

# Altenberg 16: An Exposé Of The Evolution Industry

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Article: Suzan Mazur

## THE ALTENBERG 16

**Will the Real Theory of Evolution Please Stand Up?**

By [SUZAN MAZUR](#)

## AN EXPOSÉ OF THE EVOLUTION INDUSTRY

*An E-Book in 6 Parts - Part 1 - Chapters 1, 2 & 3*

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### **FOREWORD**

"Olduvai was first found in 1911 by a German naturalist called Professor Katwinkle. That was when Tanzania was German East Africa – a German colony.

Katwinkle took back some fossils to Berlin. And the Germans sent out an expedition in 1913. But then, of course, the First World War happened so they couldn't come back.

But my husband came out for the first time in 1930. He was here in 1930-31 with the German geologists who worked here. And then, of course, there was a hiatus for a long time.

I came here first in 1936, no 1935. But in those days we had very little money and most we could do was come here for a week or two and work rather hurriedly. And it wasn't until the discovery of the Zinjanthropus. . . Zinjanthropus was in 1959.

We were coming from tents in Nairobi. That was before we had any substantial grants from the National Geographic Society. And we were prospecting, that is I was prospecting. My husband wasn't feeling well.

The site actually is just below this camp here. I saw a bit of bone that looked strange and it was in fact this mastoid skull. And when I brushed some soil away, I found some teeth which showed it was hominid straight away. So I fetched my husband down from the other camp. In those days we camped on the other side of the Gorge.

I was very excited because we'd been looking for it for a long time. And we were very fortunate because Des Bartlett, a professional photographer, was due to come down and photograph the work here.

So we covered it up and waited until he arrived two days later. So we have a film of the whole of the uncovering of the skull, which is very fortunate.

The discovery of the Zinjanthropus skull created a stir. And following that, the National Geographic Society decided to fund the work at Olduvai, which they still do to this day."

*Mary Leakey* , paleoanthropologist and media star

*Conversation with Suzan Mazur, Olduvai Gorge, Tanzania, June 1980*

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## INTRODUCTION

"There has never been a theory of evolution." – Cytogeneticist **Antonio Lima-de-Faria**,  
*Evolution without Selection*

**N**o one knows how life began, but so-called theories of evolution are continually being announced. This book, *The Altenberg 16: Will the Real Theory of Evolution Please Stand Up?* exposes the rivalry in science today surrounding attempts to discover that elusive mechanism of evolution, as rethinking evolution is pushed to the political front burner in hopes that "survival of the fittest" ideology can be replaced with a more humane explanation for our existence and stave off further wars, economic crises and destruction of the Earth.

Evolutionary science is as much about the posturing, salesmanship, stonewalling and bullying that goes on as it is about actual scientific theory. It is a social discourse involving hypotheses of staggering complexity with scientists, recipients of the biggest grants of any intellectuals, assuming the power of politicians while engaged in *Animal House* pie-throwing and name-calling: "ham-fisted", "looney Marxist hangover", "secular creationist", "philosopher" (a scientist who can't get grants anymore), "quack", "crackpot". . .

In short, it's a modern day quest for the holy grail, but with few knights. At a time that calls for scientific vision, scientific inquiry's been hijacked by an industry of greed, with evolution books hyped like snake oil at a carnival.

Perhaps the most egregious display of commercial dishonesty is next year's celebration of Charles Darwin's *Origin of Species* – the so-called theory of evolution by natural selection, *i.e.*, survival of the fittest, that was foisted on us almost 150 years ago.

Scientists agree that natural selection can occur. But the scientific community has known for some time that natural selection has nothing to do with evolution. It also knows that self-

organization is real, that is, matter can form without a genetic recipe – like the snowflake (non-living). It does this without external guidance.

And that the *Hydra* (living), for example, can self-assemble its scattered cells even after being forced through a sieve. Yet, science elites continue to term self-assembly and self-organization "woo woo".

Coinciding with the 2009 Darwinian celebration, MIT will publish a book by 16 biologists and philosophers meeting in Altenberg, Austria at the Konrad Lorenz Institute in July to discuss a reformulation of the theory of evolution. That's the mansion made famous by Konrad Lorenz's imprinting experiments, where Lorenz got his geese to follow him because they sensed he was their mother.

The symposium's title is "Toward an Extended Evolutionary Synthesis?", although the event is expected to be the actual kickoff of an evolution remix.

Some of the Altenberg 16 or A-16, as I like to call them, have hinted that they're trying to steer science in a more honest direction, that is, by addressing non-centrality of the gene. They say that the "Modern Evolutionary Synthesis", also called neo-Darwinism – which cobbled together the budding field of population genetics and paleontology, etc., 70 years ago – also marginalized the inquiry into morphology. And that it is then – in the 1930s and 1940s – that the seeds of corruption were planted and an Evolution industry born.

I broke the story about the Altenberg affair last March with the assistance of Alastair Thompson and the team at *Scoop Media*, the independent news agency based in New Zealand. (Chapter 2, "Altenberg! The Woodstock of Evolution?")

But will the A-16 deliver? Will they help rid us of the natural selection "survival of the fittest" mentality that has plagued civilization for a century and a half, and on which Darwinism and neo-Darwinism are based, now that the cat is out of the bag that selection is politics not science? That selection cannot be measured exactly. That it is not the mechanism of evolution. That it is an abstract rusty tool left over from 19th century British imperial exploits.

Or will the A-16 tip-toe around the issue, appease the Darwin industry and protect foundation grants?

Certain things look promising. First, while most of the A-16 have roots in Darwinian and neo-Darwinian theory, they recognize the need to challenge the prevailing Modern Evolutionary Synthesis because there's too much it doesn't explain.

For example, the Modern Synthesis was produced when genetics was still a baby and we've now discovered all the human genes there are to be found. We've only got 20,000 - 25,000 of them, roughly what other species have, and those genes arrived on the scene a half billion years ago. So there's a push for more investigation into non-genetic areas, for how body plans originated, for instance. Charles Darwin never said.

Second, the Extended Evolutionary Synthesis event is being hosted by Konrad Lorenz Institute, where for years there have been discussions about self-organization.

Third, one of the stars of the symposium, New York Medical College cell biologist Stuart Newman, hypothesizes that all 35 animal phyla self-organized at the time of the Cambrian explosion (a half billion years ago) without a genetic recipe or selection (hardwiring supposedly followed).

Fourth, KLI's chairman, Gerd Mueller has collaborated with Stuart Newman on a book about origin of form. And Newman has other allies within the group, including Yale biologist Gunter Wagner, Budapest biologist and KLI board member Eors Szathmary, as well as KLI's science manager, Werner Callebaut – a Belgian philosopher who will deliver the non-centrality of gene paper.

I published a "first peek" at Stuart Newman's concept (Appendix, "Stuart Newman's High Tea") following his presentation at the University of Notre Dame in March. There has so far been a stonewalling on the science blogs about self-organization. The consensus of the evolution pack seems to be that if an idea doesn't fit in with Darwinism and neo-Darwinism – KEEP IT OUT!

Meanwhile, Swedish cytogeneticist Antonio Lima-de-Faria, author of the book *Evolution without Selection*, sees any continuance of the natural selection concept as "compromise". He says Darwinism and neo-Darwinism deal only with the biological or "terminal" phase of evolution and impede discovery of the real mechanism, which is "primaeval" – based on elementary particles, chemical elements and minerals (Chapter 6, "Knight of the North Star").

Lima-de-Faria's views are considered "extreme" by some science elites 20 years after publication of *Evolution without Selection*, his book about self-assembly – a phenomenon he defines as "the spontaneous aggregation of biological structures involving formation of weak chemical bonds between surfaces with complementary shapes". However, it looks like some other science elites may be warming up to concepts he laid down decades ago as evidenced by comments at June's World Science Festival in New York.

**Steve Benner, pioneer of synthetic biology and founder, Westheimer Institute for Science:**

**"B**ut certainly our view of how life originated on Earth is very much dependent on minerals being involved in the process to control the chemistry. . . . So in that sense, I agree with my distinguished colleague from Lund [Lima-de-Faria]."

**Paul Davies, theoretical physicist and astrobiologist, Director BEYOND Center, Arizona State University:**

**"T**here has to be a pathway from chemistry to biology – powerful levels before Darwinian evolution even kicks in."

Lima-de-Faria notes that when Charles Darwin's *Origin of Species* and Alfred Russel Wallace's essay on natural selection came out, both were criticized. He quotes Darwin quoting a Professor Houghton of Dublin "that everything new in them was false and what was true was old". Lima-de-Faria adds that "time and again, any radically new approach" in science is met with the same response.

The commercial media is both ignorant of and blocks coverage of stories about non-centrality of the gene because its science advertising dollars come from the gene-centered Darwin industry. With declining ad revenue already widespread, and employee layoffs and contract buyouts in the editorial departments of news organizations like *Newsweek*, *Time*, the *Washington Post* as well as the *New York Times* – reporting on an evolution paradigm shift could mean the loss of even more advertising and/or yet another editor's job.

