

**BOTOND GAÁL**

**THE TRUTH OF REASON AND THE  
REALITY OF THE WORLD**

**HISTORIC DEVELOPMENT OF EXACT SCIENCES FROM A  
CHRISTIAN VIEWPOINT**

**BÖSZÖRMÉNYI JENŐ ALAPÍTVÁNY  
DEBRECENI REFORMÁTUS HITTUDOMÁNYI EGYETEM  
DEBRECEN  
2002**

Original title:  
Az ész igazsága és a világ valósága

Author:  
Botond Gaál

Translated by  
Jusztina Nagy-Jánossy

Reviewed by  
Frank Sawyer

Copyright © Botond Gaál, 2002  
All right reserved.  
Kálvin tér 16.  
4044 Debrecen/Hungary

Jacket photograph:  
Vencsellei István  
Front and back page: Debrecen Reformed College

ISBN 963 202 714 0

Published by  
Böszörményi Jenő Alapítvány  
Debrecen, 2002  
Printed in Debrecen/Hungary by Fábíán Nyomdaipari Bt.

To my dear wife

MÁRIA

and

our three children

GERZSON, BOTOND and VERONIKA

*Special thanks!*

This translation was supported by a grant from the  
Science and Religion Course Program in Europe of the  
*Center for Theology and Natural Sciences (CTNS)*  
in Berkeley, California,  
funded by the  
**John Templeton Foundation**

The publisher and sponsor of this book is the  
*"Foundation for the memory of Reverend  
Jenő Böszörményi and his wife"*

This Foundation was established in 1995 by Mrs. Georges Lainé  
[Márta Böszörményi], the daughter of Reverend Jenő Böszörményi,  
in order to promote the publications of the  
Debrecen University of Reformed Theology

This publication was also sponsored by the  
**Regional Center of the Hungarian Academy of Sciences  
in Debrecen**

# CONTENTS

## PREFACE

<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. ROOTS OF EXACT SCIENCES IN ANCIENT TIMES .....</b>	<b>4</b>
Plato projects reality into heaven .....	5
Aristotle: reality equals the truth of the divine part of mind .....	10
Stoics talk about the 'soul of the universe' .....	14
Philo dissolves man in divinity .....	17
Rise and decline in Greek mathematics .....	19
Intellectualism of the Jews of ancient times .....	27
<b>3. POSITION OF ANTIQUE SCIENCE IN THE STRONG CENTURIES OF THE ROMAN EMPIRE .....</b>	<b>37</b>
The appearance of Christianity .....	37
The political framework of Rome .....	37
Importance of Alexandria and of the east-west religious movement .....	39
Fight with gnosticism .....	40
Victory over neoplatonism .....	41
Fall of Alexandria and the decline of Hellenic culture .....	43
<b>4. THE FIRST SIGNIFICANT ERA OF CHRISTIAN THINKING ....</b>	<b>45</b>
Trinity, a factor influencing views .....	46
Creatio ex nihilo .....	48
New interpretation of the relationship between truth and reality in Christian thinking .....	53
Four important thinkers of the ancient church who contributed to the proper development of exact sciences through their cosmology .....	57
Contingent approach and the order of the world .....	61
<b>5. FROM PTOLEMY TO COPERNICUS .....</b>	<b>67</b>
Ptolemy 'saved the phenomena' .....	68

