

## LIFE QUESTIONING ITSELF: BY WAY OF AN INTRODUCTION

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It is surely no coincidence that with the threat of a global ecological catastrophe there has been a resurgence of interest in the question ‘What is life?’ James Lovelock, for instance, who suggests that this catastrophe will leave only two hundred million people alive at the end of the century, has argued that the Earth is different from other planets not only because it has life, but because it is a living being, raising immediately the question what is it to be a living being.<sup>1</sup> He had argued that living beings have moulded the Earth to produce the conditions for life, resulting among other things in an atmosphere consisting of reactive gases that are not at chemical equilibrium. It was on this basis that he held the Earth to be a living entity, a form of life which regulates its chemistry and temperature to suit life. As a form of life it is sick.<sup>2</sup> It has lost its resilience due to human activity and is undergoing a transformation to remove the cause of this sickness: most of humanity. That is, it seems to act with purpose. Lovelock’s claims were immediately contested. The response of mainstream biologists revealed their discomfiture at the questioning of a crucial assumption of mainstream science, that there is no real purpose in nature. As the famous proponent of sociobiology and orthodox science, Richard Dawkins, put it in *The Extended Phenotype*, the global ecosystem cannot be self-regulating because planets do not reproduce.<sup>3</sup> Teleology can only be entertained as shorthand for the forms of growth, organization or activity that have survived in the past because they facilitated survival and have been bequeathed to offspring through the Darwinian process of reproduction, variation and natural selection. As such it is better characterized as ‘teleonomy’ than ‘teleology’ or ‘purpose’, and is only the appearance of purpose. In response, Lovelock showed how a self-regulatory system could develop without being the outcome of natural selection, illustrating this with a model of black and white daisies surviving differentially according to whether the Earth’s temperature is hotter (favouring white daisies, which

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<sup>1</sup> See James Lovelock, *The Revenge of Gaia*, New York: Basic Books, 2006 and J.E. Lovelock, *Gaia*, Oxford: Oxford University Press, 1979.

<sup>2</sup> See James Lovelock, *Gaia: The Practical Science of Planetary Medicine*, London: Allen & Unwin, 1991.

<sup>3</sup> On this and Lovelock’s response to it, see James Lovelock, ‘The Gaia Hypothesis’ in *Gaia in Action: Science of the Living Earth*, Peter Bunyard (ed.) Edinburgh: Floris Books, 1996, pp.15-33.

would then reflect more heat) or colder (favoring black daisies, which would then absorb more heat). Lovelock, along with Lynn Margulis, continued this argument by suggesting that the Earth as a living entity has evolved through the development of increasingly complex forms of symbiosis and through ecosystems, including the global ecosystem, eliminating those organisms that foul their own nests.<sup>4</sup> Identifying such mechanisms provides support for Lovelock's claim that the Earth can be a self-regulating system maintaining the conditions for life without this having been the result of the Darwinian mechanism of reproduction, variation and selection. However, it is clear from the debate between Lovelock and his opponents that deeper issues are involved. The argument reveals fundamental differences over what is science, what is an explanation, and more fundamentally, what is life, what is its significance, what is the place of humanity in the evolution of life, and how should we live our lives.

While Lovelock's work is not at the centre of debates on the question of what is life, his work does show how consideration of our ecological predicament raises this question, and shows that our entire conception of who we are and what is our place and role in the cosmos hinges on this question. Further evidence for this comes from the work of a leading US biologist, Edward O. Wilson. Along with Dawkins, Wilson had been a major figure in the development and promulgation of sociobiology which, in its dominant form, was the pinnacle of the synthetic theory of evolution. It sought to explain living organisms as nothing but machines for reproducing genes, conceived of as strings of DNA. That is, it effectively sought to explain life by explaining it away. The development and promulgation of sociobiology was important in the advance of neo-liberalism and neo-conservatism and for undermining the quest for social justice, and it was attacked by radical biologists, such as Richard Levins and Richard Lewontin, for this reason.<sup>5</sup> Later, Wilson became increasingly concerned about the destruction of species and attempted to rally people to defend the diversity of life, although this concern made no sense from his previous reductionist perspective. Subsequently, Wilson revised his ideas and set out to promote 'consilience', the unity of knowledge. While he still attempted to uphold central assumptions of mainstream science that there is a simple order accessible through the 'scientific method' underlying the diversity of appearances in nature, he moved away from his earlier reductionism, offering some support for Stuart Kauffman's efforts to develop a notion of life as self-organising, grappling with the question of mind and its relation to the body and arguing that that genes and culture co-evolve in the evolution of humanity.<sup>6</sup>

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<sup>4</sup> See James Lovelock, 'Gaia: A Model for Planetary and Cellular Dynamics', *Gaia: A Way of Knowing*, William Irwin Thompson (ed.), Great Barrington MA: Lindisfarne Press, 1996, pp.83-87, and Lynn Margulis, Ricardo Guerrero and Peter Bunyard, 'We are all Symbionts', in *Gaia in Action*, Peter Bunyard (ed.), Ch.12.