But neither will most science blogs report there's a paradigm shift afoot because they share the same ideology as the corporate media. At the same time, the Darwin industry is also in bed with government, even as political leaders remain clueless about evolutionary biology.

Thus, the public is unaware that its dollars are being squandered on funding of mediocre, middle-brow science or that its children are being intellectually starved as a result of outdated texts and unenlightened teachers.

However, while the A-16 organizers have noted that their July symposium "could turn into a major stepping stone for the entire field of evolutionary biology," this book is not an endorsement of any attempt to "graft" novel ideas onto the Modern Evolutionary Synthesis – only of the decision to begin sorting out the mess. The real task is one of making a theory where none previously existed. That will require casting a wide net for visionaries who have political courage. And it will take some time.

Again, let's not forget that Evolution is an industry where scientists are media stars with books to promote as well as images. The A-16 are no exception.

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### **Chronology**

- Oct. 2007 – Publication of philosopher Jerry Fodor's *London Review of Books* story "Why Pigs Don't Have Wings" on the subject of evolution without adaptation.
- Dec. 2007 – Evolutionary biologist Massimo Pigliucci publishes a story in the journal *Evolution* asking if we need an Extended Evolutionary Synthesis.
- Feb. 2008 – Massimo Pigliucci leaks word of a July 2008 meeting about an evolution remix at Altenberg during a phone conversation and again during an interview in Manhattan.
- Feb. 2008 – The Konrad Lorenz Institute in Altenberg leaks its letter of invitation about the remix event by email.

- March 2008 – Stuart Newman gives an origins of form talk during "high tea" at the University of Notre Dame, introducing his concept of DPMs (dynamical patterning modules) as the pattern language all modern animals used to self-organize without a genetic recipe a half billion years ago.
- March 2008 – Richard Dawkins at Tribeca Barnes & Noble addresses the subject of Altenberg and a reformulation of the theory of evolution.
- April 2008 – Richard Dawkins announces during a Q&A at a New York Ethical Culture talk that he is renouncing Darwinism as religion.
- April 2008 – Stuart Newman and co-author Ramray Bhat publish their theory of form paper in *Physical Biology* making it freely available to the public.
- May 2008 – Rockefeller University Evolution symposium.
- May 2008 – Massimo Pigliucci – The Secular Humanist Society of New York – paradigm shift talk.
- May/June 2008 -- World Science Festival -- New York.
- July 2008 – Konrad Lorenz Institute Altenberg symposium.

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## Evolution Tribes

(partial list)

### Form & Structure

**Ricardo Azevedo** – complexity investigator, U of Houston  
**Lev Belousov** – chair of embryology department, Moscow State U, Russia  
**Ramray Bhat** – self-organizationalist, New York Medical College  
**Mary Jane West-Eberhard** – biologist, U of Costa Rica  
**Gabor Forgacs** – U of Missouri biological physicist  
**Brian Goodwin** – theoretical biologist, Schumacher College, UK  
**Pegio-Yukio Gunji** – theorist, Kobe U, Japan  
**Leendert Van Der Hammen** – structuralist, The Netherlands  
**Kiyohiko Ikeda** – Waseda U, Japan  
**Stuart Kauffman** – complexity pioneer and philosopher, U of Calgary, Canada  
**Dave Lambert** – structuralist, Massey University, New Zealand  
**Antonio Lima-de-Faria** – emeritus professor of molecular cytogenetics, Lund U, Sweden  
**Gerd Mueller (A-16)** – chair of Konrad Lorenz Institute, Altenberg, Austria and chair of theoretical biology department, U of Vienna  
**Stuart Newman (A-16)** – professor of cell biology and anatomy, New York Medical College  
**Stuart Pivar** – self-organizationalist, New York

**Isaac Salazar-Ciudad** – morphological mechanism of evolution  
investigator, U of Helsinki, Finland  
**Giuseppe Sermonti** – professor emeritus of genetics, U of Perugia, Italy  
**Atuhiro Sibatani** – molecular biologist, Japan  
**Vladimir Voeikov** – professor bioorganic chemistry, Moscow State U, Russia  
**Gunter Wagner (A-16)** – Yale U evolutionary biologist  
**Gerry Webster** – structuralist, U of Sussex, UK

### **Biology & Genetics**

**Roger Buick** – astrobiologist, U of Washington  
**Sean Carroll** – biologist, U of Wisconsin-Madison  
**Jerry Coyne** – evolutionary geneticist, U of Chicago  
**Doug Futuyma** – evolutionary biologist, SUNY – Stony Brook  
**Sergey Gavrilets (A-16)** – biomathematician, U of Tennessee  
**Eva Jablonka (A-16)** – geneticist, Tel Aviv U  
**David Jablonski (A-16)** – professor of geophysical science, U of Chicago  
**Marc Kirschner (A-16)** – professor of systems biology, Harvard Medical School  
**Richard Lewontin** – Harvard geneticist  
**Michael Lynch** – evolutionary biologist, U of Indiana  
**F. John Odling-Smee (A-16)** – bioanthropologist, Oxford U  
**Michael Purugganan (A-16)** – evolutionary geneticist, New York U  
**Eors Szathmary (A-16)** – biologist, Eotvos U and Collegium Budapest, Hungary  
**Ulrich Technau** – evolution complexity investigator, U of Vienna  
**David Sloan Wilson (A-16)** – evolutionary biologist, Binghamton U  
**Greg Wray (A-16)** – biologist, Duke U

### **Public Intellectuals & Philosophers**

**John Beatty (A-16)** – philosopher of biology, U of British Columbia  
**Werner Callebaut (A-16)** – scientific manager of KLI, philosopher, Limburg U, Belgium  
**Noam Chomsky** – MIT linguist and activist  
**Richard Dawkins** – professor, public understanding of science, Oxford U  
**Niles Eldredge** – paleontologist, Museum of Natural History  
**Jerry Fodor** – philosopher, Rutgers U  
**Alan Love (A-16)** – philosopher, U of Minnesota  
**Paul Nurse** – president, Rockefeller U  
**Massimo Piattelli-Palmarini** – cognitive scientist, U of Arizona  
**Massimo Pigliucci (A-16)** – philosopher and biologist, Stony Brook  
**Stan Salthe** – natural philosopher, Binghamton U

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## THE ALTENBERG 16

I had a phone conversation with Stony Brook evolutionary biologist Massimo Pigliucci in February 2008. I was developing a piece for one of America's top ten newspapers about the evolution debate, which after many months of serious though informal discussion, got killed. However, by the time the piece was stopped, I had already posted a provocative "rethinking evolution" series with *Scoop Media*, the "fiercely independent news agency" based in New Zealand run by Alastair Thompson, Selwyn Manning and the Wellington team.

Pigliucci mentioned to me that there was to be a meeting of scientists in Vienna in July to discuss the evolution debate. I thought little more about it at the time, since scientists meet regularly to talk about evolution. That is, until I actually met with Pigliucci on February 21 at the Pret A Manger cafeteria across from New York's 42nd Street library where he was doing research.

Massimo Pigliucci is a high-strung Italian-American with three PhDs – in botany, genetics and philosophy. He's 44 years old, with little trace of an Italian accent, having lived in the US for almost 20 years.

Pigliucci was dressed down in a windbreaker and jeans. He's got a wiry body and walks as rapidly as he speaks. There's a hint of red in his brush-like receding hair. Pigliucci was carrying a birthday gift and smiling.

He answered my questions and also gave me a bit of a lecture about self-organization (matter can form without a genetic recipe) based on the bottle of water I was drinking.

"What you're drinking now – water. Now we know that water is made of two atoms of hydrogen and one of oxygen. And yet the physical and chemical properties of water – the temperature at which it's going to freeze, the density that it has at certain temperatures and so on – cannot be derived directly from the knowledge of the physical and chemical properties of hydrogen and oxygen. In other words, water is an emergent property of a specific combination of hydrogen and oxygen.

The emergent properties are due to the fact that these atoms are not just mixed together in a two to one proportion. They're actually connected in molecules that have a particular shape. And it is that shape that is determined by the chemical bonds that in turn determine the physical and chemical properties. Emergence is a big component of self-organization. It's fundamental. It's very important. We don't even understand things like water."

Pigliucci also confirmed that humans have about 25,000 genes, that we're not going to find any more, and that was a principal reason why self-organization was currently an important focus of research.

He told me his investigations into epigenetics – the study of heritable changes in gene expression and function outside genetic variation – suggested there was a whole layer of inheritance on top of the genes which the current Modern Evolutionary Synthesis doesn't account for.

About ten days later, Pigliucci emailed to me the paper he co-authored on "ecological epigenetics". The paper described how environmental change might affect fitness – previously an idea espoused by the controversial 19th century scientist Jean-Baptiste Lamarck.

One reviewer from the Faculty of 1000 Biology, a group that evaluates new papers in the field, commented on the Pigliucci *et al.* paper: "This perspective paper suggests that epigenetics may challenge the assumptions of Modern Evolutionary Synthesis."