The teleological theology of Augustine .....	69
Did Thomas Aquinas succeed in bringing about the great synthesis? .....	71
The turn by Copernicus .....	73
<b>6. EXTERNAL MEANS OF THE INITIAL DEVELOPMENT OF SCIENCE IN GRECO-ROMAN CULTURE .....</b>	<b>75</b>
Technical level .....	75
Evolution and effects of writing .....	77
<b>7. AT THE DAWN OF MODERN TIMES .....</b>	<b>83</b>
Buridan doubts the truth of Aristotelian physics .....	84
The pioneering role of the Academy of Florence .....	85
Importance of the theology of the Reformation in scientific thinking .....	86
<b>8. NEW APPROACH – NEW ERA .....</b>	<b>91</b>
Descartes before the threshold of the modern times .....	92
Kepler at the threshold of the modern times .....	93
Galileo steps over the threshold of the modern times .....	94
Newton creates the world of the modern times .....	95
Kant puts the seal on the intellectual direction of the modern times .....	103
German idealists after Hume and Kant .....	104
<b>9. THE EXPANDED CONCEPT OF REALITY FROM MAXWELL TO EINSTEIN .....</b>	<b>107</b>
Maxwell expands the concept of reality .....	109
Einstein opens his mind on the unlimited world .....	113
<b>10. THE WORLD OPEN UPWARDS - Truth approaching reality in the scientific thinking of the twentieth century .....</b>	<b>121</b>
Mathematicians interpret the nature of mathematics .....	121
Physicists debate about the laws of physics .....	127
Personal knowledge and reality in Mihály Polányi's philosophy of science .....	133
Karl Barth's 'epistemological revolution' in theology .....	137

<b>11. A SECRET OF THE CONCEPTION OF EUROPEAN CIVILIZATION .....</b>	<b>149</b>
Different approaches to the 'European miracle' .....	149
Thinking in writing .....	151
The necessity of expressing abstract thinking .....	153
<i>Thinking in writing</i> in mathematics .....	157
Christianity and the world of mind in other cultures and religions .....	159
The spatio-temporo-material world and the mind perceiving it .....	163
<b>12. HARMONY OF THE MODERN UNDERSTANDING OF THE WORLD AND CHRISTIAN APPROACH - Summary and perspectives .....</b>	<b>169</b>
The order .....	169
The temporal beginning .....	171
The teleological nature of the laws of the universe .....	172
A uniform approach to the world .....	174
<b>BIBLIOGRAPHY .....</b>	<b>179</b>

## PREFACE

Almost all fields of science use the words 'truth' and 'reality' in a certain natural way. Their exact meaning or definition, however, are not found in each field. Specialists use them in an established context or with a specific meaning in their own division of science. With the development of science, the relative disambiguity of truth and reality has not been preserved by any of the fields of science, moreover, it has disappeared in several cases. By now inter-disciplinarity has been taken for granted so it is no wonder that the tendency is towards a 'clearly comprehensible language' by each field of science and, in the interest of a faster and more precise flow of information these terms should become the means of expressing ideas in a straightforward fashion.

The above problem is raised in a more explicit way in the field examined by us. In both philosophy, and exact sciences and theology it has been felt that the conceptual understanding of truth and reality has not been clarified to the required extent. There are shifts in interpretation and their understanding may differ occasionally. The degree of this difference causes complications not only in the fruitful co-operation between the fields, but also in the disciplined cultivation of science within a single area. Considering philosophy alone, certain thinkers say that truth is the thing that is beyond the knowledge of the spatio-temporo-material world perceived by the mind. In other cases, it is the understanding of reality itself that presents a problem. The term is used as if it constituted the double control of scientific cognition along the line of *reality – cognition – reality*, but in this context, reality only means experience. Thus, it is necessary for each field of science to interpret the world which it wants to know using ideas which are close to each other.

Discussing the topic, reality is interpreted through objects and phenomena seen *sub specie totalitatis*. Reality is understood to be the universe forming a whole, in all its spatial, temporal, material and intellectual aspects. The mind tries to understand this universe and fixes the truth of reason at the contemporary level of knowledge, which does not necessarily correspond to full reality. Therefore, unlike reality, truth can never exceed the knowledge established by the intellect. Truth is regarded to be the thing that has been covered by human intellect in the process of understanding reality. Thus the truth of reason always includes the possibility of exceeding itself, too. This is the essence and, at the same time, secret of scientific thinking. Should any law



between the truth of reason and the reality of the world be discovered by us, we have come closer to this secret. That is the aim of science.