<sup>5</sup> See R.C. Lewontin, Steven Rose, and Leon J. Kamin, *Not in our Genes: Biology, Ideology, and Human Nature*, New York: Pantheon Books, 1984 and Richard Levins and Richard Lewontin, *The Dialectical Biologist*, Cambridge: Harvard University Press, 1985. For further developments of this argument, see also Richard Lewontin and Richard Levins, *Biology Under the Influence*, New York: Monthly Review Press, 2007.

<sup>6</sup> See Edward O. Wilson, *Consilience: The Unity of Knowledge*, New York: Alfred A. Knopf, 1998.

Thus the global ecological crisis has provided an intellectual environment conducive to deep questioning of our culture facilitating a revival of interest in the question ‘What is life?’ This has been associated with a revival of interest in the philosophers, scientists and artists who in the past grappled with this question and with a much more critical attitude towards tendencies within culture that have suppressed such questioning. The role of mathematics in science, the role of models, the nature of explanation, assumptions about what is objectivity and what is subjectivity have all been brought into question, and all this questioning is brought into focus by the question ‘What is life?’ In fact, this question has implications for virtually every facet of culture, from how we understand science and its relation to the arts, the humanities and metaphysics and the way we understand the place of humanity in the cosmos, to the goals we set humanity. It forces those who consider this question to appreciate that they themselves are living beings and part of life; that they are participating in the process by which life, at a crucial stage in its evolution, is reflecting upon and questioning itself.

The papers in to this special edition of *Cosmos & History*, contributed by eminent thinkers from a diversity of disciplines and schools of thought, reflect the vitality of inquiry in this area. They give some indication of the profundity of the question and of its significance for humanity, and for the future of life. They also give some indication of the difficulties in addressing this question. Any ‘utterance’, whether spoken or written, presupposes assumptions by the producer of the utterance, including assumptions about what is assumed by the ‘receivers’ of the utterance. This becomes problematic when those making the utterances are based in different disciplines, different schools of thought, different metaphysical traditions, different countries and different continents. The ordering of these papers is designed to highlight the crucial issues at stake, to show the interconnections between the issues raised by these papers and their practical significance, so as to stimulate further reflection on this topic. To appreciate differences in assumptions, however, it is first necessary to say something about both the contributors and their contributions.

The first paper ‘Subjectivity and Objectivity: A Matter of Life and Death’ comes from Gertrudis Van de Vijver and Joris Van Poucke of the Centre for Critical Philosophy, Ghent University. They argue that the question ‘What is life?’ arises as a symptom of the objectivistic/subjectivistic frame of thought which insists on being interpreted. The paper criticizes the prevailing tendency to address this question from an objectivist angle and invokes a Kantian transcendental approach, but criticizes past efforts in this direction for failing to transcend the objectivism/subjectivism opposition. The argument is presented through an examination of Robert Rosen’s critical reading of Erwin Schrödinger’s book, *What is Life?*, supporting thereby Rosen’s argument that it is necessary to develop a new epistemology and a new metaphysics.<sup>7</sup> This paper continues Van de Vijver’s work on the philosophy of biology, with a particular concern to give a place to final causes along with

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<sup>7</sup> See Robert Rosen, *Life Itself: A Comprehensive Inquiry into the Nature, Origin, and Fabrication of Life*, New York: Columbia University Press, 1991.

other causes in the science of complex dynamical systems, integrating not only developments in complexity theory but hierarchy theory and biosemiotics, while reviving and reformulating transcendental philosophy.<sup>8</sup>

This paper, along with the paper by Marcello Barbieri, are placed first because in my view these two papers taken together spell out most clearly and straightforwardly the significance and the problematic nature of this question (although to gain a full picture of the complexity of this question these two papers should be read in conjunction with the last paper by Murray Code). While most of the contributors in some way struggle to transcend the opposition between the objectivist and the subjectivist perspectives, it is possible to identify those who begin to address this question from the subjectivist side and those who begin to address it from an objectivist perspective. These two papers illustrate the opposing starting points. In doing so, Van de Vijver and Van Poucke also gives some indication why increasing attention is being paid to the radical thinking of Rosen, while Barbieri's paper gives some indication why biosemiotics has become such an important area of research. The opposition between these two papers thereby provide a preliminary organizing principle for what follows.

