowed to reproduce with explosive speed, and are given the raw material they need to increase their numbers. T-cells of no use in confronting the current assault are robbed of food, of the ability to procreate, and often of life itself. Each is subject to destruction from within via the "pre-programmed cell death" of apoptosis.

In the neural net, nodes whose collaboration contributes to the solution of a problem are rewarded with more electrical energy and with connections to a far flung skein of recruits. The nodes whose efforts prove irrelevant to the problem at hand are fed less electrical juice, and their ability to connect with and arouse others is dramatically decreased. Both T cells and network nodes compete for the right to commandeer the resources of the larger system. And both show a seeming "willingness" to abide by the rules which dictate denial. This combination of competition and selflessness turns an agglomeration of electronic or biological components into a learning machine whose totality possesses an adaptive power vastly beyond that of any single element within it.

The same modus operandi is built into the biological fabric of most social beings. Look, for example, at evidence from the phenomenon which its discoverers call "learned helplessness." Animals and humans able to solve a repeated problem remain vigorous. But mice, monkeys, dogs and people who cannot get a handle on recurrent misfortune become victims of the self-destruct mechanisms mentioned above. Let's be more specific. Experiments on the physiological impact of mastering a problem began in the 1950s, when Joseph Brady and his colleagues devised a cruel but clever mechanism. They placed two small chairs side by side. The chairs were wired into an electrical circuit which would deliver simultaneous shocks of identical voltage to each of the contraptions' loungers. The experimental subjects destined to be strapped into these hot seats would be monkeys. Only one thing made the monkey on the left different from that on the right. The right-hand monkey was given a button with which he could solve the pair's joint dilemma. With it, he could turn each shock off when it arrived. Investigators assumed that the primate with the switch would develop severe health problems. He was the "executive monkey," the one of the pair weighed down with responsibility. The beast sitting next to him was relieved of his pain at the same instant. But this free-rider had to exercise no judgement or effort. Surely the creature without the switch would thrive more readily, unencumbered by the double burden of distress and vigilance. Indeed, early analyses seemed to demonstrate that this assumption had been correct. The monkeys with the ordeal of decision making were declared to have a far greater tendency to develop ulcers.

But later inquiry showed that the executive monkey experiments had fatal design flaws. Their results had been invalid. Twenty years down the road, variations on the experiment demonstrated something rather different. When put into adjacent shock cages, one of which had a control switch and one of which didn't, two lab rats would at first scurry and jump attempting to find a means of escape from the arbitrary administration of Thor's lightning. The rat in one cage would soon find his control button. When the current sizzled his soles, he would lunge for the switch and turn it off, rescuing both himself and his comrade. The rat whose frantic search resulted in no discovery of a means of control, on the other hand, would eventually give up his struggle, lie down in the cage, and accept his jolts with an air of resignation.

As "learned helplessness" experiments continued, it was discovered that more than mere laziness was crippling the beast unable to contribute to the resolu-

tion of the shared dilemma. His immune system no longer protected him from disease. If given a way to escape his situation, his perception was too bleary to see it or to register its utility. His self-destruct mechanisms had taken control. All indications were that these self-maiming reflexes were physiologically pre-programmed. Most telling was the fact that the beast able to cope with the slings and arrows of a researcher's outrageous fortunes retained a vigorous immune system, a relatively keen perception of the world around him, and remained active and energetic-despite his periodic spurts of torment. How might his neighbor's internally-inflicted disablement aid the projection of the victim's genes into the next generation? Apparently no one bothered to ask.

A naturalist named V.C. Wynne Edwards, however, had already observed the effects of these phenomenon in a social context. Under feral conditions innumerable species are not isolated by a cage but live as part of a larger group. Edwards studied wild grouse in the Scottish moors. Here, punishments and rewards were handed out not by scientists, but by the natural and the social environment. Male grouse whose mastery of their surroundings enabled them to find good provisions of food and safe sleeping conditions became strong and self-confident. Those less able to forage successfully or to find the safest roost became less physically robust. Weakened, they entered the seasonal competition for females. They fought their problem-mastering flockmates in one-on-one battles, and usually lost. Their failure to find a way to dominate their natural environment led to a corresponding failure to gain control in their social environment.

The successful birds ended up with avian harems, access to even more food than before, and an increased level of pep and acumen. The losers had insult heaped to their injury. As their self-destruct mechanisms kicked in, they showed symptoms which comparative psychologists have called a direct analog of human depression. Like the rats with no handle on their fate, these unfortunates gave up, resigning themselves to a position on the outskirts of the flock-the very location in which they would be most tempting to a passing fox. They lost appetite. As their immune systems shifted into low gear, they grew unhealthy. And in times of scarcity, they were the first to die.

Wynne-Edwards theorized that he was watching group selection at work. The birds whose failure had led to a physical decline, he felt, were sacrificing themselves to adjust the group size to the carrying capacity-the amount of food and other necessities-in their locale. The Scot announced his conclusions in 1962. By 1964 William Hamilton's equations had taken the evolutionary community by storm. Wynne Edwards became the poster boy for group selection and was driven from scientific respectability. He is cited in current textbooks primarily as an exemplar of scientific error. What Wynne-Edwards had seen at work was a complex adaptive system devilishly similar to a neural net. Those individuals within the group capable of finding solutions to the problems of the moment were rewarded with dominance, desirable food and lodging, and sexual privileges. The weak links in the group's neural net, the individuals who had not found a means of solving the environmental puzzles thrown their way, were isolated and impoverished by the social system and disabled by self destruction.

