

Contents

I Science and Emotion

Ivan Colagè

- Sociality, Brain, Evolution and Culture: The Human Specificity and the *Imago Dei* Doctrine: Towards a Working Conceptual Framework 3

Allan T. Emrén

- Cat, Retro-Causality and Emotion. 27

Jay R. Feierman

- The Biology of Religious Belief, Emotion, and Behavior: A Natural Science Perspective 41

Enn Kasak

- Do Emotions Shape the Clever World of Scientific Stupidity?. 63

Wiesław M. Macek

- On the Origin and the Existence of the World 69

William J. Shoemaker

- Limbic Emotions, Moral Emotions and the Social Brain Network 83

Hans Van Eyghen

- Scientific Theories of Religion as Naturalistic Challenges. 93

II Persons Experiencing Emotions

Sybille C. Fritsch-Oppermann

Emotional Intelligence – A Concept Bridging Theology and Science 113

Mark Pretorius

The Role of Religious Experience vis-à-vis Religious Belief in Improving Mental and Physical Health: Empirical Findings from Psychology and Neuroscience 129

John A. Teske

An Emotional Psychology for Navigating Worldviews. 143

Berge J. Traboulsi

Emotions and Orthodox Spirituality during Turbulent Times: Analysis of Facebook Expressions over the Abduction of Metropolitan Paul (Yazigi) of Aleppo. 167

Kenneth Wilson

The Dynamic Root of Gratitude: Scientific Enquiry in Context. . . . 183

III Miscellanea

Paolo D’Ambrosio

The Epigenetic View in Life Sciences: Towards a Riper Picture of the Nature of Living Beings and Their Evolution 195

Hans-Ferdinand Angel

No Believing Without Emotion: The Overlapping of Emotion and Cognition in the Model of Credition 217

Philippe Gagnon

Cartesianism, the Embodied Mind, and what’s best for the Future of Cognitive Research 225

<i>Ladislav Kvasz</i>	
Emotions, Theology and Transcendence	245
<i>Javier Leach</i>	
Language, Internal Motions, Public and Personal Meaning.	255
Author Biographies	265

On the Origin and the Existence of the World

WIESŁAW M. MACEK

Abstract

This paper considers the evolution of the Universe according to the standard Big Bang model, quantum models of creation, and the recent theory of nonlinear dynamics, including deterministic chaos, fractals, and multifractals. It shows that by looking for an order and harmony in the complex surrounding real world these modern studies give a new insight into the most important philosophical issues exceeding classical ontological principles, e.g., providing a deeper understanding of an old emotional philosophical dilemma: why does something exist instead of nothing? The paper argues that this exciting question is a philosophical basis of the emotions that shape our life. In the belief that the concepts of modern science can bridge science and religion, this paper discusses the consequences of science and religion for the sense of human life in the surrounding Universe. In fact, in the mathematical-natural sciences we ought to look for the sense of the world in the mystery of rationality; the sense of its existence is the justification of the Universe. This scientific view gives sense and hope to human existence. Therefore, it seems that both science and religion provide important contributions that shape our emotions, when we experience the world in which we are immersed.

Keywords

Creation, existence, world, reason, science, religion, theology, reality, sense, emotions.

1. Introduction

THE EVOLUTION OF THE UNIVERSE is based on the Big Bang model, which has now become a standard scenario in the scientific literature. However, very little is known about the early stages of this evolution, because the required quantum gravity theory is still missing.

On the other hand, the creation of the world is usually an important issue for religion (theology of creation). Nevertheless these two domains of human activity seem often to be in conflict. Some scientists and philosophers have noticed that the aim of science is to explore the Universe created by

God; science and natural theology have different methods, but they have the same subject (Heller 1996). Admittedly, even though the methods of science and religion are different, studies on quantum reality (Espagnat 1983) suggest that one can mutually help each other to approach the unique Truth (Heller 2010). In our view this requires new philosophical concepts based on metaphysics exceeding the classical ontological principles (Macek 2000). Moreover, in our experience science is continuously renewing our thoughts about God (Macek 2009; 2010; 2011).