Later that day Pigliucci sent a second email:

"I just found out (see below) that the paper I sent you this morning has been nominated by the Faculty of 1000 as one of the most interesting recent papers in biology. Not a bad accomplishment, but more importantly a sure sign that people are beginning to pay attention to these things."

However, in the interim I'd had a phone conversation with esteemed Harvard geneticist Richard Lewontin and I referred to the conversation about epigenetics with Pigliucci. Lewontin had reservations about the vagueness of language.

Quoting Pigliucci, I told Lewontin one argument was that "we're beginning to have mounting empirical evidence to suspect that there's a whole additional layer of inheritance. Not just the genes."

To which Lewontin responded: "Suspect or know?"

Lewontin is not supportive of an "Extended Evolutionary Synthesis", asking, "Why would we want to do that?" In fact, he thinks it's all a race to become the next Charles Darwin. (Chapter 7, "The One and Only Richard Lewontin")

Nevertheless, the Pret A Manger chat with Pigliucci was pleasant, even though Pigliucci was determined to stay on point. He had no interest in the antiquities trial in Rome, for instance, which I'd been following. And he got red-faced when I brought up Stuart Pivar, the independent scientist and old friend of Andy Warhol who has a theory that the bagel-shaped torus – the toroidal surface of the germ plasm – is the origin of all form.

Pivar, knowing that Andy couldn't draw yet became the most famous pop artist of his time, has long been suspicious of credentialed evolutionary scientists with hefty foundation research grants.

Pigliucci again brought up the subject of the Austrian talks at our meeting and suggested I contact organizers in Europe to see if press was being invited. Later realizing something extraordinary might be brewing, I contacted Konrad Lorenz Institute.

I got Werner Callebaut on the phone. Callebaut is a Belgian philosopher and KLI's scientific manager. He was friendly – like his autobiography on the institute's web site – and told me that he knew the paper I was writing the evolution debate piece for. He also said that one or two journalists did attend KLI sessions sometimes.

Callebaut has been involved with KLI workshops for years. He knows the public is interested in such intellectual events and he has coordinated radio shows of these kinds of brainstorming conversations in the past. Callebaut's Altenberg paper is on non-centrality of the gene.

I next received the letter of invitation from KLI that was originally sent to A-16 scientists. It was signed by Massimo Pigliucci and Gerd Mueller and described the talks as "a major event" and "a major stepping stone for the entire field of evolutionary biology".

In March I published my first story about the Altenberg meeting to discuss evolution reformulation. It created a sensation. Because of response to the story, however, Altenberg organizers made the decision to bar both media and public from the event.

But after months of tracking the Altenberg story, I am now familiar with the general content of many of the papers. I've also written stories about maybe Altenberg's most pivotal participant – Stuart Newman – who will present his hypothesis on the origin of form by self-organization (Chapter 5, "The Two Stus", also Appendix), and I've interviewed Ramray Bhat, Newman's co-author. (Appendix, "The Enlightening Ramray Bhat"). I've been in touch with other A-16 by phone and email.

However, the question remains, can Altenberg be a "stepping stone" for the entire field if so many other perspectives are being left out of the discussion?

And while A-16 organizers have said they will be available for comment once the group disperses, by then will an Extended Evolutionary Synthesis already be etched in stone for MIT publication? If so, what chance will the public and the rest of the scientific community have had to comment, since Altenberg is "Private"?

Here then is a peek at what the Altenberg 16 are presenting.

### **Selection and Adaptation Reformed**

**J**ohn Beatty – "chance variation"

John Beatty is a Texan with a PhD in the History and Philosophy of Science. As a philosopher of biology at the University of British Columbia, he's currently investigating the connection between biology and the State, as in the Manhattan Project. Beatty told me this subject will not get covered at Altenberg, however.

Maybe Beatty's equally provocative research into "how evolutionary biology is as much like history as it is like science" will. **(Is there a "chance" Beatty is referring to invention of the term natural selection – "survival of the fittest" – by Darwin *et al.* and it being subsequently forced onto humanity, resulting in war and other devastation?)**

Beatty was originally going to discuss "drift", that is, gene frequencies over generations. He's said it's difficult or impossible to distinguish drift from natural selection.

In a phone conversation a couple of weeks before the Altenberg meeting, Beatty told me he'd been reassigned the topic of chance variation by Massimo Pigliucci. Beatty has co-authored the book *The Empire of Chance: How Probability Changed Science and Everyday Life*.

Here's the Beatty Altenberg abstract:

"A topic of considerable interest and controversy concerns the contingency of evolutionary outcomes. Stephen Gould famously (or infamously) argued that replays of the "tape" of life will lead to widely different outcomes. And since then there have been many attempts to confirm or refute his thesis on the basis of controlled laboratory experiments, "natural experiments," and computer simulations. My concern is not so much to adjudicate the controversy, as to analyze it. I will focus on one of the two senses of "contingency" employed by Gould and others, namely, the unpredictability of evolutionary outcomes. And I will emphasize one particular source of unpredictability, namely random variation, or more specifically still, the historical order, in which random mutations occur. The contingency of evolutionary outcomes has been thought to undermine the "importance" of natural selection. One of the general questions at issue in my paper will be the meaning of claims about the importance of this or that evolutionary agent, and in particular, what is at stake in debates about the relative importance of selection vs. variation."

**Sergey Gavrilets – fitness landscapes (reproductive success visualized in terms of a range of mountains – peaks, valleys, flats – also called "adaptive landscapes")**

I reached Sergey Gavrilets by phone a couple of weeks before the Altenberg symposium. He made a point of telling me in dramatic Russian-English that he didn't like my Altenberg story, neither the tone nor substance, and objected to being compared to a Woodstock rock star. He said Altenberg was all about "normal developments" in biology.

Sergey Gavrilets has a PhD in physics and mathematics from Moscow State University, Russia and is a 2008 Guggenheim Fellow. He specializes in biomathematics at the University of Tennessee.

Gavrilets was originally scheduled to speak about neutralism, relating to species inhabiting the same environment, but not intentionally interacting, as in the tarantula and cactus – or maybe Darwinist and self-organizationalist.

He said he was reassigned the topic of "fitness landscapes" by Massimo Pigliucci. Gavrilets is the author of the book *Fitness Landscapes and the Origin of Species*, in which he presents a "quantitative theory" for the origin of species using "simple math models".

Commenting on Gavrilets' book, Doug Futuyma, the celebrated evolutionary biologist from Stony Brook, wrote the following: "A deep reading of his book will require considerably more mathematical competence than most evolutionary biologists (including this reviewer) have. . . ."

Gavrilets will also be addressing "future" fitness landscapes.

Here's the Gavrilets abstract: "*High-dimensional Fitness Landscapes and the Origins of Biodiversity*":

"The Modern Evolutionary Synthesis of the 1930s and 1940s became possible only after the development of theoretical population genetics by Fisher, Wright, and Haldane who built a series of mathematical models, approaches, and techniques demonstrating how natural selection, mutation, drift, migration, and other evolutionary factors shape genetic and phenotypic characteristics of biological populations.

One of the theoretical constructions that emerged at that time and has since proved extremely useful both in evolutionary biology and well outside of it is that of "fitness landscapes", which are also known as "adaptive landscapes", "adaptive topographies", and "surfaces of selective value". I will describe recent advances in the theory of fitness landscapes that explicitly account for the fact that biologically realistic fitness landscapes have extremely high dimensionality. I will also consider the implications of the theoretical results on the properties of high-dimensional landscapes for understanding the processes of the origin of species.

At the end I will discuss two research areas which are of great interest and importance both for scientists and general public. The first area has to do with the dynamics of adaptive radiation and large-scale evolutionary diversification. The second area concerns the ultimate speciation event - the origin of our own species. The progress in both these areas will likely depend on the success in building adequate mathematical theories."

## **David Sloan Wilson – multilevel selection ("altruism and pro-social behaviors" evolve because they benefit the group, although they may disadvantage individuals in the group)**

Binghamton University evolutionary biologist and Huffington blogger (following response to my Altenberg story carried by *Scoop Media*, Wilson proposed that Huffington create a science section).

David Sloan Wilson is the son of Sloan Wilson, author of the 1955 novel *The Man in the Grey Flannel Suit* about the organization man – later portrayed on screen by Gregory Peck. DS Wilson is the author of *How Darwin's Theory Can Change the Way We Think about Our Lives*.

*Wilson* may be the one A-16 most resistant to a coup d'état re Darwin. (Chapter 3, "Jerry Fodor and Stan Salthe Open the Evo Box").

## **New Views on Genomes and Inheritance**

### **G**reg Wray – gene regulatory networks (switching on and off of genes)

Director, Duke University Institute for Genome Sciences and Policy. Wray is a PhD in biology, and a bodybuilder who enjoys flexing his muscles. We'll see if such "fitness" is successful in winning over reluctant colleagues at Altenberg.

Wray's Altenberg paper looks at altered interactions in gene regulatory networks and evolutionary transformations. He has said: "During embryonic development, a fertilized egg containing a few simple spatial cues is transformed into an intricately patterned, functioning organism consisting of thousands of differentiated cells." Wray is co-founder and associate editor of the journal *Evolution and Development*.

