The G System Philosopher's Corner

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The G System Philosopher's Corner

0.6.0

Abstract

This book collects the philosophical musings of diverse contributors on the theme of evolution. The way this project is implemented, particularly the actual simulation, will make statements and assumptions about how evolution works. It is important for contributors and interested parties to be able to understand and challenge these. As this project is for both scientific and amusement purposes, this book is also an end in itself.

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Scientific Religion

Mr. Raphael Langerhorst

0.6.0

Abstract

Many people will be surprised about such a title, scientific religion, and explain that religion is a lot, but certainly not scientific. While this is true at the first glance, there is a deeper meaning within.

Life, as we know it today, has one functional body for collecting information or knowledge about life which is accepted by most people: science. The reason why it is broadly accepted is because, in general, scientists build up a knowlegdebase based on *proven observation*. This means that the knowledge they collect can be considered logical, which in turn is what makes people believe in them.

On the other hand, religion, at least as we know it today, has a knowledge about life that was taught and believed. The knowlegde itself tends to be more of life concerning human beings themselves rather than physical laws of nature, which is the domain of modern science.

The human nature needs something it can hold on or believe in, always. In former times religion had the knowledge or wisdom that was suitable for most people. They were tought something they could believe in, without questioning it. The reason why many people make science their new religion now is simply because people nowadays tend to question what they believe in. They want to understand, rather than just believe.

Science, nowadays what many people trust and believe in, has tremendous success in finding and defining physical laws of nature. But it ultimately fails to give human beings like you and me guidance in metaphysical domains, including ethics, life itself, evolution of life, social wisdom or even guidance on how to live a fulfilling life. This is what humans are confronted with in daily life just as much as with physical laws. Many of these things are covered by religion, but since religion fails to provide a solid base to believe in for many people nowadays, these people struggle with everyday life without a clear guidance.

The G System tries, as one of its goals, to provide a framework to allow science to embark on a journey boyond physical laws to the very essence of life. To allow such a journey it is crucial to understand how this can be accomplished.

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Chapter 1. Beyond Science

There are two ways of comprehending an object of interest. One, which is always used by science, is to observe it with sensors of some kind from without. This leads to understanding about the object's size, weight, and so on.

A different approach is to understand an object from within, also called intuition. This approach is less known and in many cases much less developed than an *intellectual* approach to comprehension. The principle of intuition, thoroughly understood, implies the principle of unity of life. Which, to make it brief, just states that all living beings are related to each other and together form one unit of life.

If we think about it the unity of life must be true, since otherwise it would not be possible for us to relate to each other in any way.

Intuition has many aspects, altough they all are the same in the end: unity The one aspect that results from this and that is of interest to this project is inherent understanding, which comes from within. Such intuitively grasped knowledge is irresistible, it simply is. This is also the difference to scientifically learned knowledge. In science you usually learn something and with intuition you just know.

The G System combines these concepts, the scientific and the intuitional, for the purpose of learning about life as a whole.

A crash course in evolution according to Raphael

Mr. Raphael Langerhorst

0.6.0

Abstract

Life, as a whole, constantly evolves. There is nothing separate in the universe − everything is included in it, thus, there is only one life.

Forms are used to represent or express life. Only by forms life seems to be separated. Thus all expressions of life are ultimately connected and are included in the universal life.

By separating this universal life into many expressions or representations, evolution is made possible. Life is still one grand whole, but expressed in many forms, which allows these separations to become conscious entities or beings.

When these separated expressions of life return, now consciously, to their united state, one cycle of evolution is completed and life has grown, enriched by conscious entities that have grown out of unconsciousness.

We will define the term "evolution" as the process that leads from unconsciousness to consciousness.

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Chapter 1. Evolution in depth − a technical perspective

Since there is only one whole life, how does it come that we see so many different forms of life? The question actually answers itself, as it says that we see only different "forms" of life. But then, people may say that they just don't feel "whole" with everything else they see.

To answer this, we need to think about consciousness. Life is made up by beings, some of them conscious like humans, some of them unconscious, like plants and most animals. Seeing the wholeness is a matter of being conscious about it. We, as humans, are at least conscious about the fact that we exist. But this doesn't mean that we are conscious about everything. To demonstrate this simply try to figure out what makes up your consciousness... so it seems that we are not fully conscious, which ultimately leads to the conclusion that we have not yet reached our goal of evolution.

Life itself must, in the end, be whole, otherwise we would not be able to interact with our environment. We can conclude this when we think about interaction with our environment. We wouldn't be able to ever sense our environment if we were not connected to it in some way. Nothing, that is not connected to each other at all, can in any way take note or be aware about each other, think about it. This means, that we are somehow connected to each other, thus being part of the same one thing − life.

Chapter 2. Evolution − The process.

Now we should probably take a closer look at the process of evolution itself.

Before an universe manifests, life is already there − in an unmanifested but united state. There are many conscious and many unconscious beings in this wholeness. But because nothing is manifested there is no "evolution" taking place.

In order for this wholeness to evolve, the universe needs to manifest itself. In this manifested universe of conscious beings also unconscious entities are taken in which can only become conscious in a manifested universe (see above). But not only these yet unconscious entities become conscious but also the already conscious entities become "more" conscious.

As we have seen separation is what allows for consciousness to evolve. Now let's take a look at densitiy of matter. Atoms, for some time thought as the most elementary building block, consist themselves of smaller building blocks − electrons, protons, neutrons. Lately we heard that even this is not the end, there exist plasma, tachyons and whatever scientists call these building blocks. In addition it is shown that matter actually consists solely of energy. Now, what about these building blocks? It shows that the physical matter (the so called "elements") is the densest part of the universe. In this level of density it is possible to definitely separate forms from each other. This separation is what makes the development of individual consciousness possible.

Life (the unconscious entities) takes form in this separated matter. During a long time these beings are being influenced by external things (separated in form) and are thus able to develop self consciousness which leads to individuality.

Now that the unconscious entities have developed consciousness the goal that still has to be reached is consciousness about life as a whole, which is the goal of evolution − as far as we humans are concerned with it anyway. In the next chapter we will look at this part of evolution.

The Role Of Computer Simulation in the Evolution of Language Debate

BA (Hons) essay for Ling 40? − Evolution of Language.

Mr. Anton Melser

0.6.0

Abstract

The Role Of Computer Simulation in the Evolution of Language Debate

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Chapter 1. Introduction

Computers and computer technologies are now ubiquitous in academia and, indeed, in most areas of modern Western life. While some hold reservations about the true contribution made by computers, many, if not most, believe the limitations for us now are not with computers but with our imagination.