I have been interested in how man's ideas of the surrounding world have changed in the course of history. The question of what the internal structure of the universe and the human mind perceiving it are like has recurred from time to time. I have always felt that the solution to this question should lie in the understanding of the relationship between **the truth of reason and the reality of the world**. Thus my goal has been definitely set. To achieve this goal I have examined the detectable historic signs of the shaping of the aforementioned relationship over the past two and a half thousand years. I have expected my examinations to be beneficial in two ways. *On the one hand*, I have hoped to find the laws which could serve as a link between the development of exact sciences and the human intellect exploring the world. I have approached the problem from a Christian standpoint asking whether the nature of human reason and the structure of the immanent laws of the world are congruent or not. This intellectual problem has been one of the most difficult ones since the ancient times. *On the other hand*, I have been searching for the answer to a most intriguing and often asked question: why was it the European civilization that had become a decisive factor among all other civilizations? Going further, I have also asked how and to what extent Greek science and the Jewish and Christian approaches had contributed to a culture of that high level.

I think my ideas are just a minor contribution to answering these highly complicated but extremely interesting questions which have been dealt with by so many. It is my strong belief that these questions will be properly answered when there is an even stronger collaboration among sciences, including theology. The effective work to be done joining forces will most likely consider investigations concerning the basics of nature, knowledge of reality and science and, consequently, it will contribute to the research of the origins of the whole of our European culture.

Holding a grant, I have been given the privilege to belong to the disciples of Professor Thomas F. Torrance who worked at the Faculty of Theology at the University of Edinburgh. Professor Torrance, holder of the Templeton prize, often shared ideas with Michael Polanyi, discussed his problems with his master, Karl Barth and was in uninterrupted contact with the best of philosophers, mathematicians and physicists. These forms of cultivating science

have become a model for me, too. I have learned from Torrance how to interpret the contingent approach of the universe in Christian theology and exact sciences. When I investigated how deeply this approach was true in some fields of mathematics, physics and theology, I could see that contingency did play a basic part in exploring the relationship between the truth of the reason and the reality of the world. Professor Torrance has had a significant share in shaping my way of thinking in these areas. I am really grateful to my old master.

It is my pleasure to recall of my research in the Center of Theological Inquiry at Princeton, New Jersey. Many questions were discussed with my academic friends there. The results were built into this book. I am also grateful to the members of the European Society for the Study of Science and Theology and to the participants of the Science and Theology Conference in Debrecen for the fruitful discussions which has always encouraged me in my work. With a sense of gratitude I think of several friends of mine in Hungary from whom I have learned a lot. I am thankful to Jusstina Nagy-Jánossy for making a basic translation of this difficult text from Hungarian into English. I ought to express my special thanks to Frank Sawyer, the guest-professor of Sárospatak Theological Academy, for his great assistance in reviewing the text of this book.

Botond Gaál  
Debrecen/Hungary  
December, 2001

---

## INTRODUCTION

The task to examine how the high level civilization of Europe developed appears to be an exciting one. The process is still in progress: the people of different continents are trying hard to incorporate this civilization in their own culture and use it to build a modern society capable of developing.

Informatics developing at a tremendous speed has been an excellent example of high level science of European origin. Being a new field of science, little is known about it and it is also difficult to predict to what heights it may raise the world. Certainly, we are part of a promising developmental process when, at an ever growing speed, human knowledge can create devices needed for the cultivation of science. These devices have their impact on the human mind which has created them at an even faster rate through the communication of information. It is not only the facts and results of science that give the essence of informatics, i.e. the internal reality of this self-generating process, but also *the speed of communicating information, which is an inherent property of the subject*. The faster the flow of information via to-and-fro feedback, the greater the output of man which, consequently, results in a more powerful technical development. No wonder why the whole world rushes to take over and learn this high-level culture of European origin. It also seems evident and certain that several nations will enrich the universal cultivation of science through their own creativity and so far unutilized intellectual and moral energies in the near future.