### **M**ichael Purugganan – genomes and post-genomes

Director of New York University's Plant Evolutionary Genetics lab (with funding from the US Defense Department (?), National Science Foundation and Guggenheim Foundation). Purugganan, has a PhD in Botany from the University of Georgia. His web site notes that he likes to dress in Armani, black Armani.

In March he emailed me that he was supplying the Altenberg 16 buttons for the talks at KLI.

The lab at NYU's Washington Square must rock. I ran into Xianfa Xie, a postdoc fellow from Purugganan's lab at the Rockefeller University Evolution event in May. As I approached the stage to have a word with the night's principal speaker, Xie was already grilling him on the subject of epigenetics. The speaker was Jerry Coyne, the University of Chicago geneticist and Richard Dawkins (*Selfish Gene*) pal.

### **E**va Jablonka – epigenetic inheritance (heritable changes in gene expression and function outside genetic variation)

Geneticist, Tel-Aviv University. Eva Jablonka is the one woman presenting a paper at Altenberg. She does not appear to be intimidated by the flexing of muscles. Jablonka has been attacked in print as a "Marxist biologist" for her opposition to the Iraq War and ethnic cleansing and is quoted in *Israel-Academia-Monitor.com* defending her position:

"I am sick and tired of hearing that the critical and concrete decision of the AUT and similar decisions are anti-Semitic. Like many others in Israel who have a rather close connection with the holocaust [Jablonka was born in Poland], I do not need to be preached at about this issue. I

understand very well the sensitivity and paranoia of a people who like me, had families who perished and parents who still suffer the scars of the past, but I am also very worried about the misuses of our tragic history."

Eva Jablonka is the co-author of three books: *Evolution in Four Dimensions*, *Animal Traditions: Behavioral Inheritance in Evolution*, and *Epigenetic Inheritance and Evolution: The Lamarckian Dimension*.

**F**rancis John Odling-Smee – niche inheritance (organisms "inherit genes, and biotically transformed selection pressures in their environment from their ancestors")

Oxford University lecturer in Bioanthropology. Odling-Smee's paper covers ecological inheritance in evolution. He is co-author of the book *Niche Construction: The Neglected Process in Evolution*.

### Understanding the Phenotype

**D**avid Jablonski – dynamics of macroevolution (mass-extinctions "set the stage" for "evolutionary recoveries")

Jablonski is said to be a very lively lecturer. He's a professor of geophysical science at the University of Chicago with a PhD from Yale and he chairs the Committee on Evolutionary Biology. Since the Altenberg meeting is "private", we will have to wait for the DVD sales to hear Jablonski speak about mass-extinctions and macroevolution.

Jablonski *et al.* have established that multicellular animals had five major and a number of minor mass extinctions in a 530 million year span which "set the stage" for "evolutionary recoveries".

**M**assimo Pigliucci – phenotypic plasticity (characteristics of an organism change in response to changes in environment)

Massimo Pigliucci is one of the architects of the Altenberg summit. He has three PhDs – in botany, genetics and philosophy. Pigliucci directs an ecology lab at the State University of New York, Stony Brook and has also been on the rise as a public intellectual.

One Pigliucci associate has referred to Pigliucci's "flamboyance".

Pigliucci's web site *Rationally Speaking* carries the words of the Enlightenment's Marquis de Condorcet describing a public intellectual as one who devotes "him or herself to the tracking

down of prejudices in the hiding places where priests, the schools, the government and all long-established institutions had gathered and protected them".

His wedding earlier this year was featured in the Sunday *New York Times* style pages.

Massimo Pigliucci is scheduled to deliver a paper on phenotypic plasticity. But because Pigliucci also wears the hat of philosopher, it's tough to predict the extent of his influence in the EES MIT book (Chapter 6, "The Two Massimos").

He is the author of *Denying Evolution: Creationism, Scientism and the Nature of Science*, as well as the forthcoming book on science and junk science, *Nonsense on Stilts: How to Tell the Difference Between Science and Bunk*.

I asked Pigliucci whether natural selection was politics or science during his May Secular Humanist Society of New York talk on "Paradigm Shifts and the Objectivity of Science."

He responded: "**Both**".

## **S**tuart Newman – origin of form and body plans

Stuart Newman thinks Darwinism is a dying theory; it begins with life and doesn't address where form comes from. Newman thinks he has a coherent hypothesis for origin of form. His paper will likely be the centerpiece of the Altenberg symposium.

Newman is a perfectionist right down to the last umlaut. He draws his inspiration from the masters of classical art. And he prefers penning commentaries on science and culture from upstate New York to the science wars of Manhattan.

Stuart Newman is Professor of Cell Biology and Anatomy at New York Medical College in Valhalla, where he also directs a lab. He's a KLI Fellow and external faculty member.

Newman's PhD is in chemical physics from the University of Chicago where he did post doctoral studies in theoretical biology, as well as at the School of Biological Sciences, University of Sussex.

His hypothesis is that all 35 animal phyla self organized half a billion years ago at the time of the Cambrian explosion using dynamical patterning modules (DPMs), a pattern language that called up certain physical processes to enable multicellular animals about a millimeter in size to body-build cavities, layers of tissue, segments, extremities, primitive hearts and even eyes.

Newman told me that selection followed as a "stabilizer" of form, although I sensed a reluctance in his voice when he said it – as if it had been thrown in to keep the evolution pack at bay. (Chapter 3, "The Two Stus" and Appendix)



He has collaborated with KLI Chair Gerd Mueller and University of Missouri biological physicist Gabor Forgacs on aspects of his DPM hypothesis. Ramray Bhat is Newman's co-author on the DPM paper.

Newman has also co-authored the textbook *Biological Physics of the Developing Embryo* with Gabor Forgacs, and with Gerd Mueller co-edited *Origination of Organismal Form: Beyond the Gene in Developmental and Evolutionary Biology*, a volume about the origination of body form during Ediacaran and early Cambrian periods.

### **Contributions from Evo-Devo**

#### **Gerd Mueller – innovation (novel trait emerges and becomes fixed in population)**

Chairman, Konrad Lorenz Institute for Evolution and Cognition Research, MD, PhD, Professor of Zoology and Chair, Department of Theoretical Biology at the University of Vienna where he is Director, Mueller Lab.

Mueller is also a referee for the Institute of Advanced Study, the Guggenheim Foundation, MacArthur Foundation and the NSF. With Stuart Newman, Mueller co-edited the book *Origination of Organismal Form* (cited above) as well as "Special Issue: Evolutionary Innovation and Morphological Novelty" in the *Journal of Exp. Zoology* (2005). Newman cites Mueller's collaboration in his DPM paper.

I met one of Gerd Mueller's colleagues at the Rockefeller University Evolution event in early May 2008 – the handsome Ulrich Technau. Technau is a professor in the University of Vienna's Department of Theoretical Biology which Mueller heads.

Ulrich's lab is gene-centered, investigating the Cnidaria organism. Technau told me that Mueller had said nothing about July's Altenberg talks to him.

At the end of May, Gerd Mueller sent the following polite email to me making it clear media was not invited to the symposium:

"Dear Suzan Mazur,

Thanks for your enthusiastic interest in the evolution debate and the workshop Massimo Pigliucci and I are organizing at the KLI this summer. I would like to point out that the KLI workshops, like many specialized meetings in the scientific domain, are based on personal invitation by the organizers. There is nothing secret or closed about this format, many meetings all over the world follow this procedure every day. In contrast with huge congresses, to which many hundreds of scientists flock to give a short lecture, the workshop format, where a handful of experts come together for several days, serves a very different purpose: These are working sessions that are meant to produce new results from the interaction among the participants. For this procedure to be productive, a small number of participants and an undisturbed setting are required. Even if we wanted to, we cannot accept additional attendances, neither by scientists nor by journalists, simply because the KLI is placed in a family mansion, and the room in which the

workshops are held doesn't hold more than maybe 20 people. Given that the scientists working at the Institute at the time of a workshop have a right to listen in to the discussions, the room is already more than full. However, the organizers of the meeting, Massimo Pigliucci and myself, as well as the participants, will be available for interviews after the meeting, when organizers can report about the actual event and its results.

Thanks, again, for your interest in this subject!

Sincerely,

*Gerd Mueller*

Chairman KLI"

**G**unter Wagner – modularity ("Organisms seem to be organized into structural modules or "parts," presumably on account of a connection between parts and the ability to perform functions."–Dan McShea, Duke University)

Gunter Wagner is Alison Richard Professor of Ecology and Evolutionary Biology, Yale University and a 1992 MacArthur Fellow. He's a native of Vienna with a PhD in Zoology from the University of Vienna and with postdoc research at Max-Planck Institute and the University of Gottingen.

Wagner has been at Yale since 1991 where he now directs a lab that "uses mathematical modeling to understand complex adaptations of organisms".

He's written a book called: *Modularity in Development and Evolution*.

Wagner did not respond to my attempts to reach him for an interview for my original Altenberg story. After the story appeared he emailed me as part of an A-16 group message (probably in error) saying, "Hey that is great! This is one button I will keep!" – referring to the Altenberg 16 buttons Michael Purriganan said he was making for the symposium.