Universities and technical institutes have embraced computer technologies with enthusiasm and many faculties now will not accept essays or assignments if they have not been put through a word−processor. Registration, course information and, increasingly, course content are available through the Internet. The internet has a wealth of information and resources (a good deal of the material for this essay was downloaded from the internet) and in reality it is only cost which inhibits universal access. The real revolution for academia, however, lies not in the mere exchange of words and pictures but in the construction and exploration of new and exciting artificial worlds. It is the relevance and contribution of these artificial realities or simulations to the Evolution of Language (henceforth EOL) debate that is the topic of this essay.

In the first part of this essay I take a look at what a computer simulation[1] is and in particular what a simulation of the origins and evolution of a language/communication system is. I ask why we would want to build such simulations and look at what modelling opens up to us. Some recent work is reviewed. The essay then moves on to look at tendencies in the field and shifts that appear to be taking place.

In the final section I take a look at some of the theoretical and practical problems that surround simulation work in EOL studies and look at how the work fits in to the overall research enterprise.

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[1] In this essay I use the terms simulation , computer simulation , computational model and computer model interchangeably. This is not unproblematic, but simplifies things greatly and is not overly detrimental to the points made.

Chapter 2. Simulation and Complex Systems

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What is a computational model?

Roughly speaking a computational model can be described as a numeric approximation of a situation or system instantiated in some form on a computational device. In practise this approximation will usually be a simplification incorporating the salient features of some real world physical or social situation upon which various functions or mappings are performed. These functions represent other phenomena or processes which are known to take place in the real world. These mappings are run on computers and, hopefully, we end up knowing something about how the real world phenomena interact − something more than we would have been able to find out with pen and paper. It is important to note that everything is represented (as all things on modern computers are) necessarily as a finite bit string, a point I will return to briefly (see Flake, 2001 and references therein for more on computation).

What can computer models offer EOL research?

The attraction of computer modelling is obvious. More and more cheaply, models can be built to simulate just about anything, from the physics of elementary particles to the art of music composition, from nuclear chemistry to the functioning of national economies, from evolution to the world of Shakespeare.

Simulations are lightning quick in comparison to many physical, biological and social experimentation methods. A complicated simulation might take as little as a few minutes on today's machines. Simulations never suffer from dirty test tubes or interviewer bias and can be performed at any time of the day or night, rain or shine.

Another hugely attractive aspect for ecologists, nuclear researchers and social scientists alike is the freedom to run experiments unthinkable in the real world. A meteorologist can't test the effects on the upper atmosphere of letting off 100−megaton nuclear bombs, and a cognitive scientist can't deprive a child of all human contact to test hypotheses of intellectual development − all of this and more, however, is but an "Enter" away in the artificial realities of the computer.

The key question I look at in this essay is − given there is a world of promise, what has been delivered to EOL researchers?

The EOL discussion is a perfect candidate for simulation experiments and for well over a decade now research in the development of communication systems, or various aspects of them, has flourished (see below for references). Because language developed in the distant past (all agree more than 60,000 years ago) there is no way to directly gather evidence, at least for its development in our own species. Now also (at least in the West) all experiments with human beings need to go through an often lengthy approval process with ethics committees, and issues of privacy and representative sampling (i.e., the first−year psychology student problem) often detract from results. However, language (it is thought by most) is unique to Homo Sapiens and so experimentation with other species is often dismissed as totally irrelevant (see Wallman, 1992 or Taylor, 1997). On top of this, research with other species can be horrendously expensive and take years to get results from (as with the work of Rumbaugh and Savage−Rumbaugh, see Savage−Rumbaugh and Lewin, 1994). This often makes such research impracticable.

What phenomena have been modelled in the EOL field?

Simulation work in the field can be roughly divided into work on syntax (e.g., Batali, 1994, 1998; Briscoe, 1998; Gmytrasiewicz and Gopal, 2000; Hurford, 2000; Kirby, 1997, 2000; Kirby and Hurford, 2001; Steels, 1997; Tonkes and Wiles, 2002; to name but a fraction), the lexicon (e.g., Kaplan, 1998; Oliphant, 1996; Smith, 2001; Steels, 1998, Van Looveren, 2001; Vogt, 2001; as above) and the less common work on phonology/phonetics (e.g., de Boer, 2000, 2001; Glotin and Laboissiere, 1996; Berrah, 1998 (cited in de Boer, 2000)).

Though it would be impossible to give an accurate account of how each simulation was run, it is possible to review some of the main mechanisms. The basic format of many of the simulations (see Steels, 2000) can be described in the following way:

A group (sometimes as small as two) of agents is put together and engages in controlled interactions or language games. The agents usually have no ability to communicate initially, at least in the phenomenon being modelled and, after a certain number of language games, an ability and/or language develops with which enables the agents communicate. The extent of knowledge and abilities assumed varies (see below for discussion). The structure of the agents varies but they are commonly represented as neural networks (e.g., Batali, 1998; Tonkes and Wiles, 2002) or simply as a collection of numeric weights (de Boer, 2001) or physically instantiated as robots (Steels, Kaplan et al, 2002) with collections of numeric weights.

Steels (2000:1) describes the methodology thus:

> The basic idea is that a community of language users (further called agents) can be viewed as a complex adaptive system which collectively solves the problem of developing a shared communication system. To do so, the community must reach an agreement on a repertoire of forms (a sound system in the case of spoken language), a repertoire of meanings (the conceptualisations of reality), and a repertoire of form−meaning pairs (the lexicon and grammar).

In the above quote Steels mentions the notion of a complex adaptive system. A full analysis of the notion of complex adaptive system is out of the question here and the reader is directed to Flake (2001) or Stonier and Xing (1995) for a more substantial treatment. The following excerpts give us an indication of what a complex adaptive system entails:

> Complex Systems are things that consist of many similar and simple parts. Often the underlying behavior of any of the parts is easily understood, while the behavior of the system as a whole defies explanation. ... By changing the type and form or interactions that exist among the parts of a complex system, the type of global behavior can be varied such that the complex system as a whole can be globally goal−seeking while only local information is passed around by the parts. This means that a collective form of computation can take place without an explicit global algorithm. (Flake, 2001:229)
>
> The analysis of systems with nonlinear interactions among system components dominates many aspects of current research. Such systems with interesting emergent behaviour are referred to as complex systems. Those complex systems with the additional property that their primitive components can change specification, or evolve, over time, are often called complex adaptive systems (CAS).
>
> The basis of adaptation rests on the premise that there is some condition of operation or performance which is better than any other. Moreover, to be called adaptive, self−organising features must exist in the system to enable performance to be optimised. (Stonier and Xing, 1995:Introduction[2])

The basic idea is that groups of "agents" or units are designed to exhibit only very limited behaviours. Out of prolonged interaction a language or language ability develops.