Barbieri begins his paper 'Life is Semiosis' with a careful analysis of the nature and significance of the question 'What is life?', and while defending semiotics, addresses this question from a objectivist perspective. Barbieri is the editor of the new *Journal of Biosemiotics* and has recently published two landmark anthologies on biosemiotics.<sup>9</sup> To appreciate the full significance of the prominent place Barbieri is now playing in the rapidly developing field of biosemiotics it is necessary to appreciate the contrast between the origins of biosemiotics and Barbieri's own work. Biosemiotics as such was founded by Thomas Sebeok and Jesper Hoffmeyer, Claus Emmeche and Kalevi Kull (the Copenhagen-Tartu Nexus) under the influence of Peircian semiotics and Jacob von Uexküll. It was developed as a more radically anti-reductionist form of biology than the organicism of Joseph Needham, C.H. Waddington, Levins, Lewontin and Kauffman. It was, as Claus Emmeche characterized it, a 'qualitative organicism'.<sup>10</sup> This inspired the development of an even more radically qualitative form of biology, biohermeneutics, by S.V. Chebanov in Moscow and Anton Markoš and his colleagues in Prague utilizing the hermeneutic philosophy of Hans Georg Gadamer. Barbieri, President of the Italian Association for Theoretical Biology, and an eminent theoretical biologist apart from his involvement with biosemiotics, is an unapologetic mechanist in the tradition of Descartes, Manfred Eigen, Freeman Dyson and Graham Cairns-Smith. He has claimed that Peircian biosemiotics provides no explanations. However, he is not a reductionist, pointing out that

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<sup>8</sup> Apart from references in this paper to her work, see also Gertrudis Van de Vijver, 'Identification and Psychic Closure: A Dynamic Structuralist Approach to the Psyche' in *Closure: Emergent Organizations and their Dynamics*, Jerry L.R. Chandler and Gertrudis Van de Vijver (eds), Annals of the New York Academy of Sciences, Vol. 901, New York: The New York Academy of Sciences, 2000, pp.1-12.

<sup>9</sup> Marcello Barbieri (ed.) *The Codes of Life*, Dordrecht: Springer, 2007; and Marcello Barbieri (ed.), *Introduction to Biosemiotics: The New Biological Synthesis*, Dordrecht: Springer, 2008.

<sup>10</sup> C. Emmeche, 'Does a Robot have an Umwelt', *Semiotica*, 134(1/4) (2001): 653-693, p.657.

mechanisms have emergent properties, and he argues that mainstream biology has to introduce, along with information and structure, 'meaning' into biology.<sup>11</sup> He has attempted to do this by showing the central role and diversity of 'codes' in living organisms and defining semiosis and meaning through his characterization of codes. The present paper furthers Barbieri's argument, responding at the same time to challenges to it, firstly from mainstream biologists whose assumptions rule out any place for biosemiotics, but also from more qualitative biosemioticians such as Markoš.<sup>12</sup> In doing so Barbieri is not only showing that mainstream biology must recognize the importance of biosemiotics but is working towards a rapprochement with the qualitative organicists by offering a broader notion of semiotics within which their work can be situated. Barbieri begins with codes associated with the manufacture of objects and their organization into functioning structures without any interpretation involved, allowing that complex kinds of semiosis involving interpretation can have evolved from this. In this way, Peircian semiotics, which gives a central place to interpretation, is treated as a special, third kind of semiosis. Challenging those anti-reductionists who dismiss the importance of mechanistic explanations, but marginalized by mainstream science, Barbieri's work provides a challenge to reductionists that is virtually impossible for them to ignore, while providing the foundation for explaining the emergence of Peircian semiosis, including semiosis associated with mind and language.

The difference between these two papers requires some comment. As noted, Van de Vijver and Van Poucke, despite their concern to transcend the objectivist/subjectivist opposition and to overcome the dogmatic subjectivism characteristic of Kant's transcendentalism, take the subjectivist side of this opposition as their reference point, while Barbieri, despite his concern to give a place in biology to 'meaning', takes the objectivist side of this opposition as his reference point. One might hope that there would be a convergence between the two approaches. I think this is the case, but it is not straightforward. Rosen's work which is central to the argument of Van de Vijver and Van Poucke is a sustained attack on reductionist, mechanistic thinking, on the surface of it, totally at odds with Barbieri's defence of mechanistic explanations. However, Barbieri is surely right to discriminate between reductionism and mechanism. As Michael Polanyi pointed out half a century ago, machines can only be understood in relation to the purpose for which they are made and operated, and require at least two levels of explanation to account for their existence.<sup>13</sup> Barbieri's notion of code emerging through the interaction between two different processes could be taken as a development of Polanyi's argument. On the other hand, Rosen is revealing and attempting to overcome deeper reductionist

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<sup>11</sup> M. Barbieri, *The Organic Codes. An Introduction to Semantic Biology*, Cambridge: Cambridge University Press, 2003, p.ix.

<sup>12</sup> Anton Markoš et.al. 'An Epigenetic Machine: Review of Barbieri's *The Organic Codes: An Introduction to Semantic Biology*', *Sign Systems Studies*, 31(2) (2003): 605-616.