Obviously, to bridge science and religion a proper philosophy is required. Hence one should return to great philosophers, starting with the Greeks who asked questions about the origin of the existence of the world: for example,

- Aristotle, according to whom the world always existed, but needed the *eternal* (atemporal) First Mover
- Plato, according to whom a Demiurg transformed an initial *chaotic* stuff into the ordered *Cosmos*
- St. Augustine, for whom a Creator (in the fullest sense) was a *Being* from whom the existence (in time) of all things derives (from nothingness in the past, to nothingness in the future).

In this paper, we would like to consider the origin of the Universe in the light of modern science, including quantum models of creation, recent theories of nonlinear dynamics, deterministic chaos and fractals. We hope that these studies will give us also a new insight into the most important philosophical issues exceeding the classical ontological principles, e.g., providing a deeper understanding of an old philosophical question: *Why does something exist instead of nothing?* (Gottfried Wilhelm von Leibniz (1646–1716), Leibniz 1714). We argue that this dramatic problem is the philosophical basis of the emotions that shape our life.

Basically, in this paper we argue that a simple *nonlinear* law, within the theory of chaos and (multi-)fractals, can possibly describe a hidden order for the creation of the Universe. Therefore, let us also give the other citation, which will help us to understand the main issue of our paper: *Chaos is the score on which reality is written* (Henry Miller (1891-1980), Miller 1934).

Finally, since we believe that the mathematical natural sciences will admit a better understanding sense of man in his relation to the Universe, let us

cite Michael Heller (born 1936) according to whom *in the environment of Sense the life is worth to live* (Heller 2010). Therefore, it would seem that both science and religion provide important contributions that shape our emotions when we experience the world in which we are immersed

2. Evolution of the Universe

According to the Big Bang model, the Universe expanded from an extremely dense and hot state and continues to expand today. A common analogy explains that space itself is expanding, carrying galaxies with it, like spots on an inflating balloon. The graphic scheme here is an artist's concept illustrating the expansion of a portion of a flat Universe (Fig. 1)¹.

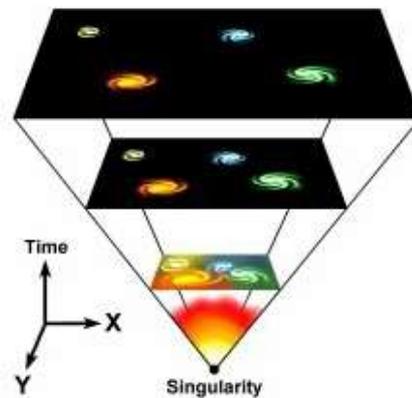


Fig 1: The expanding universe

Based on the best available measurements of the Wilkinson Microwave Anisotropy Probe (WMAP) in 2010, the original state of the Universe began around 13.7 billion years ago, when the Big Bang occurred. This was possibly followed by 'inflation', producing a burst of exponential growth in the size of the Universe. The first second, consisting of electroweak, quark, and hadron epochs, together with the lepton epoch (till 3 minutes of its existence) were

¹ Taken from http://en.wikipedia.org/wiki/Big_Bang, Accessed 1 September 2014.

decisive for further evolution, leading to the nucleosynthesis of helium from hydrogen. Only after 70 thousand years was light separated from matter. The afterglow light seen by WMAP was emitted about 400 thousand years after the beginning (when the electrons and nucleons were combined into atoms, mainly hydrogen) and has traversed the Universe largely unimpeded since then. The conditions of earlier times are imprinted on this light; it also forms a backlight for later developments of the Universe. The first stars appeared about 400 million years later.

After the formation of galaxies and finally the Solar System, about 5 billion years ago, for the next several billion years the expansion of the Universe gradually slowed down as the matter in the Universe pulled on itself *via* gravity. More recently, the expansion has begun to speed up again as the repulsive effects of *dark energy* have come to dominate the expansion of the Universe.

2.1 The Origin of the Universe

2.1.1 *Where did the Universe come from?*

However, no one knows how the first space, time, and matter arose. And scientists are grappling with even deeper questions:

- If there was *nothing* to begin with, then where did the laws of nature come from?
- How did the Universe ‘know’ how to proceed?
- And why do the laws of nature produce a Universe that is so hospitable to life?