In other words, the group had shown all the key characteristics of a functional learning machine, a complex adaptive system, or, if you prefer, a superorganism. Later, Israeli naturalist Amotz Zahavi would demonstrate that groups of birds function as communal information processing apparatuses. However Zahavi failed to put his observations together with those of Wynne Edwards, with those of the "learned helplessness" experimenters, and with the principles of complex adaptive systems.

My work since 1981 has been to demonstrate that these elements are parts of a single puzzle. The existence of self-destruct mechanisms, the fact that they are turned on and off by control of circumstance, and the fact that social animals are linked in information-exchange networks explains the mechanism behind David Sloan Wilson's research-survey conclusion that a group usually solves problems better than the individuals within it.

In short, if one acknowledges that individuals like the grouse do indeed compete for reproductive advantage (remember the seasonal tournaments which determined which avian males would receive mates), but that their competition takes place within the framework of a connective intelligence, the idea of group selection seems a necessity. Pit one massively parallel information processor against another-a constant occurrence in nature-and that which most successfully takes advantage of complex adaptive system rules, that which is the most powerful cooperative learning machine, will almost always win.

It is time for evolutionists to open their minds and abandon individual selectionism as a rigid creed which cannot co-exist with its supposed opposite, group selection. For if I am right, the networked intelligence foreseen by computer scientists and physicists as a product of emerging technologies has been around a very long time. In fact, it has sculpted the perverse physiological makeup which manifests itself in our depressive lethargy, our paralyzing anxiety, the irritability which drives others away when we need them most, our resignation when attainment repeatedly eludes us, and the failure of our health when we become victims of overwhelming loss or crisis. These physiologically pre-wired features have made us microprocessors in

the most intriguing form of parallel computer ever constructed on this earth. Without transistors, they have turned each one of us into cells of a networked brain.

1 Three questions and Howard Bloom's responses

Are scientists like Gerald Edelman with his neuronal darwinism concept also suggesting group selection within populations of neurons?
Howard Bloom: Yes and no. First, you are wise to connect Edelman's work with complex adaptive systems principles. You probably know that 50% of the brain cells are killed off through apoptosis in the first year of life. Those which don't match the challenges in the baby's environment are the ones to go. It is the principle of "to him who hath it shall be given, from he who hath not even what he hath shall be taken away" at work. However individual selectionists would scoff at the idea that this represents group selection - though discrete populations of neurons compete and live or die by the results of their success. Individual selectionists would say that since all the neuronal cells involved in this battle carry the same genetic content, the principle at work is the same as that in Hamilton's original (and inaccurate) model of an insect colony. That is, each instance of self-sacrifice represents kin selection in which a suicidal cell commits an altruistic act to benefit copies of its genes within other cells of the macroorganism. If this sounds a bit like the hair-splitting of the medieval scholastics, it is. However too often scientists become so obsessed with squabbling over the knothole in one pine tree that they utterly fail to register the existence of the forest of which that tree is a part. In fact, they may even claim that the tree itself does not exist.
Do you think that group selection is also behind recent social developments and now again visible with the destruction of the social welfare state coming along with the globalization?
Howard Bloom: Yes, very much so. The proliferation of and competition between subcultures is one form of group selection which powers the machinations of the collective brain. I will demonstrate how in my next book, The Irrational Invention Machine. In addition, social critics like America's John Naisbett (Megatrends) and several major historians have claimed convincingly that one social current leads to the birth of its opposite. Hegel would have approved. Today's globalization is spawning an opposite but equal reaction - tribalization, the fragmentation of society into increasingly self-contained mini-groups. However it is through this manner of differentiation and competition that a complex adaptive system proceeds to invent new modalities for altering its environment. In other words, your supposition, in my view, is accurate. What economists call constructive destruction is integral to the operation of the group brain.
Group selection and a self destroying mechanism in individuals seem to be a very cruel procedure in an ethical context and it reminds at the concept of social darwinism. What status could an ethical approach have in this point of view and which kind of ethics could fit within the context of group selection?
Howard Bloom: Nature, in the words of The Lucifer Principle, is not the benevolent mother that her proponents think. In fact, she is a parent who exults in child abuse. Her viciousness is built into our biology at so many levels that it has become integral not only to our physiology but to each and every human culture. All societies, including the pre-colonial Inuit so often lauded for their peaceful ways, designate groups of people it is permissible to hate. Hatred of outsiders, in fact, has been proven by innumerable scientific studies to be one of the strongest bonds holding a cultural or subcultural group together. Though it has been imposed on us involuntarily, this modus operandi is morally despicable. As a consequence, it is incumbent on you, me, and everyone else with a moral sensibility to do the following: Rebel against nature and her ways. Stop violence wherever you can. If you pass a mugging in the street, end it (I always do...and I am both puny and unathletic). If you see mass murder and fail to try to bring it to a halt, you are an accomplice in its execution. And so am I.
Most importantly, watch out for the dark side of your own idealism and of your moral sense. Both come from our arsenal of natural instincts. And both easily degenerate into an excuse for attacks on others. When our righteous indignation breathes the flames of anger against a "villain," we all too often become a fang in nature's scheme of tooth and claw. No martians or heavenly saviors will arrive to save us from our inborn evil. We must battle the nature outside of us and within us in order to save our selves.

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