<sup>13</sup> See Michael Polanyi, *Personal Knowledge*, Chicago: University of Chicago Press, 1958, p.359ff, and Michael Polanyi, 'Life's Irreducible Structure' in *Knowing and Being*, Marjorie Greene (ed.), Chicago: University of Chicago Press, 1969, Ch.14.

assumptions built into the mathematical models of mainstream science, which, he argues, has created a surrogate world blind to life itself. Although the language is similar, Barbieri and Rosen are really talking about different things. Rosen does give a place to mechanistic explanations, but following Nicolas Rashevsky, goes on to argue that it is also necessary to understand 'life itself' to comprehend the teleology of these mechanisms, and this is more than the sum of all these mechanisms. However, Rosen was thinking of mathematical models of mechanisms, and this is somewhat different from what Barbieri understands mechanistic explanations to be. If Rosen had addressed the issue of semiosis more generally through the new epistemology and metaphysics he was developing (rather confining himself to the study of models) he might have bridged the gap between Gertrudis Van de Vijver and Joris Van Poucke on the one hand and Barbieri on the other. At the same time this might have furthered the efforts of biosemioticians to bridge the gap between Pattee's physical explanation for the possibility of signs, Barbieri's work on codes independent of interpretation, the Peircian biosemiotics of Hoffmeyer, Emmeche and Kull, and the work of the biohermeneuticists. However, despite his early collaboration with Howard Pattee, who has been working since 1965 to provide a physical explanation for the possibility of semiosis,<sup>14</sup> Rosen in his later work left his successors with the task of integrating a fully developed theory of semiosis into his theoretical scheme.

The next paper by Arran Gare, 'Approaches to the Question "What is Life?": Reconciling Theoretical Biology with Philosophical Biology' also grapples with the objectivist/subjectivist opposition. The approach adopted here is firstly, historical, examining efforts to overcome this opposition, first from the subjectivist standpoint, beginning with Hans Jonas, Edmund Husserl, von Uexküll and Maurice Merleau-Ponty and ending with Markoš, and then from the objectivist standpoint, beginning with Max Delbrück, Niels Bohr and Schrödinger and ending with Rosen. As with Van de Vijver and Van Poucke, much of this paper is devoted to explicating and evaluating the work of Rosen, although with a different intent. Rosen's analysis of the limitations of mainstream science and efforts to overcome these limitations through a radical rethinking of mathematics are examined and evaluated. It is argued that the limited success in overcoming the failures identified justifies a return to the philosophy of Friedrich Schelling who, it is suggested, began the modern tradition of process metaphysics as well as being an influence on both semiotics and hermeneutics. Schelling, it is claimed, saw as clearly as anyone the need to overcome the subject/object opposition and his philosophy of nature, privileging process (or 'productivity/product'), was an effort to find a starting point for understanding the world more primordial than subjects and objects from which these could be seen to have co-emerged. From the perspective offered by this process

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<sup>14</sup> See Howard Pattee, 'Irreducible and Complementary Semiotic Forms', *Semiotica*, 134(1/4) (2001): 341-358. On the relationship between Pattee and Rosen, see Howard H. Pattee, 'Laws, Constraints, and the Modeling Relation – History and Interpretations', *Chemistry and Biodiversity*, 4 (2007): 2272-2295.

metaphysics the claim of Kauffman and Markoš, that to comprehend the creativity of the world mathematics ultimately must be subordinated to stories,<sup>15</sup> is defended.

The fourth paper, 'Towards a Science of *Life As Creative Organisms*' by Norm Hirst, is the point of departure for the following paper by floyd merrell. Hirst's paper, which is partly autobiographical, describes an intellectual adventure to find a place in a scientific world for values and meaning. What this adventure revealed was that mainstream science, mathematics, logic and philosophy mutually support each other to promote a comprehensive materialist world-view that has no place for meaning or creativity. In this journey Hirst discovered the work of Rosen, and concluded, as Rosen had, that a new metaphysics is required. In this paper he uses Peirce's notion of 'abduction' to justify the speculative presentation of an alternative, process organismic world-view, a form of process metaphysics. While strongly influenced by Alfred North Whitehead and scientists influenced by him (especially the biophysicist Mae-Wan Ho), it is an original synthesis. This synthesis is then contrasted with 'materialism'. This contrast highlights the way apparently diverse ideas cohere as total perspectives, thereby displaying not only that what are often regarded as obvious, theoretically neutral ideas actually part of and even provide the foundations for a particular perspective of the world, but the real alternatives between perspectives. Against the background of the account of materialism, Hirst argues that advances in biology herald the move towards a process organismic world-view. However, this is being blocked not only by mathematical ideas, but more fundamentally by mainstream ideas in logic. In identifying blockages to this revolution in thought Hirst is particularly concerned with the influence of extensional logic, which, like the mathematical formalism attacked by Rosen, effectively eliminates meaning and creativity. What is called for, he argues, is a new logic adequate to the creativity of life.