Undoubtedly, this process is not a predestined or blind one which would yield chance results; on the contrary, it has its inner laws, a regulatory order that can be discovered. Several attempts have been made to reveal what the highlighted position of the European civilization is due to in this global process. The different sciences have given different explanations about this spectacular leading role. In fact, several competent thoughts were born and their harmonization may give rise to a more acceptable and uniform theory which, at a higher level of thinking, will decide about the value of truths thought to be valid until now. No such general theory has been given birth yet, so the

theory of science can be enriched by adding partial results to it. All fields of science may produce useful discoveries but it would be a mistake if any of the fields thought they had acquired the final truth and given a perfect explanation for now and forever. That field of science may yet reach a higher level thus making former truths relative. It is an open-ended process and the laws of order should be found within the process itself.

As far as the European development of scientific thinking is concerned, the different areas give different reasons for the shift in paradigms. For example, history points at facts of the satisfactory or unsatisfactory socialization of technical achievements<sup>1</sup> as well as the undoubtedly important development and incorporation of literacy, a method of cultivating science, into the conscious sphere.<sup>2</sup> The several divisions of philosophy have been trying to find out about the springs which lie and govern the history of ideas in the background regardless of whether they are of conscious, economic or social aspect. As it will be demonstrated soon, natural sciences – as they are understood today – are in the most ambiguous position because, after a promising start in ancient times, the shocking shift only came in the modern times and it is rather difficult to say why. After all, it is hard to find a reassuring explanation to why it was the milieu of the modern times when the 'tree of knowledge' grew to its biggest size or why that soil was the most nourishing one to enable the tree to produce immeasurably and incomparably richer yields compared to those of the other parts of the world. This question could emerge as a real problem for representatives of other cultures such as thinkers raised in the traditions of Chinese, Babylonian and African civilizations of several thousand years. The problem can be presented in another way: representatives of Hinduism, Buddhism, Chinese 'universism' and Muslim thinking may ask what caused the spectacular progress in the cultivation of science in European societies whose results, serving as useful tools, are now shared by the whole world.

---

<sup>1</sup> Cf. István Hajnal, *Technika, művelődés. (Technology, education.) Studies*. Compiled and preface written by Ferenc Glatz, História Könyvtár, Department of the History of Science of HAS (Hungarian Academy of Sciences) Budapest, 1993. 299. (in Hungarian)

<sup>2</sup> Cf. István Hajnal, *Technika, művelődés. op.cit. Studies: History of European culture - literacy, 13-27., Rational development and literacy, 29-36., Literacy, intellectual layer and European development, 36-64* (in Hungarian). The preface on pages XIX-XXIV by Ferenc Glatz specially written to this compilation by István Hajnal shows the historical importance of literacy. The social, scientific and theological relations of the same topic are summarized in Elisabeth Eisenstein, *Printing Press as an Agent of Change: Communications and Cultural Transformations in Early-Modern Europe*. Cambridge University Press, Cambridge, CT, 1979. 683-708.

No fully satisfactory explanation has been found to the 'hows' and 'whys' of European development. Therefore it is worth pointing out facts which can help us better understand or, at least, approach this problem that presents a hard puzzle to solve. The question 'What caused the development of exact sciences in this part of the world from ancient times until now?' appears to be of utmost importance. Where is the secret hidden? Why did it develop that way? Why did it develop here? Why was the development full of obstacles and what forces of drawback had to be overcome? It also may be worth noticing what led to the sudden rise of exact sciences starting from the 15<sup>th</sup> and 16<sup>th</sup> centuries.