Tendencies − from genes to ants

A lot of work in the late 80's and early 90's looked at the genetic development of groups' of individuals (agents[3]) communicative abilities using genetic[4] algorithms. It is no coincidence that it was around this time that Pinker and Bloom (1990) burst into flower. It is probably also true that at this time it was widely accepted among linguists/cognitive scientists that there existed some sort of language−specific processing machinery in the brain[5], as well as a LAD in more than the abstract sense. This approach was also supported by the belief in humans' unique status as owners of a combinatorially rich and unbounded system of communication. There seemed to be only one mechanism for the development of such a system − evolution by natural selection, and consequently it was to genes and genetic mechanisms where we were to look (and so to model). The models created simulate the development of language specific capabilities in the species. Examples of this type of simulation are Hurford (1989, 1991), Werner and Dyer (1991), Lucas (1994) and Hashimoto and Ikegami (1995).

Since that time, however, and possibly thanks in large part to the work and prestige of the scholar Luc Steels, in the past decade there has been a move away from genetic approaches − away from sexual selection of/for abilities/capacities towards a self−organisation approach. The mid−90's saw a good deal of what could be termed genetic assimilation (Baldwinian evolution) modelling approaches. These incorporated genetic aspects and self−organisation aspects. See Batali (1994), Oliphant (1999), Livingstone and Fyfe (2000), Kirby (1998), Kirby and Hurford (1997), Briscoe (1998).

Recently, though, recourse to genetic explanation of any kind has been explicitly rejected in favour of wholly self−organisational approaches (see Steels, 2000), see de Boer (2000, 2001), Hutchins and Hazlehurst (1995), Hurford (2000), Kirby (2000), Batali (1998), Steels (1998), Vogt (2001) among many others. With the shift away from genetic selection to a more consensus−based mechanism there has been a shift from focus on the individual's (agent's) abilities to a focus on the development of the actual communication system (language) itself. An good example here is the "Glossogenetic" approach of Kirby and Hurford (2001, inter alia). This refocussing follows directly from the fact that the agents "capabilities" don't change over time, only the values of certain parameters. The actual values taken by these parameters are usually arbitrary and can change even after a stable system has been obtained. The agents have very little or no language−specific machinery and there is no change in agent architecture as such. There are a number of issues with this move, some of which are discussed below.

These are certainly only tendencies, however, and contradicting examples could easily be found. For example, Cangelosi (2001) is still heavily genetic in approach, and so on. What does seem significant about this is the theoretical shift implied. Many in the field openly reject the Chomskyan innatist view of language ability (e.g., de Boer, 2000; Steels, 2000). If this trend continues and takes hold among linguists we may see a move back to the more learning−based theories of the pre−Chomskyan era. There is evidently a wish to explain as much as possible in non−genetic terms. Having said this, however, most of the scholars would not in any way attempt to deny the importance of genetic factors. I look at this in more detail below.

Problems

I now turn a critical eye on simulation work to ask the question. How has it helped us in solving the enigma of the origin of language? The first part of the section deals with problems with a totally self−organisational approach and the last part deals with simulation issues in general.

One of the key aspects of self−organising systems is the bottom−up development of structure. One of the prototypical examples of this phenomenon is the formation of near optimal paths to a food source in a species of ant, Linapithema humile (see Bonabeau and Theraulaz, 2000 for a fuller description). Though it is clear that an ant has no concept of optimising the time and energy spent getting to a food source, in spite of this, the optimal path is (often) obtained. The mechanism works in the following way. On returning to the nest from a plentiful food source an ant drops pheromone. Other ants are attracted to this pheromone trail, and so to the food source, but with a very weak trail, the ants will initially take very many different paths back to the nest. The number of ants increases and so does the amount of pheromone between the nest and the food source. The paths that are most direct to travel will, on average, be those ones that are reinforced the most and will, after a time, begin to have significantly more pheromone. Eventually ants will begin to use these paths exclusively. So it appears that an optimal path, sometimes a very long one through even the immensely varied jungle terrain is reached. This sort of result looks almost intelligent, though once we look at the mechanism we see clearly it is not. It is in this way that an increasing number of researchers wish to investigate the origins and evolution of language. In many ways, however, this is very strong claim. If it is an advantage to be a successful communicator (and most take this point for granted, though there are powerful arguments against this position, cf. Power, 2000; Dessalles, 2000) and all that is required for this are a few basic all−purpose learning mechanisms and a modicum of habitual association then how is it that only humans have language? We know even lower primates (e.g., Vervet monkeys, Cheney and Seyfarth, 1990) are capable of maintaining a digital lexicon, and capable of storing and processing intricate tapestries of social information. And what of the chimpanzees of Savage−Rumbaugh, who have shown the capability of acquiring at least a rudimentary form of what we might call a "protolanguage" (in the sense of Bickerton, 1990)? We must ask why this has not developed into full−blown language if the principles of self−organisation obtain in the real world.

The urge to over interpret results should be resisted. If it is a mistake to anthropomorphise the behaviour of the higher primates, who share so much with us in the real world, then it is surely a faux−pas of the worst kind to read anything into rudimentary simulations.

It is here we see a key problem in taking the self−organisation approach. Artificial agents are not even ants, let alone vervets or proto−humans. While this approach appears to have been fruitfully applied in the economic sphere (see Arthur et al., 1997 for examples) the fact that many aspects, such as differential advantage in communicating between the sexes − an aspect some claim to be of vital importance (e.g., Power, 2000) − are utterly ignored. It seems to me that, in essence, what is happening is that the lessons learnt over the past decade or two in the EOL debate are abandoned − for the sake of constructing manageable models with clear−cut results. Though this might bring simulation into the mainstream, it seems an intellectually questionable move.

It was noted above that there is a distinct tendency in current simulation experiments to deny any role within the model to genetic evolution. The rationale behind the move seems innocuous enough − the less we need to explain in terms of physical genetic evolution the better. We obviously have no way of knowing the exact phenotypic/genotypic progression in the hominid line, let alone the sequence of specific selective pressures that were present. Therefore, all structure that can be explained in terms of the interaction between low−level elements decreases the load on genetic explanations and should strengthen our theory. However, to ignore sexual (genetic) selection entirely is to fly in the face of established facts about how biological organisms interact with their environments over time.