The Peircian semiotician floyd merrell has recognized in Rosen's and Hirst's critiques of mainstream thought justification for his own philosophy as a solution to problems they have revealed. In a massive trilogy (*Signs Becoming Signs*, *Semiosis in the Postmodern Age*, and *Signs Grow*), merrell developed a coherent Peircian cosmology advancing Peirce's most radical ideas on the semiotic nature of all reality, fusing the customary distinctions between life and non-life, mind and matter, self and other, appearance and 'reality'. In his contribution Merrell further explicates Peirce's philosophy, revealing how radical his ideas really were, and in doing so, offers the basis for the development of the kind of logic Hirst argued is required to understand life.

Wendell Kisner's paper 'The Category of Life, Mechanistic Reduction, and the Uniqueness of Biology' examines the problem of defining the specific nature of life through Hegel's categories. Kisner is specifically concerned to expose and free biology from residues of mechanistic categories. However, this paper does far more than this. The revival of interest in Hegel has been for the most part associated with an appreciation of his continuing relevance to social and political philosophy. Kisner shows that Hegel's

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<sup>15</sup> See Anton Markoš, 'In the quest for novelty: Kauffman's biosphere and Lotman's semiosphere', *Sign Systems Studies*: 32.1/2, 2004, 309-327.

*Science of Logic* and *Philosophy of Nature* are not only historically interesting; they have relevance for contemporary debates in the philosophy of nature and in the sciences. The paper examines the relationship between Kant and Hegel, pointing out that Hegel's *Logic* is not merely an epistemology but an ontology, arguing against Heidegger's interpretation of Hegel before going on to explicate the *Logic*. This explication reveals the profundity of Hegel's critique of Cartesian categories, how Cartesian thought can be overcome and what Hegel then offers to biology.

Kisner's paper on Hegel's philosophy is followed by a critique by Andrew Taggart of John McDowell's *Mind and World*. While Taggart places McDowell's work squarely in the context of German Idealism, he also points out its naturalism and its concern to re-enchant nature. While commending this naturalism, Taggart argues that more is required to re-enchant nature than the 'therapeutic' or 'stoical' solution McDowell recommends. He calls for the cultivation of 'a form of dialectical thought that can better face the deeply social and historical disunity between mind and world.' Taggart then offers a Hegelian inspired attempt in this direction.

A feature of the questioning of prevailing reductionist materialism is the revival of interest in and reassessment of the Romantics, and along with this, of the importance of the humanities and arts in cognizing the world. It is now recognized that the Romantics were not anti-Enlightenment but, against the mainstream Enlightenment thinkers, were promoting a subtler form of rationality which gave a place to feeling and emotion, and were developing a more dynamic view of nature. Kathleen O'Dwyer in her paper 'The Question of Love's Possibility Explored Through the Poetry of William Wordsworth' shows the poetry of Wordsworth to be not only a significant expression of literary romanticism, but a significant contribution to human knowledge, human understanding and human development. Through a study of Wordsworth's examination of the role of love in human living, obstacles to it and its necessity for human flourishing, O'Dwyer argues for a broader interpretation of Romanticism than has previously been considered.

In 'Quantum Uncertainty, Quantum Play, Quantum Sorrow' David A. Grandy takes as his point of departure the efforts by quantum physicists to characterize life. Following Evelyn Fox-Keller he argues that the discovery of DNA threw very little light on 'the secret of life'. Examining the reflections on life by Erwin Schrödinger, Niels Bohr and Max Delbrück, Grandy points out the subtlety of Bohr's work and the significance of the discovery of indeterminacy in the quantum realm for understanding life. He argues that quantum uncertainty plays an essential role in the elemental life experiences of random play and of compassionate sorrow. These experiences give a place to 'unscripted novelty, fresh variation, and far-flung sympathetic interconnection' allowing 'inner and outer feeling experiences to grow back together.'

Seán Ó Nualláin, a major figure in the development of cognitive science and author of *The Search for Mind: A New Foundation for Cognitive Science*, has contributed a paper on the foundations of biology. It is, as he notes 'a ground clearing exercise' extending the notion of causation to include final and formal causation along with efficient causation. Aligned with Barbieri's paper but more wide-ranging it grapples with the problem of

understanding the most basic forms of symbolic operations of organisms, arguing that there is interaction between metabolism and symbol-processing at all levels of life. The conclusions are radical: 'Darwin must be sacrificed for the sake of the stupendous theory of evolution which is emerging.' However, this paper, like much of the author's work, is far more than a contribution to biology. It grapples with political issues and the problem of grounding ethics. O Nualláin concludes: 'It is possible to develop a politics based on the integrity of ecosystems as long as it is realised that our capacity for symbol use, and our very selves are also part of nature. To assert a "green" politics is also to assert the finest heights of human culture, and its extraordinary perennial search for the absolute grounds of its own existence.'