As difficult as these questions are, scientists are attempting to address them with bold new ideas – and with new experiments to test those ideas.

2.1.2 *In search of quantum gravity*

Understanding how the Universe began requires developing a better theory of how space, time, and matter are related. In physics, a theory is not a guess or a hypothesis. It is a mathematical model that lets us make predictions

about how the world behaves. Einstein's theory of gravity, for example, accurately describes how matter responds to gravity in the large-scale world around us.

And our best theory of the tiny sub-atomic realm, called *quantum* theory, makes very accurate predictions about the behavior of matter at tiny scales of distance. But these two theories are not complete, and are not able to make accurate predictions about the very earliest moments when the Universe was both extremely dense and extremely small.

2.2 The Standard Model of Forces

According to the Standard Model we have three generations of elementary particles: quarks (up and down, charm and strange, top and bottom) and leptons (electron, muon, and tau particles with the corresponding neutrinos). The gauge bosons responsible for interactions (gluons and photons for quarks, with heavy bosons Z and W for leptons) are in the fourth generation and finally the Higgs boson is in the fifth, providing the mass to particles. We can have four basic types of interactions between particles: gravitational, strong, weak and electromagnetic (electroweak) forces. The role of the Grand Unification Theory of these elementary forces in the evolution of the Universe is depicted in Figure 2².

2.3 Models of the Creation of the Universe

Because we do not have a quantum theory of gravitation a number of models of the creation of the Universe with the following characteristics have been proposed:

- Quantum model (Hartle & Hawking, 1983) - *creation from 'nothing', ex nihilo*
- Noncommutative geometry (Heller et al., 1996) - *the beginning is everywhere*

² From <http://web.williams.edu/Astronomy/Course-Pages/330/images/forces.jpg>, Accessed 1 September 2014.

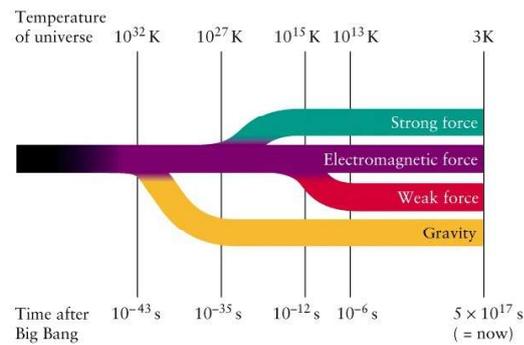


Fig 2: Birth and evolution of the universe

- String theory (M-theory, Witten, 1995) - collision of branes
- Cyclic (ekpyrotic) model (Steinhardt & Turok, 2002) - *big bangs and crunches*
- Eternal chaotic inflation (Linde, 1986) - *bubble of universes*

Please note that below the Planck threshold (in space and time, of 10^{-35} m and 10^{-43} s respectively) any time has been formally eliminated in the quantum model. Alternatively, these critical values correspond to a phase transition from a commutative to a noncommutative régime. Admittedly, in the last two models time is *eternal*, but it is difficult to verify these models according to the criterion of falsifiability required for any scientific theory (Popper, 1959).

2.3.1 String Theory

It is worth noting that some of the best scholars in physics are working on a new theory of space, time, and matter, called ‘string theory’, that may help us better understand where the Universe came from. String theory is based on new ideas that have not yet been tested. The theory assumes, for example, that the basic particles in nature are not point particles, but are shaped like strings.

The theory requires – and predicts – that space has *more* than the *three* dimensions in which we move. According to one version of the theory, the

particles and forces that make up our world are confined to the three dimensions we see – except for gravity, which can ‘leak’ out into the extra dimensions.

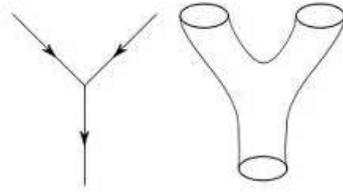


Fig 3: Elementary interactions in the standard model and in string theory

This (super)string theory has led to some bizarre new scenarios for the origin of the Universe. In one scenario, the Big Bang could have been triggered when our own Universe *collided* with a ‘parallel universe’ made of these extra dimensions.