In this work, I would like to answer these questions or contribute to existing answers through a special kind of investigation which may enrich approaches and give new ideas for the exploration of the topic. Let me start with an interesting remark: In fact, the results of fantastic depths and heights in *exact sciences were born in a geographical area, on a social basis and in a scientific and spiritual environment whose borders coincided with those of the mind-set represented by Christianity*. That was the case until the middle of the 20<sup>th</sup> century when representatives of other cultures also contributed to scientific development. Mention should be made here of Asian nations that raised the already existing scientific levels, in a most intriguing way, by borrowing their intellectual tools, such as the mathematical apparatus, from the above areas. Now that we know the final result it seems worth going back to the beginnings to find out about the roots from which the European mind emerged, and to see what the nourishing sources for the European style of the cultivation of science were. Then we should go along some of the most important historic stations which had their positive or not so positive impact on scientific development. If the field of interest is restricted and the road is taken from the standpoint of Christian theology, surprisingly useful facts will be discovered. They can be seen as landmarks which the history of science has passed unnoticed, not realizing that these important signs were also standing there. It must be mentioned that these road signs were occasionally drawn ambiguously, moreover, set up in the wrong direction which now makes it necessary for us to criticize things in the interest of the disciplined cultivation of science. But first, let us look at the start, the birth and childhood of exact sciences in the ancient times. . .

## BIBLIOGRAPHY

- Augustinus, Aurelius.** *De vera religione.* Maurinus kiadás: Sancti Aurelii Augustini opera omnia, studio monachorum ordinis S. Benedicti, Paris, 1679-1700.
- \_\_\_\_\_. *Vallomások.* Budapest: Gondolat, 1982.
- Balázs, Béla - Fényes, Imre - Géczy, Barnabás - Horváth, József.** *Mi az idő?* Budapest: Gondolat, 1980.
- Barrow, John D.** *Theories of Everything. The Quest for Ultimate Explanation.* Oxford: Clarendon Press, 1991.
- \_\_\_\_\_. *A fizika világgépe.* Budapest: Akadémiai Kiadó, 1994.
- \_\_\_\_\_. *The World within the World.* Oxford: Oxford University Press, 1990.
- \_\_\_\_\_. *Impossibility. The Limit of Science and the Science of Limits.* Oxford: Oxford University Press, 1998.
- Barth, Karl.** *Protestant Theology in the Nineteenth Century.* London: SCM Press, 1972.
- \_\_\_\_\_. *Die protestantische Theologie in 19. Jahrhundert. Ihre Vorgeschichte und ihre Geschichte.* 3. Auflage. Zürich: Evangelischer Verlag, 1960.
- \_\_\_\_\_. *Die Kirchliche Dogmatik.* I - XIII. köt. Zollikon-Zürich: Evangelische Buchhandlung, 1932-
- \_\_\_\_\_. *Kis dogmatika.* Budapest: Sylvester, 1947. Ford.: Pilder Mária
- Bavinck, Hermann Johan.** *Vallásos tudat és keresztyén hit.* Kiadó és évszám nélkül.
- Beck, Mihály.** *Tudomány - áltudomány.* Budapest: Akadémiai Kiadó; 1978.
- \_\_\_\_\_. *A fullerének felfedezésének története.* Debreceni Szemle, 1997/3-4. szám.
- Bergson, Henri.** *Téremtő fejlődés.* Budapest: Akadémiai Kiadó, 1987.
- Berkson, William., ed.** *Fields of Force. The Development of a Worldview from Faraday to Einstein.* London: Routledge and Kegan Paul, 1974. 126-212.
- Bolberitz, Pál.** *Isten, ember, vallás a keresztyén frlozófiai gondolkodás tükrében.* Budapest: Ecclesia, 1981.
- Bolyki, János.** *A természettudományok és a teológia II.* Theologiai Szemle, 1975. 3-4. sz.