The contribution from Peter Corning is also wide ranging, continuing his work of several decades of developing a holistic form of Darwinism recognizing the central place of symbiosis and functional synergy in the evolution of life. He recently expounded this in his book *Holistic Darwinism*.<sup>16</sup> This paper, like Barbieri's and Ó Nualláin's, takes its starting point from an objectivist perspective within mainstream science, but going beyond this, advances ideas that have not been properly recognized in mainstream science to develop a more adequate conception of life and its evolution. In particular, the work builds on those critics of Social Darwinism who revealed the ubiquity of symbiosis in nature. Corning develops the analysis of symbiosis much further, showing how the development of functional synergies can account for most of the evolution of life.

Helena Knyazeva from the Institute of Philosophy of the Russian Academy of Sciences presents a distinctive theory of the self-organization of complex systems to explain, as the title of the paper indicates, 'The Riddle of Human Being'. What is privileged in this version of complexity theory are the laws of co-evolutionary development of structures characterized by different speeds or rates of development, along with laws of assembly of wholes from parts where some elements of 'memory' (DNA, cultural traditions etc.) are essential. This approach reveals a number of paradoxical consequences, such that a part (for instance an individual) might be more complex than a whole (society) and why in changing an individual to reconstruct society it is still necessary to preserve in the individual the supposed undesirable past. The subtitle of this paper, 'A Human Singularity of Co-Evolutionary Processes' alludes to a theory of singularity as a moment of instability in a phase transition. According to this theory (influenced by Ilya Prigogine and Isabelle Stengers) the actions of one individual can determine which path of development is taken, and contribute to the emergence of a new pattern of collective behaviour. Finally, drawing on work on non-linear dynamics by members of the Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences, it is argued that in certain evolutionary regimes the future can have a direct influence on the present.

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<sup>16</sup> See Peter A. Corning, *Holistic Darwinism: Synergy, Cybernetics and the Bioeconomics of Evolution*. Chicago: University of Chicago Press, 2005 and P.A. Corning, *The Synergism Hypothesis: A Theory of Progressive Evolution.*, New York: McGraw-Hill, 1983.

Robert Arp is the author of *Scenario Visualization*, an argument that humans gained evolutionary ascendancy through their distinctive capacities to synthesise apparently unrelated concepts, hypothesize, invent and take advantage of serendipitous opportunities.<sup>17</sup> Here he offers a general account of living organisms as hierarchical ordered processes that maintain homeostasis at different levels ‘through their abilities to internally exchange data, selectively convert data to information, integrate that information, and process information from environments.’ This characterization is developed and defended through an engagement with mainstream biologists, philosophical biologists and philosophers of mind as well as more radical theorists. The paper offers a careful analysis of key concepts in philosophical biology and defends the reality of emergence.

In ‘Of ~~Mice~~ Moths and ~~Men~~ Machines’ Susan Schuppli is concerned to recognize diversity, and does this by pointing out the liberating effect of what does not obey the logic of the machine. Through an historical study of how a moth was found interfering with the functioning of an early computer, the first actual case of a bug being found, Schuppli shows how mutations are necessary for systems to change and evolve. The dynamic vitality of the moth interacting with the apparently lifeless machine pushed the machine to a state of chaos. Chaos ‘is not only an animating force in the constitution of new systems but is necessary for the evolution of difference’, Schuppli argues. This provides support for the quote from Henri Bergson with which she begins the paper: ‘In vain we force the living into this or that one of our molds. All the molds crack, they are too narrow, above all too rigid, for what we try to put into them.’

Amien Kacou in ‘Why Even Mind?’ examines the basis for valuing life, considering what is involved in justifying the view that life should be lived in the first place. It examines the work and ideas on the role of philosophy of the philosophers who have been concerned with this question: Nietzsche, Heidegger, Albert Camus, Gilles Deleuze and Ludwig Wittgenstein, and is primarily concerned to clarify the question ‘should life be lived?’ Distantly inspired by Heidegger, its conclusion is that if we are committed to assigning a value to life *in general* then we should be able to say that life is good *irrespective* of its existence.

In ‘How Lacan’s *Ethics* Might Improve our Understanding of Nietzsche’s Critique of Platonism: The Neurosis & Nihilism of a “Life” *Against* Life’, Tim Themis argues that Lacan’s critique of the Platonic idea of the Sovereign Good illuminates Nietzsche’s project of exposing the metaphysics underlying the history of Western morality. That is, it can help expose the metaphysics that has turned life against itself, as presently manifest in the destruction of the global environment, including ourselves amongst its earthly inhabitants.