Interaction in the subatomic world – world lines of point-like particles in the Standard Model or a world sheet swept up by closed strings in string theory – are shown in Figure 3. Scenarios like these are very speculative, because string theory is still in development and remains untested; but they stimulate astronomers to look for new forms of evidence.

3. Nonlinear Dynamics and Fractals

3.1 Deterministic Chaos

CHAOS (χάος) according to Strogatz (1994) is (see an excellent popular book by Stewart, 1990):

- *non-periodic long-term behavior*
- *in a deterministic system*
- *that exhibits sensitivity to initial conditions.*

This means that there is a fixed distance r such that, no matter how precisely one specifies an initial state, there exists a solution of a dynamical

system starting from a nearby state (at least one) that after some time gets a distance r away.

One example comes from the dynamics of irregular flow in viscous fluids, which is still not sufficiently well understood. It appears that the behavior of such systems can be rather complex: from equilibrium or regular (periodic) motion, through intermittency (where irregular and regular motions are intertwined) to nonperiodic behavior. Two types of such nonperiodic flows are possible, namely chaotic and hyperchaotic motions. As discovered by Lorenz (1963), deterministic chaos exhibits sensitivity to initial conditions leading to unpredictability of the long-term behavior of the system (the ‘butterfly’ effect). Please note that in the original paper by Lorenz (1963) the term *chaos* has not yet appeared, but *nonperiodic* behavior is used instead. In a simple model of three ordinary nonlinear differential equations

$$d X / d t = \sigma(Y - X)$$

$$d Y / d t = -X Z + r X - Y$$

$$d Z / d t = X Y - b Z$$

for some values of the model parameters, $r = 28$, $\sigma = 10$, $b = 8/3$, the solution is *nonperiodic* and *sensitive* to initial conditions (resulting from the lack of Lyapunov stability). It is worth noting that for the first time we see here an asymptotic solution in a form of a *strange attractor* that has fractal structure, cf. Figure 4.

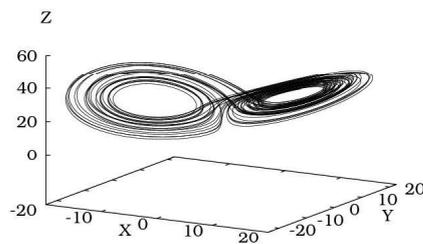


Fig 4: Strange attractor

Hyperchaos is a more complex nonperiodic flow, which was recently discovered in the generalized Lorenz model previously proposed by Macek and Strumik (2014). The results of this paper illustrate how all these complex motions can be studied by analyzing this simple model. In particular, it is shown

that various kinds of complex behavior are closely neighbored depending on two control parameters of the model.

Convection appears naturally in plasmas, where electrically charged particles interact with the magnetic field. Therefore, the obtained results could be important for explaining dynamical processes in solar sunspots, planetary and stellar fluid interiors, and possibly for plasmas in nuclear fusion devices.

3.2 Fractals and Multifractals

Let us now move on to the basic concept of fractal geometry that is important for our understanding of the structure of nature (Mandelbrot 1982). We can say that a *fractal* is a rough or fragmented geometrical object that can be subdivided in parts, each of which is (at least approximately) a reduced-size copy of the whole. Fractals are generally self-similar and independent of scale, described by a fractal dimension. A *multifractal* is a set of intertwined fractals, and the self-similarity of multifractals is scale-dependent, with the spectrum of dimensions.

Simple examples of fractals are a middle Cantor set and a Koch triangle, which are discussed in many textbooks, e.g. by Strogatz (1994). A generalized two-scale weighted Cantor set has been applied for modeling turbulence in space plasmas (Macek 2012).

4. Implications for Cosmology and Creation of the Universe

- *Nonlinear* systems exhibit complex phenomena, including intermittency, and chaos.
- Fractals and multifractals can describe complex shapes in the real world.
- Strange chaotic attractors have fractal structures and are sensitive to initial conditions.
- Within the complex dynamics of the fluctuating intermittent parameters of turbulent media there is a detectable, hidden order described by a generalized Cantor set that exhibits a multifractal structure.