**M**arc Kirschner – evolvability (the body has a certain plasticity and can work around "errors")

Professor of systems biology at Harvard Medical School and founding chair of the Department of Systems Biology. PhD University of California – Berkeley.

Marc Kirschner is recipient of the 2003 E.B. Wilson Medal, the American Society of Cell Biology's highest honor and is also a past president of ASCB. He's co-author of *The Plausibility of Life: Resolving Darwin's Dilemma*. And he's served as an adviser to the director of the National Institute of Health.

Kirschner's lab at HMS is investigating the mechanisms of establishing the basic vertebrate body plan and other areas.

Kirschner's Altenberg paper is on evolvability, meaning the body has a certain plasticity, where blood vessels, nerves, ligaments, etc. work around a so-called mutation.

**Swedish cytogeneticist Antonio Lima-de-Faria argues that there are no mutations. Everything is ordered.**

### **Characteristics of Extended Synthesis**

#### **Werner Callebaut – non-centrality of the gene**

Werner Callebaut was the first to brief me on the particulars of the Altenberg meeting. Callebaut is scientific manager of KLI. He has a PhD from the University of Ghent, Belgium and is a professor of philosophy, Limburg University, Belgium. Callebaut is the author of *Taking the Natural Turn, or How Real Philosophy is Done* and was editor of *The Vienna Series in Theoretical Biology* with Gerd Mueller and Gunter Wagner.

Of all the Altenberg bios, Callebaut's is the most charming, with this glimpse into his 1950s primary school years growing up in a village in Flemish Brabant posted on the KLI web site: "Most importantly, the school yard had one wall that was very high, and hence perfectly suited to show my pals who could pee higher."

Callebaut has been involved with the radio streaming of scientific conferences and was supportive of media attending Altenberg.

#### **Eors Szathmary – principles of transition**

A professor of biology at the Department of Plant Taxonomy and Ecology, Eotvos University and Collegium Budapest (Institute for Advanced Study), and a KLI board member. Szathmary co-authored two books with John Maynard Smith: *The Major Transitions in Evolution* and *The Origins of Life*.

Philosopher Stan Salthe sent an email to me saying that "most folks would opt for John Maynard Smith for the accolade" of "most important evolutionary biologist of the passing generation", but that Harvard geneticist Richard Lewontin gets his vote. He thinks "Lewontin outclassed him [Smith] on originality and style." (Chapter 7, "The One and Only Richard Lewontin")

Szathmary served as president of the International Organisation for Systematic and Evolutionary Biology (1996-2002). Some of his "achievements" include: a mathematical description of phases of early evolution; a framework for discussing major transitions in evolution; a scenario for origin of genetic code.

Szathmary established the New Europe School for Theoretical Biology foundation to help Hungarian scientists find educational financing.

## **A**lan Love – The structure of evolutionary theory and biological knowledge

Philosopher, University of Minnesota. PhD from the University of Pittsburgh in History and Philosophy of Science. Love's Altenberg paper is based on a presentation he gave in March 2008 at SUNY, Stony Brook – which was hosted by Massimo Pigliucci. Here is the Love abstract:

"Much of the discussion about the adequacy of contemporary evolutionary theory has focused on its content, such as whether it integrates developmental considerations. A different approach is to explore the form or structure of evolutionary theory, which is in part a philosophical question about the nature of scientific theories. In this paper I adopt the latter route in order to introduce some epistemic materials for a 21st century synthesis. Specifically, I distinguish narrow and broad interpretations of evolutionary theory and argue that a broad interpretation is more appropriate for conceptualizing an expanded evolutionary synthesis (*e.g.* one that includes development). This requires construing the structure of evolutionary theory as multiple problem domains exhibiting complex but coordinating relationships. As a consequence, we can observe a new perspective on the structure of biological knowledge and gain a concrete understanding of how 'nothing makes sense except in the light of evolution'."

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## **2**

### **ALTENBERG! THE WOODSTOCK OF EVOLUTION?**

*March 4, 2008*

*1:49 pm NZ*

**I**t's not Yasgur's Farm, but what happens at the Konrad Lorenz Institute in Altenberg, Austria this July promises to be far more transforming for the world than Woodstock. What it amounts to is a gathering of 16 biologists and philosophers of rock star stature – let's call them "the Altenberg 16" – who recognize that the theory of evolution which most practicing biologists accept and which is taught in classrooms today, is inadequate in explaining our existence. It's pre the discovery of DNA, lacks a theory for body form and does not accomodate "other" new phenomena. So the theory Charles Darwin gave us, which was dusted off and repackaged 70 years ago, seems about to be reborn as the "Extended Evolutionary Synthesis".

Papers are in. MIT will publish the findings in 2009 – the 150th anniversary of Darwin's publication of the *Origin of Species*. And despite the fact that organizers are downplaying the Altenberg meeting as a discussion about whether there should be a new theory, it already appears a done deal. Some kind of shift away from the population genetic-centered view of evolution is afoot.

Indeed, history may one day view today's "Altenberg 16" as 19th century England's X Club of 9 – Thomas Huxley, Herbert Spencer, John Tyndall, et al. – who so shaped the science of their day.

**Here then are the Altenberg 16: John Beatty**, University of British Columbia; **Sergey Gavrilets**, University of Tennessee; **David Sloan Wilson**, Binghamton University; **Greg Wray**, Duke University; **Michael Purugganan**, New York University; **Eva Jablonka**, Tel-Aviv University; **John Odling-Smee**, Oxford University; **David Jablonski**, University of Chicago; **Massimo Pigliucci**, SUNY Stony Brook; **Stuart Newman**, New York Medical College; **Gerd Mueller**, University of Vienna; **Gunter Wagner**, Yale University; **Marc Kirschner**, Harvard University; **Werner Callebaut**, Limburg University; **Eors Szathmary**, Collegium Budapest; **Alan Love**, University of Minnesota.

A central issue in making a new theory of evolution is how large a role natural selection, which has come to mean survival of the fittest, gets to play.

Natural selection was only part of Darwin's *Origin of Species* thinking. Yet through the years most biologists outside of evolutionary biology have mistakenly believed that evolution is natural selection.

A wave of scientists now questions natural selection's relevance, though few will publicly admit it. And with such a fundamental struggle underway, the hurling of slurs such as "looney Marxist hangover", "philosopher" (a scientist who can't get grants anymore), "crackpot", is hardly surprising.

When I asked esteemed Harvard evolutionary geneticist Richard Lewontin in a phone conversation what role natural selection plays in evolution, he said, "Natural selection occurs."

Lewontin thinks it's important to view the living world holistically. He says natural selection is not the only biological force operating on the composition of populations. And whatever the mechanism of passage of information from parent to offspring contributing to your formation, what natural selection addresses is "do you survive?"

In an aside, Lewontin noted natural selection's tie-in to capitalism, saying, "Well, that's where Darwin got the idea from, that's for sure. . . . He read the stock market every day . . . . How do you think he made a living?"

Stanley Salthe, a natural philosopher at Binghamton University with a PhD in zoology – who says he can't get published in the mainstream media with his views – largely agrees with Lewontin. But Salthe goes further. He told me the following:

"Oh sure natural selection's been demonstrated . . . the interesting point, however, is that it has rarely if ever been demonstrated to have anything to do with evolution in the sense of long-term changes in populations. . . . Summing up we can see that the import of the Darwinian theory of evolution is just unexplainable caprice from top to bottom. What evolves is just what happened to happen."

Several months ago, Salthe hosted an intense email debate among leading evolutionary thinkers, which I was later let in on. It followed the appearance of an article by Rutgers University philosopher Jerry Fodor in the *London Review of Books* called "Why Pigs Don't Have Wings".

In the piece, Fodor – who told me he left MIT because he wanted to be closer to opera in New York – essentially argues that biologists increasingly see the central story of Darwin as wrong in a way that can't be repaired.

When I called Fodor to discuss the article, he joked that he was now in the Witness Protection Program because he'd been so besieged following the *LRB* piece. But we met for coffee anyway, on Darwin's birthday, as frothy snowflakes floated to ground around Lincoln Center. After a cappuccino or two, Fodor summed things up saying we've got to build a new theory and "all I'm wanted to argue is that whatever the story turns out to be, it's not going to be the selectionist story".

Fodor also told me that "you can't put this stuff in the press because it's an attack on the theory of natural selection" and besides "99.99% of the population have no idea what the theory of natural selection is".

Fodor noted in the *LRB* article that evolutionary investigators are looking to the "endogenous variables" for answers, which leaves plenty of room for interpretation. On that point there is considerable agreement.

But Richard Lewontin told me he resents evolutionary biology being "invaded by people like Jerry Fodor and others" as well as by some from within the field who don't really know the "mechanical details down to the last".

Evolutionary biologist and philosopher Massimo Pigliucci is also critical of Fodor for not seeing "the big picture". Pigliucci is a principal architect of the Altenberg 16 meeting as well as a participant. That rare combination – a consummate scientist with a sense of humor!