Michael Zimmerman in ‘*The Singularity: A Crucial Phase in Divine Self-Actualization*’ is also concerned with the consequences of failing to question our culture and its assumptions about life, but sees a different, although related threat. He probes the

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<sup>17</sup> Robert Arp, *Scenario Visualization: An Evolutionary Account of Creative Problem Solving*, Cambridge, Mass.: MIT Press, 2008.

vision of the future of those ‘posthumanists’ who, believing that we are leaving the past behind through nanotechnology, artificial intelligence, robotics, and genetic engineering, proclaim a future in which ‘Our civilization will ... expand outward, turning all the dumb matter and energy we encounter into sublimely intelligent – matter and energy.’ Far from such a view of the world being entirely new, Zimmerman argues, it is really a re-working of ‘the long-standing Christian discourse of “theosis” according to which humans are capable of being God or god-like.’ This is a vision in which God only becomes fully actual through the process by which humanity achieves absolute consciousness, a view exemplified by Hegel’s philosophy. In this case, however, our offspring, posthumans, will carry out this process. In the meantime, the consequences for humans could be, to put it mildly, frightening. This is really a different manifestation of life turned against itself. And as with global ecological destruction, this is not a vision of dreamers. It is a vision in the process of being realized.

Like many other contributors, Philip Henshaw is highly critical of Darwinists who have identified the engine of evolution as the struggle for survival. He argues that organisms for the most part are ‘engaged in resourceful exploration, using what they find while avoiding conflict.’ However, Henshaw is more concerned to expose the defective way mainstream science investigates the world and the blindness this engenders, particularly when it comes to addressing environmental problems. This defect he ascribes to the tendency of biologists to emulate physicists, or, more fundamentally, ‘to adopt a self-consistent model to represent a complex, inconsistent world.’ The consequence is that the independence, relative autonomy and diversity of organisms and their behaviours are ignored. That is, the life in things is ignored. Echoing Whitehead’s warning against the ‘fallacy of misplaced concreteness’ (that is, ignoring the degree of abstraction in our concepts and then taking these abstractions for reality), Henshaw argues that we have to learn to understand that natural systems are different from our formal ideas of them. It is the failure to appreciate this, he argues, that is the cause of failures to manage systems. To address this problem, however, Henshaw proposes something new, that instead of taking our abstract models as reality or discarding our abstract models, we use abstract models to reveal life. As he put it, ‘a self-consistent model could become a sensitive detector of differences, and a way to highlight the life around you.’

In ‘Towards a Phenomenology of Life: Castoriadis’ *Critical Naturphilosophie* and the Project of Autonomy’, Suzi Adams shows the contribution of Cornelius Castoriadis to the philosophy of life. Castoriadis is presented as one of a number of French philosophers inspired by the work of Maurice Merleau-Ponty and his late turn to the philosophy of nature and ontology. These philosophers have revived philosophical biology and the philosophy of life. According to Adams, Castoriadis characterized life as auto-poietic, that is, self-moving and self-creating, and then pointed out that if this is a correct characterization then the whole cosmos is in some sense living. The emergence of ‘existential life’ or living organisms, including humans, is then seen as co-emergent with the ‘world’ as a new mode of being. In this way Castoriadis examines the ontological preconditions of ways of being-in-the-world, including autonomous being. According to

Adams, this amounts to a critical rethinking of *Naturphilosophie*, the anti-mechanistic tradition of science (inspired by Schelling), in the service of Castoriadis' wider project of developing a philosophy of autonomy.

The last paper, Murray Code's 'Life, Thought, and Morality: Or, Does Matter Really Matter?' offers another radical critique of mainstream thought, and of all the contributors, is most resolutely opposed to scientific objectivism. Such objectivism has blinded us to the 'quickness' of life, and is most responsible for the 'bad sense' which dominates the modern world, Code argues. Code began his career as a mathematician before becoming a philosopher. As a philosopher he turned first to the thought of Whitehead, writing an explication and defence of Whitehead's philosophy of mathematics,<sup>18</sup> and then to Peirce, defending Whitehead and Peirce together in opposition to the 'logicism' of mainstream philosophy as represented by Bertrand Russell and Willard van Orman Quine.<sup>19</sup> In his most recent work he has sought to develop a 'subtle dialectic' which can free us from the learned stupidity which has devalued life.<sup>20</sup> This contribution furthers this work. In defending life, Code does not attack reductionism or mechanism in science, but the privileging of science and its abstract concepts. He critiques 'modern, science-centered naturalism' for its 'moral laxity'. Drawing on the work of Coleridge, Nietzsche, Deleuze and Merleau-Ponty as well as Whitehead and Peirce, Code reveals the radical implications of Whitehead's philosophy as a means for cultivating 'good sense'. As recent expositors of Whitehead have pointed out, Whitehead differs from the ancients in holding that the advance into the future is not merely reordering of what is, but creation, and such creation, Code points out, requires imagination. Imagination is not only 'fancy', but as Kant argued, is essential to knowing, and more fundamentally still, as Coleridge argued, is an essential component of the becoming of the world. Imagination is a natural power necessary for combining the intellect, the moral and the aesthetic aspects of living and thinking. That this is the case is illustrated by an analysis of Hannah Arendt's study of Adolf Eichmann, someone who, Arendt showed, was totally deficient in imagination. Code argues that Whitehead, understood as reviving an essentially nonmodern reason connecting in a 'coherent, consistent, and intelligible language the meanings of difficult ideas that are inescapably vague', more akin to poetry than science, provides the theory of actuality that Coleridge lacked. Responding to Nietzsche's challenge and his call for cultural therapy, the paper argues that a vital culture requires a well-cultivated collective imagination for a 'healthy morality' capable of overturning the nihilism entrenched in modern thought.