- Based on this scientific experience we argue here that a *simple* but possibly *nonlinear* law (cf. Macek 2000), within the theory of *chaos* and (multi-)fractals, can describe a hidden order for the creation of the *Cosmos*, at the Planck epoch, at which both *space* (at scale of 10^{-35} m) and *time* (10^{-43} s) were originated.

5. The Universe and Sense

For Heller the whole Universe is the unique Word of God that gives *sense* to humankind, history, and the world (Heller 2010). The Reason that existed at the beginning penetrates every being; existence results from the rationality of Divine Thought. Naturally, he is convinced that faith should not be in separation from science. For Heller science as a whole is a *locus theologicus*.

Certainly, like every being the Universe also requires some justification of its existence. We ought to look for the sense of the world in the mystery of rationality; the sense given by God to every existing being is the *justification* of the Universe.

That is why we can have the experience that something really *does* exist instead of nothing (cf. G.W. Leibniz).

- We should note a certain relation of the Universe to *thought*. Surprisingly enough, although human thinking is limited to a relatively very short time, it now allows us to recover the whole cosmic history, which began about 14 billion years ago. Moreover, human values can be realized in the context of the Universe, which is an incarnation of a sensible thought.
- We are deeply immersed in the Universe, since life has appeared during the evolution of the Solar System (3.8 billion years ago) followed by a first *brain* awareness event, i.e., when the first man was born.
- Moreover, human individuals are able to act following their own *will* and thoughts, including feelings that are very characteristic for our life. Therefore, any choice of sense is a demand of *rationality*, because the rejection of the sense should be considered a betrayal of the human reason. In this way, when asking about sense, we are also asking about God, who is continuously providing sense to the whole Universe.

In scientific studies of the dynamical systems one of the most intriguing problems is the question of *reversibility*, or strictly speaking the problem of the time arrow, which is related to the statistical law of thermodynamic entropy.

This means that the present moment is always separated from the future and from the past; consequently the world is historical. Basically, we all know that it is not possible to go back into the past. In particular, our biological clock is a special case of the thermodynamic clock. Unfortunately, when the entropy achieves its maximum every complex organism will die. Therefore, *death* is not only a private tragic event, but it could be regarded as a participation in the cosmic structure. It is now clear that there should be *no* contradiction between

- evolution and creation (in favor of evolutionary creationism),
- determinism and indeterminism (in view of deterministic chaos theory and quantum mechanics).

Obviously, the spiritual and moral evolution of every person depends on him- or herself. Therefore, following the critical *rationalism* of Popper, Heller has also noticed that the decision to be rational in human life is a moral choice. Rationality then becomes the morality of thinking.

6. Epilogue

- We argue that the scientific theories of *nonlinear* dynamics, *chaos* and *fractals* help us to understand the origin of the Universe (Macek 2013) (see the figure on the cover of the book (Macek 2010), adopted from *Bible moralisée* (1220-1230) by Mandelbrot (1982)).
- We also believe that the modern concept of the theology of science can bridge science and religion, thus giving sense to life (Macek 2010; 2011).
- We argue that if we do not wish to continue philosophical and theological studies in isolation from science, then the philosophy of science and classic theology should open their thinking to the most important ideas and achievements of the mathematical natural *sciences*.

- Therefore, we hope that this would admit a better understanding sense of humans in their relation to the Universe, and to the transcendent *Reality*.
- Hence, it would seem that both science and religion provide important contributions that shape our emotions, when we experience the world in which we are immersed.