I met him one afternoon across the street from the New York Public Library during a break from his research. He had a birthday gift in one arm. Pigliucci says he enjoys life.

But while he thinks Fodor is "dead wrong" about natural selection becoming irrelevant to the theory of evolution, he does recognize the value philosophers, in general, bring to science. Several of the Altenberg 16 participants are, in fact, philosophers – including, of course, Pigliucci.

Pigliucci says philosophers have two roles to play in science. One is to keep scientists – who are focused on the details – honest by looking from a distance and asking the big questions: "Well, is the paradigm that you're working with, in fact, working? Is it useful? Could it be better?"

The second is as public intellectuals. He thinks some of the best responses he's seen against Intelligent Design and Creationism, for instance, have been by philosophers. Pigliucci's philosophy web site *Rationally Speaking* carries the words of the Enlightenment's Marquis de Condorcet describing a public intellectual as one who devotes "him or herself to the tracking down of prejudices in the hiding places where priests, the schools, the government and all long-established institutions had gathered and protected them".

So what are those other engines of evolution that threaten to decommission natural selection – those "endogenous variables" – of which Jerry Fodor speaks in his now infamous "Why Pigs Don't Have Wings" article?

Pigliucci cites epigenetic inheritance as one of the mechanisms that Darwin knew nothing about. He says there is mounting empirical evidence to "suspect" there's a whole additional layer chemically on top of the genes that is inherited but is not DNA. Darwin, of course, did not even know of the existence of DNA.

Lewontin asks whether it's "Suspect or know?"

Nevertheless, these kinds of phenomena are part of what's loosely being called self-organization, in short a spontaneous organization of systems. Snowflakes, a drop of water, a hurricane are all such spontaneously organized examples. These systems grow more complex in form as a result of a process of attraction and repulsion.

So, coming up with a "sound" theory for form is one of the big challenges for the Altenberg 16.

Developmental biologist Stuart Kauffman is clearly one who thinks we must expand evolutionary theory. Kauffman, now head of the Biocomplexity and Informatics Institute at the University of Calgary, is known for his decades-long investigations into self-organization. He's been described by one evolutionary biologist as a "very creative man, try reading one of his books" who said in the next breath that "if he [Kauffman] really put an effort into understanding evolutionary biology – the basic theoretical framework that we have – I think he could have come a lot further".

Meanwhile, Kauffman's had a breathtaking career, beginning as a medical doctor, honored as a MacArthur Fellow (genius) and has worked with Nobel prize winner Murray Gell-Mann at the Santa Fe Institute where he first studied self-organization. Looking at simple forms like the snowflake, he noted that its "delicate sixfold symmetry tells us that order can arise without the benefit of natural selection". Kauffman says natural selection is about competition for resources and snowflakes are not alive – they don't need it.

But he reminded me in our phone conversation that Darwin doesn't explain how life begins, "Darwin starts with life. He doesn't get you to life."

Thus the scramble at Altenberg for a new theory of evolution.

Kauffman also describes genes as "utterly dead". However, he says there are some genes that turn the rest of the genes and one another on and off. Certain chemical reactions happen. Enzymes are produced, etc. And that while we only have 25,000 to 30,000 genes, there are many combinations of activity.

Here's what he told me over the phone:

"Well there's 25,000 genes, so each could be on or off. So there's  $2 \times 2 \times 2 \times 25,000$  times. Well that's 2 to the 25,000th. Right? Which is something like 10 to the 7,000th. Okay? There's only 10 to the 80th particles in the whole universe. Are you stunned?"

It's getting pretty staggering I told him. But there was more to come as he took me into his rugged landscapes theory – hopping out of one lake into a mountain pass and flowing down a creek into another lake and then wiggling the mountains and changing where the lakes are – all to demonstrate that the cell and the organism are a very complicated set of processes activating and inhibiting one another. "It's really much broader than genes," he said.

Kauffman presents some of this in his new book *Reinventing the Sacred*. And natural selection is back in the equation.

In his book *Investigations* (2000), Kauffman wrote that "self-organization mingles with natural selection in barely understood ways to yield the magnificence of our teeming biosphere". He said he's still there, but now thinks natural selection exists throughout the universe.

Stuart Pivar has been investigating self-organization in living forms but thinks natural selection is irrelevant – and has paid the price for this on the blogosphere. Pivar's an extremely engaging man, trained as a chemist and engineer – a bit of a wizard – who loves old art. He was a long-time friend of Andy Warhol and a buddy of the late paleontologist Steve Gould, who continues to serve as an inspiration for Pivar's work.

Steve Gould's *Natural History* magazine editor Richard Milner, by the way, describes Gould as "a popular articulator of Darwinian evolution to a new generation, while privately, his creative and rebellious mind sought to move beyond it."

Milner, himself, is a Darwinian scholar and author of the *Encyclopedia of Evolution and Darwin's Universe* (forthcoming 2009). He says Gould was intrigued with theories of how natural selection may act on levels beyond the individual (social groups, species), or at different phases of the life cycle (evolution-development), and how other embryological and evolutionary phenomena (heterochrony, neoteny) may influence or impact evolution. And he notes that "Gould took issue with those who used natural selection carelessly as a mantra, as in the evidence-free "just-so stories" concocted out of thin air by mentally lazy adaptationists".



Could also famously rejected the reductionism of Richard Dawkins' "selfish gene" theory, Milner says further, and was well aware that there seemed to be a disconnect between the models of genes, DNA, and the development of individual plants or animals.

Says Milner:

"Steve was one of the first evolutionary biologists, with Richard Lewontin, to publish the view that biology offered no plausible mechanism – a missing "theory of form," if you will – for how these genomic "blueprints" are followed in constructing phenotypes of living organisms."

I visited Stuart Pivar at his place just off New York's Central Park recently. It has the feel of a 19th century castle with interesting stuffed animals, rocks and other exotica, mixed in with important paintings and bronzes. Unlike most scientists I spoke with for this story, Pivar is not dependent on government grants to carry out his work.

Pivar says his theory is this. Body form is derived from the structure in the egg-cell membrane. And he handsomely illustrates in his book, *The Engines of Evolution*, how various species arise from the same basic structure, the Multi-torus, so-named by its discoverers – mathematicians, biologists Jockusch and Dress in 2003.

Pivar told me this structure was confirmed recently by Eric Davidson's identification of the sea urchin embryo as a dynamic torus, resembling a slow-moving elongated smoke ring – as in amoeboid motion.

If there's a lineage to his work, Pivar says it's rooted in Goethe, who observed that all life has a certain look to it – therefore it must be based on a form he called the "urform" – although Goethe never found the urform. Pivar's also been influenced by the 19th century scientist Wilhelm His, who made models using tubes of wax and pressed them to demonstrate how mechanical manipulation could generate the shape of the stomach, etc.

"The great D'Arcy Thompson was an inspiration as well," he said, citing Thompson's book *On Growth and Form* in which he described how every form in nature could be duplicated in the lab. Pivar said it's unfortunate Thompson never put the whole thing together to make a model, but that he has done just that.

He says he's shown that if you take a tubular form and you twist it this way or that way, you can generate the shape of anything in nature. He notes this is equivalent to the organization of chemistry by the periodic table. This twisting action is how tigers get stripes, butterflies wing patterns, as well as how the human embryo forms.

In *Engines*, he has published what he describes as "the blueprints" – the construction blueprints for the human body, fruitfly, lobster, jellyfish – the scheme by which all nature forms.

Stan Salthe says he considers the theory of self-organization itself "up & coming" and thinks Pivar's idea is "reasonable".

Richard Lewontin told me the following:

"I don't know what his [Pivar's] theory is but there's no question that the development of an egg is not dependent solely on the genes and nucleus, but on the structure of the egg as laid down to some extent. There are proteins that are there. There are non-genetic factors and I wouldn't be surprised if the actual structure of the cell membrane had some influence on the successive divisions that occur."

However, Lewontin added that "it's one thing to say *some* effect than it is to say I have a theory that it's *all* there."

Pivar insists "*It's all there.*"

Massimo Pigliucci does not consider Pivar's test with "wiggly water tubes" empirical evidence.

Pivar disagrees saying he presents a convincing model based on geometry and the animated drawings in his book but laments that he can't get serious circles to review *Engines*. He attributes this reluctance to scientists being discouraged about taking a chance on ideas originating outside their peer group plus their dependence on government grants – which are tied in to support for natural selection.

Pivar's also a keen observer of some of the conflicts of interest tainting science. He accuses the National Academy of Sciences of excluding other approaches to evolution but natural selection in their recent book *Science, Education and Creationism*.

Richard Lewontin resigned from NAS over the issue of one branch of NAS accepting government funds for secret weapons programs.

Pivar is also critical of church and State influences in science education, like the *Astrobiology Primer* funded by NASA, whose editor is a priest.

Fodor goes further, he says, "Astrobiology doesn't exist. What are the laws?"

Finally, Pivar thinks non-profits advising schools on science education, like the National Center for Science Education, should not have religions represented on their board of directors. Pivar is obliquely referring to NCSE's board member from the Church of Jesus Christ of Latter Day Saints-funded Brigham Young University.