It also seems highly unlikely that the physical prerequisites (short−term and long−term memory; vocal apparatus − serial gesture coordination, lowered larynx, etc) could have developed in the precise ways they did without any selective pressure. While it may be conceivable that general purpose mechanisms could be responsible for the development of 5−, 10−, or even, 50−item lexicons, modern humans have lexicons of tens of thousands, sometimes hundreds of thousands of items. The hardware necessary for this sort of processing simply could not have been left lying idle until one day the group suddenly started speaking to each other. By the same token, if we prefer the theory that the necessary hardware was already instated (as in the "sudden−change" theories e.g., Bickerton, 1990) and was simply coopted for speaking then at the very least it needs to be shown that the increased processing load was bearable. This "monster−mutation" theory of Bickerton is losing favour in the EOL debate however, and even Bickerton seems to be tempering his stance (see Bickerton, 2002). At the very least, the assumption of physical prerequisites is not unproblematic.

There are a number of language−specific adaptations, such as our sound−producing capabilities which have no analogue in the higher primate world. Why would humans develop sometimes dangerous adaptations, such as a lowered larynx, if not under pressure to increase the range of sounds in an already−present repertoire? None of these issues are adequately dealt with by the simulationists (though see the work of Daniel Livingstone and Colin Fyfe (e.g., 2000) for an attempt to address physiological issues).

It is not that none of the scholars are trying to address these issues − many are − but too often, it seems, we are told "future models will include" this or that. Luc Steels, for example, has done a good deal of recent work on robots, which he feels are more realistic, as they will introduce physical and temporal constraints not present in completely "soft" simulations. I wholeheartedly agree that this is a positive more, but it forces us to ask whether even the most sophisticated "soft" simulation is lacking in the vital ingredient of physical context/situation. While the robot's world is not the savannah of East Africa, it is considerably more open to the sort of indeterminacies that would have been present for our distant ancestors. Surely, also, this indeterminacy played a role in the development of language. Just as surely, it is lacking from the sterile cyber−worlds.

We might go even further, however, and ask whether this sort of modelling is appropriate for modern, rational, free agents such as humans. Simulationists assume that the essential properties of human rationality, action and agency have been formalised. This point leads into the issue of the computability of real world phenomena. There is an implicit assumption that the relevant aspects of a situation can all be translated into a finite bit string, and that this translation is unbiased and complete. While this is an area of debate in computer science and well out of the scope of this essay, suffice it to say that assuming that continuous, real−world phenomena can be represented by finite binary bit strings is not uncontentious. There is even a school of thought (social constructionism) that would claim that all of these things are by nature incomputable because their interpretation is "up for grabs" (see Shotter, 1993).

Can we really model just one aspect of human communication? (e.g., vowel systems?). Doing this suggests that these areas are either separate/independent from other parts of the system or, alternatively, that we know all of the other relevant factors and can accurately determine how and how much they affect the functioning and development of the whole. As is evidenced in the variety of theories to be found in any of the main texts coming out of the series of Evolution of Language conferences (Hurford et al, 1998, 2000; Wray, 2002), there is certainly no consensus on what the important factors were, nor how they might have interrelated.

MacLennan and Burghardt (1993) make the following comment, which is clearly germane:

> In a simulation, an attempt is made to imitate in a computer or other modeling system the salient aspects of a system that exists, at least potentially, in the real world. The design of a simulation is heavily theory−laden and necessarily highly selective. This is true even for models based on current theoretical and empirical understanding of the phenomena being studied. For out of the multitude of features in the natural situation, only a small fraction can be selected for modeling. This is the Achilles' heel of simulation, for an inappropriate selection vitiates the relevance of the model. This problem is especially critical in ethology, because animals respond so sensitively to their environments that it is often unclear whether a feature is relevant or not. Indeed, whether a simulation and its underlying assumptions is considered useful or valid is often based on how robustly it matches our expectations.

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[2] http://www.csu.edu.au/ci/vol02/intro.html

[3] Like most authors working on simulations, I will be intentionally vague (at least in this part of the essay) in my terminology with individuals , societies or their analogues artificial agents and artificial societies .

[4] see Mitchell (1998), and in particular section 3, for an general introduction to research in this area.

[5] This, of course, goes back to the 19th century with Broca and Wernicke but it is probably fair to say that, until the development of modern neuroscience and psycholinguistics, this was largely speculative.

Chapter 3. Conclusions

Perhaps simulation is not the panacea once hoped for. If we are to build realistic models − and surely we must to attempt to tackle social or cultural questions − then our models will not be simple, and will take considerable time and expense to construct.

At the end of the day, a simulationist can always respond with the claim that, without the sort of groundwork and bank of experience working with low−level, oversimplified models, we will never be able to model more realistic worlds. In the final analysis I would have to agree. Preliminary low−level modelling is necessary. As a linguist and computer scientist, however, I would urge scepticism concerning any results claimed from this early simulation work. It is not clear that the models take enough complexity into account to discover anything we could not have readily predicted from initial conditions. Simulations will develop, though, and it seems only a matter of time before simulation becomes a truly necessary investigative tool. I do believe we will need patience though!

Like much research, however, it seems clear that work on the origins of communication will likely be coopted into the practical world and we may eventually see a forms of computer−computer or even human−computer interaction arising from investigations originated in the EOL debate.

The final message is one of cautious optimism − we stand on the threshold of a new world but it seems that we will need to do a good deal more exploring of this new world before we find any suitable vantage points to look back upon the old.

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Cooperation and Competition and the nature of the Evolution of Language Debate

BA (Hons) essay for Ling 40? − Evolution of Language.

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Abstract

Cooperation and Competition and the nature of the Evolution of Language Debate

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Chapter 1. Introduction

In this essay I look at the conceptions of evolution by natural selection employed in contributions to the 'origins and evolution of language' debate − in particular, in contributions to Section 1 of Knight, Studdert−Kennedy and Hurford (2000) (henceforth KSH2000). The conceptions in question are characteristic of (almost, see below) all of the contributions to all of the collections resulting from the Evolution of Language conferences, i.e., Hurford, Studdert−Kennedy and Knight (1998), KSH2000, and Wray (2002) (see Knight quote below).

From the outset it will be clear that I take a different view of what constitute the "important" aspects of the work of Charles Darwin. However, at no stage am I directly questioning the validity of Darwin's overall thesis. I merely question how Darwinian concepts should be applied in the context of discussions as to the origin and development of language. And clearly, if we are to apply Darwinian concepts in this context we require to have a clear notion of just what those concepts are.

My essay's main task is to question the utility of the notion of competition/selfishness in discussions of the evolution of language. In section 1 I look closely at the KSH2000 contributions and that show all[6] of them adhere roughly what we might call "selfish gene" (Dawkins, 1976) theory applied to behaviour [7] . My discussion assumes a working knowledge of "selfish gene" Darwinism.

In section 2 I look at a wide variety of cooperative phenomena in Nature and review a number of opinions that appear to directly contradict that part of Darwin's theory which relates to the ubiquity of competition in Nature.