- \_\_\_\_\_. *A természettudomány és a teológia Barth Károlynál*. Theologiai Szemle, 1976/9-10. szám.
- Boyle, Robert and Hooykaas, Reijer.** *A Study in Science and Christian Belief*, New York: University Press of America, Ancaster, Ontario: Pascal Centre, 1997.
- Bowen, James.** *A History of Western Education. Civilization of Europe*. Vol. 1-3. London: Methuen and Co. Ltd. 1975.
- Broadie, Alexander.** *The Tradition of Scottish Philosophy: A New Perspective on the Enlightenment*. Edinburgh: Polygon, 1990.
- Campbell, Lewis and Garnett, William.** *The Life of James Clerk Maxwell: With a Selection from his Correspondence and Occasional Writings and a Sketch of his Contributions to Science*. London: Macmillan and Co., 1882.
- Cantor, Georg.** *Végteleenség a matematikában és a filozófiában*. (Gesammelte Abhandlungen mathematischen und philosophischen Inhalts. Red.: Zermelo, Berlin, 1932., New edition: Hildesheim, 1962.) Budapest: Filozófiai Figyelő, ELTE, 1988/4.
- Carse, James.** *Jonathan Edwards and the Visibility of God*. New York: Charles Scribner's Sons, 1967.
- Cootsona, Gregory S.** *The Deep Fault Line in Religion about Science*. Science and Spirit, Vol. 9. Issue 2., 1998.
- Cunliffe-Jones, Hubert.** ed. *A History of Christian Doctrine*, Edinburgh: T&T. Clark, 1978.
- Czeglédy, Sándor.** *Hit és történet*. Budapest: Sylvester, 1936.
- Dávid, Gyula.** *A lakható világegyetem*. Természet világa, 1990/7. szám.
- Davidson, Stibbs and Kevan.** ed. *The New Bible Commentary*. Grand Rapids: Eerdmans, 1953.
- Davies, Paul.** *The Mind of God. The Scientific Basis for a Rational World*. New York: Simon & Schuster, 1992. Published in Hungarian: *Isten gondolatái*. Budapest: Kultúrtrade Kiadó, 1995.
- Domb, C.,** ed. *Clerk Maxwell and Modern Science. Six Commemorative Lectures*. London: The Athlone Press, 1963.
- \_\_\_\_\_. *James Clerk Maxwell in London 1860-1865, Notes and Records of the Royal Society of London*, Vol. 35. no. 1., 67-103.
- Einstein, Albert.** „Maxwell's Influence on the Development of the Conception of Physical Reality.” In *James Clerk Maxwell: A Commemoration Volume 1831-1931. Essays*. Cambridge: University Press, 1931.
- \_\_\_\_\_. „Geometry and Experience”, *Ideas and Opinions*. New York: Crown Publishing, 1954.

\_\_\_\_\_. *A speciális és általános relativitás elmélete*. Budapest: Kossuth Könyvkiadó, 1993.

\_\_\_\_\_. *Hogyan látom a világot?* Budapest: Gladiátor Kiadó, 1994.

Eisenstein, Elisabeth. *Printing Press as an Agent of Change: Communications and Cultural Transformations in Early-Modern Europe*. Cambridge: Cambridge University Press, 1979.

Éles, Csaba. *A szépségtől a megszállottságig - Itália kultúrája 1401 és 1600 között*. Budapest: Nemzeti Tankönyvkiadó, 1995.

Előd, István. *Katolikus dogmatika*. Budapest: Szent István Társulat, 1983.

Engel, Pál. *Beilleszkedés Európába. A kezdetektől 1440-ig*. Magyarok Európában I. sorozat. Szerk.: Glatz Ferenc. Budapest: Háttér Lap- és Könyvkiadó, 1990.

Fehér, Márta. *Thomas Kuhn tudományfilozófiai „paradigmája”*. Utószó Thomas Kuhn: *A tudományos forradalmak szerkezete* című műhöz. Budapest: Gondolat, 1984.

Fine, Arthur. „Einstein's Realism.” In *Science and Reality, Essays in Honor of Ernan McMullin*. Notre Dame, Indiana: University of Notre Dame Press, 1984.