Curiously, when I called Kevin Padian, president of NCSE's board of directors and a witness at the 2005 *Kitzmiller v. Dover* trial on Intelligent Design, to ask him about the evolution debate among scientists – he said, "On some things there is not a debate." He then hung up.

Massimo Pigliucci finds it objectionable that "the study of forgiveness" is supported by the John Templeton Foundation, which funds the understanding of religion from a Christian view of God. Pigliucci says the rationale of scientists who take this money is that it's hard to get grants,

that they have to put their children through school, etc. "Well, yes – but there has to be a limit," he thinks.

As for educating the public about evolution, paleontologist Niles Eldredge, a co-author with Steve Gould of the punctuated equilibrium theory – which Eldredge reminded me was based on one of his early papers – says that increasingly scientists are being encouraged to include public outreach when asking for government grants.

Eldredge told me about the new journal that he and his son Gregory, a high school teacher in New York, are publishing through *Springer* called: *Outreach and Education in Evolution*. It debuts in March and will feature peer-reviewed articles about evolution.

I also spoke with evolutionary biologist Michael Lynch at his lab at Indiana University to get his perspective on the evolution debate.

Lynch is the author of the recent book *The Origins of Genome Architecture*. He says it's hard enough just to be a molecular biologist or a cell biologist and that reaching out to communicate to other fields is a "daunting task". He doesn't know why there's a push for an Extended Evolutionary Synthesis and says, "Everyone's bantering around these terms complexity, evolvability, robustness, and arguing that we need a new theory to explain these; I don't see it."

Lynch thinks the big challenge is to connect evolution at the genome level with cell development and the larger phenotypic level.

I asked Richard Lewontin whether it was premature to put together a new synthesis. He said he wouldn't use the word "premature" and added, "Why would we want to do that? To say it's premature suggests that one of these days we have to. I don't know what we'll have to do in the future."

He continued:

"The so-called evolutionary synthesis – these are all very vague terms. . . . That's what I tried to say about Steve Gould is that scientists are always looking to find some theory or idea that they can push as something that nobody else ever thought of because that's the way they get their prestige. . . . they have an idea which will overturn our whole view of evolution because otherwise they're just workers in the factory, so to speak. And the factory was designed by Charles Darwin."

Clearly a new theory of evolution will impact all our lives. But how? Perhaps a global public broadcast of the Altenberg 16 proceeding is the answer to that question.

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**THE INVITE – "Altenberg 16" Evolution Summit**

"We are writing to invite you to what we hope will be a major event to be hosted by the Konrad Lorenz Institute of Evolution and Cognition Research, in Altenberg, Austria (<http://www.kli.ac.at/>), on 10-13 July 2008. Our idea is nothing less than getting together a high-level group of biologists and philosophers to have a frank exchange of ideas about what, if anything, might a new Extended Evolutionary Synthesis look like.

As you know because you have been involved in this to some extent, for some time now there have been persistent rumors that the Modern Synthesis (MS) in evolutionary biology is incomplete, and may be about to be completed. Such suggestions have been received with skepticism by a number of biologists, including some of the very originators of the MS.

The challenge seems clear to us: how do we make sense, conceptually, of the astounding advances in biology since the 1940s, when the MS was taking shape? Not only we have witnessed the molecular revolution, from the discovery of the structure of DNA to the genomic era, we are also grappling with the increasing feeling – for example as reflected by an almost comical proliferation of "-omics," that we just don't have the theoretical and analytical tools necessary to make sense of the bewildering diversity and complexity of living organisms.

What is less clear is how much talk of an Extended Evolutionary Synthesis (EES) is actually going to coalesce into an organic conceptual structure capable of significantly augmenting the existing synthesis, while at the same time retaining the many key advances of Darwinism and neo-Darwinism – from population genetics theory to our still evolving understanding of the nature of species, to mention just two. The goal of the proposed symposium is, in fact, to accept the challenge and ask a number of prominent biologists and philosophers (see preliminary list of topics and contributors below) who have worked for an advancement of evolutionary theory exactly (or even approximately) what a meaningful EES would look like.

The central idea for the symposium is to have contributed papers on a range of conceptual issues that have not been addressed by (or at least are not an explicit part of) the MS, with the authors attempting not as much to give the latest technical update, but rather to provide an organic view of in what sense the new ideas can be said to extend the current scope of evolutionary theory. While it is of course impossible to be complete in such a bold survey of a rapidly changing field, we have put together a list of topics we think are crucial to an EES, and we are asking prominent scholars such as yourself to address such topics.

The goals of the workshop are two-fold: first, to bring a highly stimulating group of people together in Vienna to foster an open dialogue about the MS and the EES. Second, to produce a high-impact edited book (published by MIT Press), having the ambitious aim of providing a laboratory for ideas about what the EES might eventually look like. Since the intention is to have the book out for the Darwin anniversary year 2009, a prerequisite for accepting participation will be to agree to have a manuscript ready for the time of the workshop.

Both the workshop and the book are intended as tools for developing ideas, certainly not as finished products, yet, we think this very well could turn into a major stepping stone for the entire field of evolutionary biology.

We hope you will be joining us in Vienna next July. All travel and accomodation expenses will be paid for. If you are interested, please confirm your availability to us as soon as possible so that we may finalize plans for the workshop."

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## 3

### JERRY FODOR AND STAN SALTHER OPEN THE EVO BOX

"It works by selection of traits produced by random variations in the genes. That's essentially Darwin's hypothesis. I think not. . . . There's something wrong with the theory. It goes deep." – **Jerry Fodor**

**R**utger's philosopher Jerry Fodor's *London Review of Books* article "Why Pigs Don't Have Wings" (Oct. 2007) <http://www.lrb.co.uk/v29/n20/fodo01.html> unleashed a serious online debate among evolutionary thinkers. The debate was hosted by philosopher Stan Salthe. I was fascinated and called Fodor to arrange an interview.

We met around Lincoln Center. Fodor loves opera and says his move back to New York from MIT was because of it.

There was a snowfall that day. Fodor and I trudged through it to Pain Quotidien for coffee. I wanted to talk about self-organization and he was bent on establishing that there were internal problems with the natural selection story of evolution. We were talking around the same thing. But a Jerry Fodor argument is something splendid to behold so I listened at fascinating length and taped, clatter and all.

Fodor, said we've got to build a theory, but that in a certain sense – politics aside – it didn't matter who was right because "in 50 years we'll all be dead."

Maybe an argument there.

Fodor set out a way to look at the problem: "Here are the facts. And here are the prior theories. What do we have to change to deal with the data?"

What he did not establish was that the facts and prior theories are politically tainted. Who funded the finding of those facts and theories and promoted them?

Fodor described a couple of the theories on the table. One being Darwin's – that changes of inheritable properties are largely the effect of exogenous variables. There's an effective selection of who the predators are. The other is that there are effects we don't understand of endogenous variables and form.

He told me that if what is causing change is not selection, then maybe it is some laws of organization, but that "*basically I don't think anybody knows how evolution works.*"

And then he said the following:

"The heritable traits, features of biological organisms – complex or simple – change over time. They change as a function sometimes of variables or other god knows what. This would be true of the relation between any generation of the organism and the next generation and preceding generation.

But the question that evolutionary theory is about, as opposed to questions about where did life start or something of that sort, the question of evolutionary theory is about when you get these changes in the inheritable structures of organisms – where do they come from? What are the controlling variables? It's not whether RNA comes before DNA – the basic question is: Are these changing shapes by environmental factors as in selection or are they shaped by some internal factors currently unknown? . . .

I say there's something wrong with the thesis that they're shaped by environmental factors. And so now there are various other alternatives."

As mentioned above, Fodor's story caught the attention of zoologist and natural philosopher Stan Salthe, who's also a visiting scholar at Binghamton University in New York. Salthe says his skepticism about natural selection has made him "poison" in some science circles. But he's demonstrated that he knows how to wage a pretty good frontline battle.

From October 16 - 24, 2007, Salthe ran an email chain on the Fodor "Pigs" story with some of the science elites throwing in their two cents.

I noticed that even a former philosopher-beau of mine had been indirectly dragged into the discussion. He does not have the best argument about evolution, however, so his comments do not follow.

Said **Stan Salthe**:

"**F**olks – There's not much new in this below, but, given Fodor's prominence, and the place of publication, I thought I would pass it on."

**Michael Ruse, philosopher:**

"**I**n my opinion Fodor's piece is grotesquely and immorally irresponsible – he has done no

homework on evolutionary theory – to say that natural selection did not shape the guppy and the fruitfly is ludicrous of course, every creationist in north america is salivating today – even though, they are the people who push adaptation more than even me! think that this one won't be used in the argument over what should be taught in schools?

Today, I am deeply ashamed to be a philosopher"

**Stuart Newman, cell biologist:**

"Fodor's piece seems pretty reasonable to me, in fact, kind of obvious. To say that organisms at any stage of evolution have only a limited array of condition-dependent inherent characteristics, or developmental pathways, and selection can do no more than choose among these, has nothing whatsoever to do with creationism."