Section 3 ponders how we might understand this apparent contradiction and suggests (in the spirit of the later Wittgenstein) that we think of some of Darwin's terms not in their everyday literal sense, but in a larger metaphorical sense.

What I am offering in sections 2 & 3 of the essay is admittedly a biased and incomplete view of the range of interactions we observe in nature. The bias is deliberate for, especially in an essay of this size, it is unnecessary to show that many interactions in nature are "competitive" (at least in the spirit of Kropotkin (1914[8][1902]). What I question is whether we should make grandiose statements about the ubiquity, innateness or necessity of competition.

By showing that cooperation is not an aberrant feature of complex human interaction, but rather a feature of many interactions between different species and within species throughout the natural world, I offer a change of perspective. We can thus no longer make claims as to the "basic" cooperativeness or competitiveness of Nature. They exist side by side as valid interpretations we may make from our observations. A more complex and sophisticated understanding of the Struggle for Existence is readily available. We need not have all our intellectual eggs in the "competition" basket. Certainly, though, the range of sensible topics for discussion in the Evolution of Language debate will shift. It will no longer be adequate to assume our predecessors were selfish or competitive and therefore think of the complex system of cooperative communication as anomalous. Instead of inventing highly unintuitive explanations for why we came to control our imagined "savagery", more productive use of our time might be made inquiring as to how we got from how we were then, to how we are now[9].

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[6] The contribution of Burling (2000) is excepted here as his contribution is not in the same vein as any of others, and consequently, it should be understood that none of the criticism levelled at the other authors has any relevance to his work.

[7] In this essay I use the terms selfish theorist (or similar) and sociobiologist interchangeably. Though this is, of course, problematical, much of the literature I have encountered does this see, for example, Sahlins (1976) or Schwartz (1986).

[8] The only edition of this book I could find has no date of publication, though the University of Canterbury library puts it somewhere in the 1970 s. It appears to be a reprint of the 1914 edition with a foreword by Ashley Montagu and I proceed on the basis that the pagination refers to this edition. It appears in the References as Kropotkin (1914[1902]). 1902 was the year of first publication.

[9] I have refrained from reviewing or commenting on the widely accepted links between traditional and selfish Darwinism and free−market capitalist ideology for I believe it superfluous to our needs. For the interested reader Schwartz (1986) provides a comprehensive and erudite look at the influence of capitalist theory on modern thought, and how the success of this field in describing the modern Western economic world has been borrowed by other disciplines as an explanatory framework. In an essay of larger size I would have included this in section 3, along with the other discussion on metaphor and model.

Chapter 2. Section 1

The contributors to Part 1 of KSH2000 evidently all regard language as a cooperative enterprise (even if only in the sense of both playing or competing or following rules in a game, cf. Dessalles' contribution). This is, apparently, a very interesting and unexpected phenomenon given the way "Darwinian" evolution works. Here are some examples from the works.

> 'Selfish gene' Darwinism differs from earlier versions of evolutionary theory in its focus on one key question: Why cooperate? ...Darwinism in its modern, socially aware [sic] form provides our theoretical point of departure. (Knight, 2000a:19)
>
> The chief problem for a Darwinian account of human speech, however, is the apparent level of altruism involved. The orthodox position in evolutionary biology (Dawkins, 1976) suggests that organisms are best understood as products of their selfish genes: they do not do things for the good of the group or the species, but in order to propagate copies of their own genetic material. Given this perspective, speech (and many other forms of cooperative behaviour) can be difficult to account for. Why do speakers freely exchange valuable information when the theory of natural selection predicts selfishness? In a hypothetical protolinguistic community, what would prevent the rise of a selfish mutant strain that listened but did not speak? Speaking or signalling always costs something in terms of time and energy, and may involve more indirect costs such as exposing the signaller to greater predation risk. Why not reap the benefits of the informative signals of others, without paying the costs of signalling oneself? Or worse, why not use the communication system to lie, misinforming other for one's own benefit? (Noble, 2000: 40−41)
>
> ...Krebs and Dawkins's theory is important and relevant because it forces us to recognise the Darwinian truth that animals, including ourselves, must be expected to be manipulative rather than informative, all things being equal. This fact must be constantly borne in mind in trying to account for the anomalous levels of altruism in speech. (Noble, 2000:42)
>
> Krebs and Dawkins (1984) view signalling as a competitive affair involving mind reading and manipulation[sic]. (Noble, 2000: 42)
>
> Human conversation can be seen as a game in which something is to be won or lost. ...language appears more as a kind of 'sport' than as a way of communicating information. (Dessalles, 2000:62−63)
>
> ...for gossip to function as a means of social bonding, it necessarily coevolved with another independent mechanism for establishing commitments to alliances. Raising the costs, in terms of time and energy, of forming coalitions safeguards against exploitation by 'freeriders' − those who accept benefits of social cooperation without paying the costs? (Power, 2000:81−82)
>
> Cognition is likely to enhance fitness even where social strategies are individualistically competitive; this is not true of communication. Why share valuable information with competitors who may turn out to be direct rivals? Why pass over reliable sensory evidence in favour of information received only second−hand? ...This sets up selection pressures against evolution in the direction of speech. (Knight, 2000b:103)

One thing that is clear from the outset is that a model of evolution by natural selection has been uncritically adopted, and the apparent "anomaly" observed with language is a direct result of adopting this theory. In the following sections I show that there is good reason to reject the theory of evolution adopted as it is manifestly inadequate as an explanatory framework − competition/selfishness is simply not as ubiquitous as the theory requires/predicts. Having adopted this theory it is now up to the authors to provide mechanisms by which the predictions of the theory can be brought into line with observed reality. Humans are very cooperative now, and language is a very cooperative enterprise and must have been from the start. All of the works cited from above will reduce in relevance dramatically if it can be shown that in fact there is no "anomaly" to explain.

Chapter 3. Section 2

In fact, the particular view of evolution adopted by the contributors to Part 1 of KSH2000 (as with most of the participants in the discussion as a whole), is controversial and much criticised. Later I look at some of these criticisms and show that many of the questionable claims arise from reading concepts meant as metaphors literally.

To begin with let us go directly to the source of theorising on evolution and inquire as to what Darwin had to say about cooperation. We might sum up his theory in the following (his) words:

> Owing to this struggle for life, any variation, however slight and from whatever cause proceeding, if it be in any degree profitable to an individual of any species, in nature, will tend to the preservation of that individual, and will generally be inherited by its offspring. The offspring, also, will thus have a better chance of surviving, for, of the many individuals of any species which are periodically born, but a small number can survive. I have called this principle, by which each slight variation, if useful, is preserved, by the term of Natural Selection, in order to mark its relation to man's power of selection. (Darwin, 1988[1859]:46)

Though extensive use is made of the term 'competition' in The Origin of Species from the preceding extract it should be clear that the only arena we can suggest there will be 'competition' is within the "struggle for life", or Darwin's "Struggle for Existence" which we will deal with in Section 2. It is only here where we could possibly interpret some resistance to cooperation.