Gaál, Botond. *A Universe Fine-Tuned for Intelligent Life*. Perspectives, A Journal of Reformed Thought, Grand Rapids, Vol. 10., No. 10. December 1995.

\_\_\_\_\_. *Egy nagy természettudós hite*. James Clerk Maxwell gondolatainak haszna a teológiában. (*The Faith of a Great Scientist. The Benefit of James Clerk-Maxwell's thoughts in Theology.*) Theológiai Szemle, 1992/12.

\_\_\_\_\_. *Maxwell hitvallása és a tudomány forradalma*. (Az előző tanulmány rövidebb, átdolgozott szövege.) Debreceni Szemle, I. évf. 1993/1. szám.

\_\_\_\_\_. „Creatio ex nihilo.” Tanulmányok. In *A választott nép szolgálatában*. Debrecen: Debreceni Református Teológiai Akadémia kiadása a 80 éves Czeglédy Sándor tiszteletére, 1989.

\_\_\_\_\_. *Tér, idő és az Ige*. Debrecen: Debreceni Református Kollégium, 1985.

\_\_\_\_\_. *A természettudományok oktatása és művelése a Debreceni Kollégiumban*. Debrecen: Debreceni Református Kollégium, 1988.

\_\_\_\_\_. *Magasabbrendű dimenziók a gondolkodásban*. - Polányi Mihály gondolatainak haszna a teológiában. Theológiai Szemle, 1991/3. szám.

\_\_\_\_\_. *Teller Ede Debrecenben*. Debreceni Szemle, 1997/3-4. szám.

\_\_\_\_\_. *Természettudomány és hittudomány*. Magyar Tudomány, 1995/11. szám.

Gaál, Botond - Végh, László: *A Szentírás és az antropikus kozmológiai elv*. Theológiai Szemle, 1991/4. szám.



- Garnett, William.** „Maxwell's Laboratory." In *James Clerk Maacwell: A Commemoration Volume 1831-1931. Essays.* Cambridge: University Press, 1931.
- Giere, Ronald N.** „Toward a Unified Theory of Science." In *Science and Reality. Essays in Honor of Ernan McMullin.* Notre Dame, Indiana: University of Notre Dame Press, 1984.
- Gregersen, Niels H. and van Huyssteen, Wentzel.** ed. *Rethinking Theology and Science. Six Models for the Current Dialogue.* Grand Rapids, MI: Eerdmans, 1998.
- Hajnal, István.** "A gépkorszak kialakulása." In *Technika, művelődés. Tanulmányok. Válogatta és az előszót írta: Glatz Ferenc.* Budapest: História - Könyvtár, MTA Történettudományi Intézete, 1993.
- \_\_\_\_\_. "Európai kultúrtörténet - írásbeliség." In *Technika, művelődés, i.m.*
- \_\_\_\_\_. "Racionális fejlődés és írásbeliség." In *Technika, művelődés, i.m.*
- \_\_\_\_\_. "Írásbeliség, intellektuális réteg és európai fejlődés." In *Technika, művelődés, i. m.*
- \_\_\_\_\_. "Kézművesség, írásbeliség és európai fejlődés." In *Technika, művelődés, i.m.*
- \_\_\_\_\_. *Írástörténet az írásbeliség felújulása korából.* Budapest: Budavári Tudományos Társaság, 1921.
- Halasy-Nagy, József.** *Az antik filozófia.* Budapest: Danubia kiadás (az MTA támogatásával), 1934.
- Harman, P.M.** ed. *The Scientific Letters and Papers of James Clerk Maxwell.* Cambridge: University Press, Vol. 1., 1991 and Vol. 2. 1995.
- Hartshorne, Charles.** "Philosophical and Religious Uses of 'God'." In *Process Theology: Basic Writings.* ed. E. H. Cousins, New York: Newman, 1971.
- Hegedűs, Loránt.** *Jézus és Európa.* Budapest: Mundus, 1998.
- Hegel, Georg Wilhelm Friedrich.** *Előadások a világtörténet filozófiájáról.* Budapest: Akadémiai Kiadó, 1966.
- \_\_\_\_\_. *A filozófiai tudományok enciklopédiájának alapvonalai - A természetfilozófia.* Budapest: Akadémiai Kiadó, 1968.
- \_\_\_\_\_. *Religionsphilosophie.* Mahrheineke, 1832.
- Heisenberg, Werner.** *Válogatott tanulmányok.* Budapest: Gondolat, 1967.
- Hesslink, John.** "Natural Theology." Szócikk. In *Encyclopedia of the Reformed Faith.* Kiadó: Donald K. McKim. Luisville, KY: Westminster and John Knox Press, 1992.
- Hooykaas, Reijer.** *Religion and the Rise of Modern Science.* Edinburgh: Scottish Academic Press, 1972.
- Jáki, Szaniszló.** *A természettudomány eredete.* Győr: KÉSZ, 1991.