**Michael Ruse:**

"You are very naive – it has everything to do with creationism – of course, to deny adaptationism is not to endorse creationism – but to write a piece slagging off natural selection in that way, is to give a piece of candy to the creationists – I am sure that duane gish has already incorporated this into his talks of course natural selection has to work on an array of given things, but this is not to deny selection – especially not through fodor's silly arguments about analogies – and certainly not adaptationism the point of course is that fodor did not simply write a technical piece on adaptation – he wrote a piece flamboyantly denying selection in today's climate, where we have just had two ultra right supreme court justices appointed, I think his behavior is somewhere between stupid and wicked"

**Bob O'Hara, mathematician:**

"Hmm. For me it could do with a bit more substance, explaining what's wrong with Fodor's essay. At the moment it comes across as if you don't like the guy, but not really why we should take your side."

**Guy Hoelzer, organismal and molecular biologist:**

"Hi David [Sloan Wilson] and all, . . .

First, I should say that I found Fodor's article to be an interesting read. . . . It is typical, and appropriate IMHO, that proponents of emerging alternative paradigms shout loudly and exaggerate their claims. How else are they to get the attention of the masses holding fast to conventional wisdom? [That was a rhetorical question. There may be other ways, but loud exaggeration is one natural option.] Convention is very difficult to overturn and I think that science would be well served if the defenders of convention were more tolerant (open-minded) of possible new paradigms. It is a good idea to hold challengers to higher standards, but I don't think we should spitefully relish in putting them down, which is all too easy to accomplish when we are preaching to the choir of convention.

Believe me, I know that you of all people appreciate the importance and difficulty of fighting conventional wisdom, and I am reacting less to your draft than to the set of messages impugning Fodor's article. As weak and potentially flawed as the presented arguments may be, I think the essence of Fodor's article is a call for extending the scientific conversation about evolutionary processes, especially those involved with adaptation, beyond the traditional bounds of Darwinism. The long-term benefit of listening to the challengers, even though some (many?) of them might waste our time, could be worthwhile. Let's not add too much to the distracting noise of fighting with heretics."

**Robert J. Richards, science historian:**

"Dear Will [Provine],

You suggest Fodor is confused by Darwin's two representations of natural selection. But this supposed he actually read the *Origin*, which the evidence is strongly against . . ."

**Elliot Sober, philosopher:**

"Dear David [Sloan Wilson],

I did want to comment on your last comment where you say

[Wilson]: "I end by calling attention to this passage of Fodor's essay, which no one has commented upon yet: "Why is it so hard to be good? Why is it so hard to be happy? One thing, at least, has been pretty widely agreed; we can't expect much help from science. Science is about facts, not norms. It might tell us how we are, but it couldn't tell us what is wrong with how we are. There couldn't be a science of the human condition."

Does anyone other than myself find this passage objectionable? Note that it targets science as a whole, not evolution or adaptationism. Apart from its formulaic rendering of the naturalistic fallacy as a settled issue, it ignores the fact that implementing any value or norm requires knowledge about the facts of the world. This passage tells me that Fodor does indeed deserve the title of "secular creationist." We wouldn't be surprised at this kind of anti-scientism coming from a postmodernist, and we should recognize it for what it is in Fodor."

[Sober]: "Fodor was speaking loosely here but I'm sure he would not deny that "implementing any value or norm requires knowledge about the facts of the world." What he is talking about is that statements about what our values ought to be are not something that science describes. Science can tell you that doing X will get you Y, but it doesn't tell you that you ought to strive to obtain Y. I agree with this. This isn't anti-scientism or postmodernism, but a recognition that the naturalistic fallacy is a fallacy."

**Stan Salthe:**

"As a kind of postmodernist myself, let me say that this statement shows some ignorance of



THAT perspective. The postmodern perspective, insofar as it contacts science, is that the practice of science is a socially constituted discourse, from the production of, e.g., microscopes, to the form of scientific writings (i.e., third person, global present tense) to, at the other end, who sponsors what kind of science and why.

**All of these need inquiry as to how they may be biasing the scientific enterprise.**

. . .[S]imply stated my critique of the concept of natural selection. . .is that it is suspect because it so snugly fits into our culture's obsession with competition (from ping-pong through banking to warfare) that it is an idea that cannot be resisted, heavily freighted with taking it for grantedness. . . . Michael's [Ruse] reaction to the Fodor paper is quite typical of that of neoDarwinians to any challenge to their exaggeration of one aspect of the original Darwinian project (as by Charlie himself!), and to any challenge to their narrow-minded powerful hegemony.

What is occurring now is that outsiders have indeed been drawn into this discourse, by way generally of the complexity/self-organization discourse (from which Piattelli-Palmarini [Fodor's book co-author] comes), as found, e.g., at Santa Fe. David's [Sloan Wilson] view that only experts in biology can deal with this theory is quite at odds with the views of systems science, semiotics and complexity discourse generally. We can ALL look over the logic of this dominant driving idea (competition) of our culture. These ideas have jumped out of biology some time ago, (back) into economics, into psychology, etc. Everyone is now explicitly instead of only implicitly involved. . . . ALL, politics! . . .

The cat is out of the bag! Darwinism is everywhere, and it is the logic of its positions that are under scrutiny by anyone who is trained to think; i.e., by an intellectual. The complexity folks are already deeply involved."

**Stuart Newman:**

"**P**henotypic plasticity is the primitive condition of all biological systems. Thus, even if adaptation can be demonstrated in some modern forms, e.g., the beak size and shape in finches, this is hardly paradigmatic of how macroevolutionary change took place."

**David Sloan Wilson, biologist:**

"**A**nother example of the need to fight for the middle ground concerns the recent atheist attacks on religion by Dennett, Dawkins, Hitchens and others. In this case the problem is not a denial of natural selection but other departures from responsible scholarship to portray religion as bad, bad, bad in every respect. This includes not only poor scholarship with respect to theology, which Jack might appreciate given his comment about creationism, but extremely poor scholarship with respect to scientific understanding of religion, from an evolutionary or any other perspective. It doesn't matter that these authors have distinguished reputations, any more than a creationist with a PhD. They need to be roundly criticized on the basis of their current effort. . . . This is not repression. It is fighting to prevent responsible scholarship and scientific inquiry from becoming a carnival."

**Jack Maze, botanist:**

"My God, I can't believe I just read this! Are we to take this to mean that Fodor must be stopped or that his views, many of which I find interesting, must be prevented from being disseminated? What I read here is an erudite version of the polemics coming from G.W. Bush and I find it offensive in the extreme.

If, on the other hand, the fear is that Fodor will give aid and comfort to the creationists then I would recommend you ignore him and attack the creationists at their weak point, they rely on bad theology. ID, as a God of the gaps argument, leads inevitably to idolatry, and violation of the First Commandment, and the God depicted by Young Earth Creationists is one that is unacceptable to thinking monotheists.

Please do not include me among your friends."

**Guy Hoelzer:**

"David [Sloan Wilson]

. . . It is the assymetry of 'piling on' that I think interferes with progress toward Truth. This is why I try to find and emphasize the thought-provoking aspects of an article like Fodor's. Rigor should be our criterion for evaluating new ideas, including whether they are coherent, but I don't think we need to be so quick to pass judgement that we squash the good ones before they are ready to compete."

**Peter Corning, complexity theorist:**

"So what about Fodor's core point that nonadaptive changes from various sources may also be important causes of evolutionary change. Well, of course. This has been part of the dialogue among evolutionists ever since the publication of D'Arcy Thompson's great treatise *On Growth and Form* (1917). His work was further elaborated by C.H. Waddington and Bernard Rensch in the 1950s, by Eldredge and Go, Ho and Saunders (among others), and, more recently by Stu Kauffman, Stan Salthe and his colleagues, and others of the dynamical systems, structuralists, evo-devo and complexity schools. Yes, causation in evolution is immensely complicated and variegated.

Kauffman has been perhaps the most visible and vocal (and contentious) among the current generation of theorists in proclaiming that much of what we see in the evolutionary process may be characterized as "order for free" – biological organization that arose independently of natural selection. However, Kauffman has since retreated from this salient, and for good reason. . . ."

[\(continuing... Chapters 4 and 5 tomorrow...\)](#)

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**ABOUT THE AUTHOR**



Suzan Mazur's interest in evolution began with a flight from Nairobi into Olduvai Gorge to interview the late paleoanthropologist Mary Leakey. Because of ideological struggles, the Kenyan-Tanzanian border was closed, and Leakey was the only reason authorities in Dar es Salaam agreed to give landing clearance. The meeting followed discovery by Leakey and her team of the 3.6 million-year-old hominid footprints at Laetoli. Suzan Mazur's reports have since appeared in the *Financial Times*, *The Economist*, *Forbes*, *Newsday*, *Philadelphia Inquirer*, *Archaeology*, *Connoisseur*, *Omni* and others, as well as on *PBS*, *CBC* and *MBC*. She has been a guest on *McLaughlin*, *Charlie Rose* and various *Fox Television News* programs.