Having had a brief look at the rudiments of "Darwinism" I would now like to go on the offensive and provide evidence that we should not interpret "Struggle for Existence" as meaning competition, certainly not in its everyday sense of the term. Later, in section 3 we will see why, if we should not think in terms of the everyday sense of competition, that using the term so liberally has lead us to error.

First of all let us look at some evidence that suggests, contrary to lay−notions of the interactions of organisms in the environment, that instead of competition between species it is far more accurate to regard the fundamental principle of Nature as the avoidance of competition. This is known to ecologists as the Exclusion Principle. What it states is that for every niche there will be one, and only one, species. While this may seem a tad vacuous on the surface of things − a species is usually defined using the concept of niche so it is somewhat of a tautology − it does serve to bring into focus the fact that organisms specialise. Quite contrary to Darwin's early claims about similar species competing for the same resources, Nature shows that similar organisms will keep to very defined and delimited ranges and resources in order to avoid competition (Colinvaux, 1980). Colinvaux (1980:130) recounts the following investigation on warblers in eastern Canada and New England, USA:

> Five species, in particular, nest in the spruce forests of Maine and Vermont. The five birds are closely related, and the vegetation in which they breed is without obvious variety, just ranks of spruce trees. The beaks of the birds are all the same size, and alike, suggesting they can eat the same food. Investigations of enormous numbers of stomach contents by forestry people (who were looking for enemies of the spruce budworm) have shown that their food is, indeed, roughly the same. ...How can they occupy different niches? How can there be more than one species of them?

Robert MacArthur earned his doctorate answering these (among other) questions and after considerable observation found that:

> ...it was clear that the warblers worked in substantially different parts of the trees. One species spent nearly all of its time on the pointed spruce tops, another one lower down, a third near the ground, and so on. The spruce budworms, the most abundant food for all the warblers, lived all over the spruce trees, but the warblers hunted in their own special preserves. (ibid)

There is only one interpretation for this situation (Colinvaux gives many other examples of such behaviour in Chapter 13 of the mentioned work) and the prominent ecologist is quite emphatic in his reading:

> Peaceful coexistence, not struggle, is the rule in our Darwinian world. A perfectly fashioned individual of a Darwinian species is programmed for a specialised life to be spent for the most part safe from competition with neighbours of other kinds. Natural selection is harsh to the deviant aggressor who seeks to poach on the niche of another. Peaceful coexistence between species, which results from evolution by natural selection, has to be understood as an important fact in the workings of the great ecosystems around us. (Colinvaux, 1980:131:132)

Given the obvious reverence for Darwin, the absence of the concepts like competition, manipulation or conflict is at first glance surprising. It is well known that Darwin was indeed quite Hobbesian in his terminology, often speaking of wars and struggle, but it is patently obvious that the facts are the facts, and both Darwin and Colinvaux are from the same planet − putting those facts into the understandable form of a model are where the differences lie. Colinvaux puts a quite different spin on what goes on in Nature. On the surface it appears that, at least for different species, Colinvaux directly contradicts Darwin. We should understand how appearances can be somewhat deceiving after Section 3.

Further evidence that conflict is avoided in nature comes from Augros and Stanciu (1992:128).

> With each species in its own niche doing its own task, fights between animals of different species are exceedingly rare, if they occur at all. Lorenz (1963) after many years of studying fish remarks, "Never have I seen fish of two different species attacking each other, even if both are highly aggressive by nature." Colinvaux (1978) puts it succinctly: "A fit animal is not one that fights well, but one that avoids fighting altogether."

Now that we have seen how organisms of similar species avoid competition it seems legitimate to inquire whether they might "cooperate" or "collaborate", giving rise to further doubt the utility of the theory of "Selfishness". Here we must think a little and ask ourselves which organisms are most likely to be advantaged by the help of another species. Will it be similar species? Will they be quite different? After a moment's reflection it is apparent that it is far more likely to find cooperative endeavours among either members of ones own species, or those of a species with quite different morphologies and abilities. It is, after all, obvious that if one needs something done to one, then either a member of ones own species will be most intimately knowledgeable of the exigencies of the situation and will be most helpful or, if the task is beyond them due to size or mobility or other constraint, then a quite different being will be better suited to aid. I will first look at the situation where the beings are quite different.

In spite of what is predicted by what Hobbes called the "war of all against all", indeed we find many examples of such "helping" or "cooperation" between largely different species.

The phenomenon, more often going under the name of "symbiosis" or "mutual interdependence", is in fact very widespread. By changing our point of view we can understand just how deep this goes. I mention a few examples, all sorted and paraphrased from Augros and Stanciu (1992), and then come to some conclusions as to its importance.

Inouye (1984) talks of the relationship between the aspen sunflower of the Rocky Mountains and a species of ant. The ants are provided with a good deal of their nutritional requirements through extrafloral nectar secretions and in turn the ants provide protection from harmful parasites.

A fantastic number of plants require bees, moths, bats or others in order to cross−pollinate and provide a delicious meal of nectar for their trouble. The purpose of most fleshy fruit is in fact to entice large mobile creatures to consume the seed, take it away and fertilise it. In doing this these creatures are provided with their sustenance. In an even more dependent relationship the olive fruit (among many others), requires the digestive action of certain birds (or a chemical process mimicking this) to soften the shell before the seed can germinate.

Phoresis, or using other animals for transport and dispersal, has a very long history and is widespread. It enables "stationary" creatures, like sea anemones, to obtain food by constantly being taken about on mobile creatures, like on the backs of crabs, and crabs are given a degree of camouflage, which helps in avoiding predators. Many insects and worms hitchhike to more promising habitats.

> "Cleaning" behaviour is common on land and sea. "Among the land animals the tickbird cleans the rhinoceros, egrets clean various cattle, and the Egyptian plover enters the mouth of the crocodile to fee on leeches and emerges unharmed. According to marine biologist Conrad Limbaugh (1961), the cleaner−client association "represents one of the primary relationships in the community in the sea." Known cleaners include some forty−two species of fish, six shrimps, and Beebe's crab. Cleaners establish fixed stations that are visited by countless species of fish. The client fish approaches the station and poses, allowing the cleaner to forage within its gills and even enter its mouth without danger. Limbaugh found that the cleaners could prevent the spread of bacterial infections that would normally prove fatal to the client. He concludes, "The extent of cleaning behavior in the ocean emphasizes the role of cooperation in nature as opposed to the tooth−and−claw struggle for existence." (Augros and Stanciu, 1992:129)

The list of examples goes on and on. We haven't even mentioned bacteria in stomachs, mitochondria (see Sagan and Margulis, 1992) or microbes associated with trees! When we consider the bigger picture this leads to the realisation that in fact all animals require all plants − oxygen and carbon dioxide being taken and given respectively. In short, it is impossible to find an organism that doesn't rely for its life on at least one other organism. The earth's entire biosphere forms one big cooperative mass of organisms. This view is often associated with the "Gaia Hypothesis" of biological interconnectedness (Lovelock, 1979).