As noted in introducing the first two papers, these provide an ordering principle for this entire double edition. Following these two, the papers which follow first are those which tend to take a subjectivist perspective as their point of reference for grappling with

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<sup>18</sup> Murray Code, *Order & Organism: Steps to a Whiteheadian Philosophy of Mathematics & the Natural Sciences*, Albany: State University of New York Press, 1985.

<sup>19</sup> Murray Code, *Myths of Reason: Vagueness, Rationality and the Lure of Logic*, New Jersey: Humanities Press, 1995.

<sup>20</sup> Murray Code, *Process, Reality and the Power of Symbols: Thinking with A.N. Whitehead*, Macmillan: Palgrave, 2007.

the question ‘What is life?’, or at least critique objectivist approaches. Beginning with Grandy’s paper on the implications of quantum theory, subsequent papers take more of an objectivist perspective as their reference point. However, there in another principle of ordering also involved. Although most papers are to some extent concerned with the practical consequences of our understanding what is life, those more centrally concerned with these consequences have been placed towards the end. For this reason, Code’s contribution, which is most resolutely opposed to scientific objectivism and would otherwise have been placed near the beginning, has been placed at the conclusion. Of the essays deemed most concerned with orienting us for action, those which are mainly concerned with the consequences of a defective understanding of life, such as Zimmerman’s, are placed first, while those primarily concerned to offer guidance for overcoming such defective thinking, follow these. The concluding papers in this section are Adam’s paper on Castoriadis and Code’s paper. Castoriadis and Code are most concerned with using their philosophies of life to launch new visions for the future, each giving a central place to imagination in the creation of the future. Although Adams in this paper has been more concerned to explicate Castoriadis’ philosophy of nature than his theory of the imaginary institution of society and his project of autonomy, and Code does not mention Castoriadis, there is a striking similarity in their diagnoses of the disease of modern civilization and the importance they accord to imagination in overcoming this disease.

Apart from these dimensions there are other themes that unite different contributions. Rosen’s critique of mainstream biology, the rapidly expanding field of biosemiotics, complexity theory, the importance of metaphysics in general and Whitehead in particular, the importance of the Romantics, including Schelling, Coleridge and Wordsworth, and their subsequent influence, the ideas of Hegel, the diagnoses by Nietzsche and Heidegger of the sickness of modern civilization, and the relative importance of mathematics, science, art and poetry, or of abstract thought and feeling, in cognizing the world, are each themes taken up by different contributors. For the most part, contributions complement each other, but there are also differences between them. Apart from the subjectivist/objectivist opposition, there are major differences between Rosen (as expounded by a number of contributors), Henshaw and Code on the capacity of mathematical models to grasp life, with Rosen arguing for a radically different kind of mathematics to characterize life itself, Henshaw offering an original suggestion for how the deficiencies of models can be turned to advantage to reveal life, and Code suggesting that scientific naturalism has had far too much influence and should not be taken seriously as a point of departure for appreciating the quickness of life. There are also implicit differences in visions for what kind of future we should strive for implied or proposed by different papers. And there are issues raised but not addressed by the juxtaposition of these papers, ranging from questions about the relationship between different thinkers of the past, such as Schelling, Hegel and Peirce, given that we know that Peirce was strongly influenced by both Schelling and Hegel, to current theoretical and philosophical questions such as the relationship between mathematical models, explanation, imagination and

creativity. These might have been more explicitly addressed had these papers been presented at a conference. However, these papers were submitted independently of each other, and what is more extraordinary is their coherence. They admirably demonstrate that the question ‘What is life?’ is crucial to understanding the world and our place within it, for understanding the deficiencies of our culture and civilization, and for envisaging a better future. Perhaps their greater value is in the questions they raise than the questions they answer.

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