References

- Espagnat, B. d'. 1983, *In Search of Reality*, Springer-Verlag, New York-Berlin.
- Hartle, J. B. & Hawking, S.W. 1983, "Wave Function of the Universe", *Physical Review D* 28, 2960–2975.
- Heller, M. 1996, *The New Physics and a New Theology*, translated from Polish by G. V. Coyne, S. Giovannini & T. M. Sierotowicz, Notre Dame, Vatican Observatory Publications.
- Heller, M. 2010, *The Sense of Life and the Sense of the Universe. Studies in Contemporary Theology*, Copernicus Center Press, Kraków.
- Heller, M. & Sasin W. 1996, "Noncommutative Structure of Singularities in General Relativity", *Journal of Mathematical Physics* 37, 5665–5671.
- Leibniz, G. W. 1714, "The Principles of Nature and of Grace, Based on Reason", in *Philosophical Papers and Letters*, vol. 2, pp. 636–642, Kluwer Academic (1989).
- Linde, A. 1986, "Eternally Existing Self-reproducing Chaotic Inflationary Universe", *Physical Letters B*, 175, 395–400.
- Lorenz, E. N. 1963, "Deterministic Nonperiodic Flow", *Journal of the Atmospheric Sciences*, 20, 130–141.
- Macek, W. M. 2000, "On Being and Non-being in Science, Philosophy, and Theology", in *Interpretazioni del reale. Teologia, filosofia e scienze in dialogo* (Interpretations of Reality: a Dialogue among Theology and Sciences), P. Coda & R. Presilla (eds.), *Quaderni Sefir*, 1, Pontificia Università Lateranense (Pontifical Lateran University), Rome, Italy, pp. 119–132.
- Macek, W. M. 2009, "The God of Scientists", *The Japan Mission Journal*, vol. 63, no 3, 166–172, Oriens Institute for Religious Studies.

- Macek, W. M. 2010, *Theology of Science according to Father Michał Heller* (in Polish, Summary and Contents in English, see <http://www.cbk.waw.pl/~macek/>, Accessed 1 September 2014), UKSW, Warsaw, 2nd edition 2014.
- Macek, W. M. 2011, "Theology of Science", in *Faces of Rationality. On Michał Heller's Thought (Jubilee Book)*, in Polish), B. Brożek, J. Mączka, W. P. Grygiel & M. L. Hohol (eds.), Copernicus Center Press, Kraków, pp. 203–237.
- Macek, W. M. 2012, "Multifractal Turbulence in the Heliosphere", in *Exploring the Solar Wind*, M. Lazar (ed.), Intech.
- Macek, W. M. 2013, *On the Origin and Evolution of the Universe: Chaos or Cosmos?* (invited paper) *XXI Conference of European Society for Astronomy in Culture (Société Européenne pour l'Astronomie dans la Culture, SEAC 2013)* on *Astronomy: Mather of Civilization and Guide to the Future*, 1–7 September 2013, Athens, Greece.
- Macek, W. M. & Strumik, M. 2014, "Hyperchaotic Intermittent Convection in a Magnetized Viscous Fluid", *Physical Review Letters*, 112, 074502.
- Mandelbrot, B. B. 1982, *The Fractal Geometry of Nature*, Freeman, New York.
- Miller, H. 1934, *Tropic of Cancer*, Obelisk Press, Paris.
- Popper, K. R. 1959, *The Logic of Scientific Discovery*, Routledge, London, New York.
- Steinhardt, P. J. & Turok, N. 2002, "A Cyclic Model of the Universe", *Science* 296, 1436–1439; "Cosmic Evolution in a Cyclic Universe", *Physica D*, 65, 126003.
- Stewart, I. 1990, *Does God Play Dice? The New Mathematics of Chaos*, Blackwell Publishers.
- Strogatz, S. H. 1994, *Nonlinear Dynamics and Chaos*, Addison-Wesley, Reading, Massachusetts.
- Witten, E. 1995, "String Theory Dynamics in Various Dimensions", *Nuclear Physics B*, 443, 85–126.

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ENN KASAK qualified from the University of Tartu in 1981 as theoretical physicist (specialization in astrophysics). In 1981-1995, he did research on the physics of galaxies and cosmology at Tartu Observatory. He acquired a Ph.D. in astrophysics in 1990. Kasak worked as the director of Võro Institute from 1995-1997, helping create the orthography and grammar for his native language – Võro. From 1998-2007 he was an associate professor in the University of Tallinn and the Institute of Law. Initially, he studied the early history of science and pseudo-science in Ancient Mesopotamia, later he devoted himself to the problems of logic and argumentation. Since 2007, he has been an associate professor of the methodology of science at the University of Tartu. In 2014 the University of Tartu Press published his book on logic (in Estonian). Lately, he has also worked on questions of reality, religiosity of science, and scientific stupidity.

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