Having seen how closely some species rely on others we see can now appreciate how Augros and Stanciu (1992:131) can claim "Nature is not a war of one organism against another, but an alliance founded on cooperation."

Yet we are still to drive the point home. It is entirely possible that the "selfish" theorists will acknowledge cooperation (collaboration) in members of different species, it is merely species "exploiting" each other or the like. The key for both Darwin and the neo−Darwinist sociobiologists is not that there will be competition between species but that species internal competition will indeed be dire. Darwin is clear on this point (see below). What we would expect to find then is that members of a species are in constant conflict and competition. Any behaviour that looks as if it doesn't positively harm others (or at least non−kin) is not predicted. We should be clear on this point. If organisms (or even genes) are selfish at base and in competition then the theory predicts that we should find no behaviour or faculties that assist non−kin and we should often find behaviour that directly downgrades or degenerates the fitness (manipulation and deceit fit in here) of other organisms.

This, surprisingly or not, is not what we find in Nature. Examples of assistance of non−kin are legion and only the tip of the iceberg can be treated in an essay of this kind. Here are a few arenas sociobiology must explain using sometimes fantastical (cf. Schwartz, 1986, on sociobiology's claims to "science" status or Sahlins, 1976) means.

Adoption. Adoption is a widespread and common phenomenon given the right circumstances. It is well known that many mammals will adopt the young of other animals: cats, dogs, cows and pigs have been known to adopt rats, pigs, rabbits, cats, and dogs (though not, of course, in all combinations, Burton, 1978:12). Humans have been raised by wolves and apes, among others. Adoption of another mothers progeny (i.e., containers of the enemy's genes, or enemy gene) is known in apes (the famous Kanzi was an adoptee, Savage−Rumbaugh and Lewin, 1994) and cows (Burton, 1978:15) at least, and probably many others, given what is known about midwifery practises (see below).

Adoption is well known in many human societies, including many cultures where infanticide is practised. An horrendous fact to explain for the sociobiologists is a culture where ones own progeny are sometimes killed and the children of ones enemies are taken on as ones own! While sometimes the children are treated as slaves when "adopted" in this fashion, this is certainly not always the case (Schwartz, 1986). Adoption of animals by humans is also a phenomenon we should not forget (useless for all intents and purposes for creatures like cats and certainly for parrots).

Midwifery and post−natal care (from Burton, 1978:chap. 20). The practice of aiding non−kin females in parturition is found in many species of mammal − elephants, rhinoceroses, cows, dolphins, giraffes, mice, rats, marmosets, monkeys among others. As Burton (p177) notes "Looking at the history of our knowledge of the natal and post−natal care among mammals, it seems likely that eventually both will be found to be far more common than is at the moment supposed." The help ranges from protection from predators to resuscitation of young and other immediate needs a mother may not be able to provide (for some reason or other). "Young hippopotamuses within a colony spend much time in the care of one female while their mothers are away feeding" (p181) and penguins are known to leave their offspring in large groups to go and feed and return to collect them later.

Feeding and alarm calls. (Excepting humans for the sake of brevity) many animals show cooperation in feeding. Chimpanzees utter "pant hoots" to others when they find a tree with enough fruit for others (Mitani, 1994). There are a great number of species of mammals and birds that display sentinel behaviour and utter alarm calls. While there may be some evidence, in some species, that alarm calls are preferentially made in the presence of kin (Carroll and Loye,1992), there is little or none that suggests a positive abstention from alarm calling when kin are not present, and, if we are going to be exact, this is what a "selfish" theory predicts. Alarm calling in the sole presence of non−kin is going to be so dis−advantageous as to be impossible in Nature, if all organisms (or genes), at base, desire the destruction of their congeners. Perhaps most startling of all the examples of food sharing or mutual care, however, is that of female vampire bats (Desmodus Rotundus)(see Carroll and Loye, 1992) in tropical American forests. Bats starve to death in as little as three days and about a third of the under−two year old bats and just less than 10% of adult bats fail to feed in any given night. Not feeding on a given night puts a bat in a dangerous state. It was found that bats form bonds (with kin AND non−kin) with others and will regurgitate a meal for unfed bats, usually for another member of this group of "friends". Experiments were carried out and bats were removed from their group. Those who were starved were fed upon rejoining the group and those who were fed were not (Wilkinson, 1984, cited in Carroll and Loye, 1992). Again, this counts strongly against the predictions of the sociobiologists.

Kropotkin (1914[1902]:59) recounts several examples of blind animals being fed by seeing mates (whether kin or not is not mentioned), and Burton (1978:chap. 9) mentions several examples of blind animals being helped in other ways.

On top of all this non−conflictual (helping, cooperative, collaborative, etc.) behaviour we have human cooperation. Unparalleled in its complexity and ubiquity, humans are in many ways best thought of not as individual beings but as integral parts of a group − not having a real existence outside of this group (see the work of Malinowski, for example). What we have seen, however, is that human cooperation/collaboration is not unique. While it may be justifiable to attempt to explain cooperative behaviours in a single species as aberrant, it is somewhat intellectually irresponsible to cling to a theory which needs to make room for so many exceptions.

Chapter 4. Section 3

Let us now return to Darwin and look at little closer at what he meant by "Struggle for Existence". It is here, as we noted above, that notions of competition/conflict enter the discussion. So how could Darwin, a scholar who had spent many years out in the field observing miss so many glaring examples of the "peaceful coexistence" − not only between species but also within them? It would be cruel of fate to have treated him thus. But did he really miss out? The key is to be found in Darwin's own (1988[1859]:47) explanation of his term "Struggle for Existence". (I quote at length to do him justice):

> I should premise that I use the term Struggle for Existence in a large and metaphorical sense, including dependence of one being on another, and including (which is more important) not only the life of the individual, but success in leaving progeny. Two canine animals in a time of dearth, may be truly said to struggle with each other which shall get food and live. But a plant on the edge of a desert is said to struggle for life against the drought, though more properly it should be said to be dependent on the moisture. ...The mistletoe is dependent on the apple and a few other trees, but can only in a farfetched sense be said to struggle with these trees, for if too many of these parasites grow on the same tree, it will languish and die. But several seedling mistletoes, growing close together on the same branch, may more truly be said to struggle with each other. As the mistletoe is disseminated by birds, its existence depends on birds; and it may metaphorically be said to struggle with other fruit−bearing plants, in order to tempt birds to devour and thus disseminate its seeds rather than those of other plants. In these several senses, which pass into each other, I use for convenience sake the general term of Struggle for Existence. (Darwin 1988[1859]:47)

Among the things this passage brings to light, most importantly, we see that he is keenly aware of the fact that some of the terms he uses cannot be understood in the context of the animal world as they are understood in the human world. We see, in particular, that he was aware that we would be stretching the term "Struggle" to try and account for all observable behaviour. Though I am not aware of anywhere where he mentions the metaphorical nature of his use of the term 'competition', were we to take him to task, the above passage suggests he would certainly make it clear that the two senses of competition, human (basically economic) and "natural" are not to be equated. Certainly one of the most famous early attempts to clarify/refine Darwinism is Prince Kropotkin's 1902, Mutual Aid: A Factor of Evolution. Kropotkin devotes a number of pages to illustrate just how we should take Darwin's notion of "Struggle". Characteristic of the intellectual giant he was, Kropotkin makes the piercing observation:

> ...no naturalist will doubt that the idea of a struggle for life carried on through organic nature is the greatest generalization of our century. Life is struggle; and in that struggle the fittest survive. But the answers to the questions, "By which arms is this struggle chiefly carried on?" and "Who are the fittest in the struggle?" will widely differ according to the importance given to the two different aspects of the struggle: the direct one, for food and safety among separate individuals, and the struggle which Darwin described as "metaphorical"− the struggle, very often collective, against adverse circumstances. (Kropotkin, 1914[1902]:60)

From this we can further isolate where competition has its place in Darwin's theory of evolution. Clearly, the notion of competition has little utility in the collective, "metaphorical" struggle against the environment. It is in the struggle for food and safety among separate individuals where we should find it. Kropotkin notes on this count that

> The struggle between individuals of the same species is not illustrated under that heading [i.e., the paragraph entitled "Struggle for life most often severe between individuals and varieties of the same species; often severe between species of the same genus, DAM] by even one single instance: it is taken as granted;... (Kropotkin, 1914[1902]:61)

Kropotkin then moves on to question the reliability of his interpretation of competition of similar varieties, and with the benefit of hindsight, we must certainly concur in our judgement with Kropotkin − a basic principle of ecology, the Exclusion Principle (see above), states that similar varieties/species will impinge to a negligible degree on the niches of others. Kropotkin also picks up on Darwin's (and Wallace's) use of the term "extermination", brought in to explain away the absence of intermediary forms/transitional varieties, which are predicted by the theory. He goes into great depth to show that "It can by no means be understood in its direct sense, but must be taken "in its metaphoric sense"" (Kropotkin, 1914[1902]:64). The overzealous use of the term by Darwin is attributed to his focussing on the uncommon occurrence of the sudden appearance of a new variety of some species in a given area (with no real hope of moving for the current inhabitants) − assuming that no other variables have changed. Far more likely and common will be the situation where more of a "new, better−adapted variety would survive every year, and the intermediate links would die in the course of time, without having been starved out by Malthusian competitors" (Kropotkin, 1914[1902]:66).

This raises an important point that can now be addressed. What do we really mean when we say compete? Struggle? Exterminate? Are these not loaded terms? Can we escape from anthropomorphising, or are we doomed to make do with a language that we must accept as permanently imbued with human constructs? For on one side it is hardly debateable − animals do not exterminate in the same way humans do. What an animal does is eat, sleep and procreate. The animals have no conception of "killing all the competitors", competing or even "struggle". They simply do, and on a very basic level. What this means is that we must very carefully study the metaphors and constructs we use in describing the world around us in order to avoid the errors that we certainly commit by transferring what we can infer in one context to another. This is the gift Wittgenstein gave us that many are yet to fully understand. The case in point here is that of the "selfish gene". Are we to understand genes as being really and truly "selfish"? We might ask: How can a gene possibly be selfish? Can a gene know? Or desire? Or for that matter, how can a gene do anything? I believe what Dawkins has offered us is the chance to regard certain aspects of what we know about genes as if they were the result of rational, selfish thought. Rational, human behaviour certainly can be selfish. Therefore, we will understand in our human way better if we think of genes as if they were rational and selfish. What we must not then do is assume that those things that we associate with human selfishness are "predicted" by our "theory". If we know that a human is selfish we may certainly inquire, when he behaves cooperatively, as to his motives and how he might be manipulating or deceiving his consorts. It is a grave error, however, to enquire as to how a gene will manipulate or deceive when we know that it only appears as if it were "selfish".

Burton (1978:169) puts it succinctly when he says:

> It is easy to understand why people's descriptions of what they see animals do should be personalized or humanized. In the account of the moorhens just given, the scientific description takes more than twice the words necessary for the humanized description. The words chosen are less familiar and so are the concepts involved. Since, for most people, nothing important hinges on the way they recount their observations the easier path is chosen. Unfortunately, as we shall see in dealing with the next subject, this is a slippery slope and allows of comparisons and similes that take us even farther from the truth? [then talks of

> "mercy killings", DAM]

It certainly appears, then, that the contributors have committed the recently mentioned error, and are taking metaphors literally. If humans really were selfish, manipulative and egotistical at base, then we would legitimately be baffled at how cooperative communication developed. We see now, however, that the assumption that they are such is based on an untenable (or at least metaphorical) view of the interaction of organisms in Nature.

Chapter 5. Conclusion

This essay has looked at a range of evidence suggesting that the view of evolution taken by many of the contributors to the Evolution of Language series is biased and confused. That view fails to take into account the ubiquity of cooperation, collaboration and symbiosis present in Nature and claims to be able to explain away what cooperation it does acknowledge as "anomalous". Due to constraints on the size of this essay, I have been able to do little more than scratch the surface as to the extent of cooperative behaviour in Nature. I invite the reader to look up some of the works referenced throughout this work. Nevertheless, I believe my essay contains sufficient evidence to raise serious doubts as to the propriety of taking "selfish gene" Darwinism as our starting point. We must at least be on the defensive against taking metaphors too literally.

Carroll and Loye (1992:137) sum it up best when they say:

> Our interest is in behavioral evolution, and it is a mistake to equate evolution by natural selection with direct behavioral competition or aggression. Animals do contest for resources, chiefly food and mates, which are the most vital links in the chain of reproduction, but they also cooperate towards the same ends.

The sooner we realise that organisms are not best seen as products of their "selfish genes", the sooner we can get on to asking the important questions about how language came about.

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