\_\_\_\_\_. *Science and Creation*. (Stanley L. Jaki) Edinburgh: Scottish Academic Press, 1986.

**Jeans**, Sir James. „James Clerk Maxwell's Method." In *James Clerk Maxwell: A Commemoration Volume 1831-1931*. Essays. Cambridge: University Press, 1931.

**Kaiser**, Christopher B. *Quantum Complementarity and Christological Dialectic*. Religion & Science, History, Method and Science. ed. W. Mark Richardson and Wesley J. Wildman, New York: Routledge, 1996.

**Kalmár**, László. *A matematika alapjai*. Egyetemi jegyzet. Budapest: Tankönyvkiadó, 1976.

**Kálvin**, János. *A keresztyén vallás rendszere*. (Röv.: Institutio.) Az 1559. évi kiadás fordítása. Pápa: Ref. Főiskolai Nyomda, 1909. Ford.: Czeglédy Sándor és Rábold Gusztáv.

**Kant**, Immanuel. *A gyakorlati ész kritikája*. Budapest, 1922.

**Kennedy**, Paul. *A nagyhatalmak tündöklése és bukása*, Budapest: Akadémiai Kiadó, 1992.

**Kéki**, Béla. *Az írás története*. Budapest: Gondolat, 1975.

**Kuhn**, Thomas. *A tudományos forradalmak szerkezete*. Budapest: Gondolat, 1984.

**Larmor**, Sir Joseph. „The Scientific Environment of Clerk Maxwell." In *James Clerk Maxwell: A Commemoration Volume 1831-1931*. Essays. Cambridge: University Press, 1931.

**Lendvai** L. Ferenc - **Nyíri** J. Kristóf. *A filozófia rövid története. A Védáktól Wittgensteinig*. 3. javított kiadás. Budapest: Kossuth Könyvkiadó, 1985.

**Levinas**, Emanuel. "Transzcendencia és megértés." In *A modern tudományok emberképe*. Szerk.: Krzysztof Michalski. Budapest: Gondolat, 1988.

**Lightfoot**, J.B. *St. Paul's Epistles to the Colossians and to Philemon*. London: Macmillan and Co., 1875.

**Lochmann**, Jan Milic. "Theology and Cultural Contexts." In *Reflections*, Princeton, NJ: Center of Theological Inquiry, Public Lecture Series of 1998., Vol. 2. 1999.

**Loder**, James E. and **Neidhardt**, W. Jim. *The Knight's Move*. The Relational Logic of the Spirit in Theology and Science. Colorado Springs: Helmets & Howard, 1992.

**Lodge**, Sir Oliver. „Clerk Maxwell and Wireless Telegraphy." In *James Clerk Maxwell: A Commemoration Volume 1831-1931*. Essays. Cambridge: University Press, 1931.

**Macquarrie**, John. *Principles of Christian Theology*. London: SCM Press, 1977.

- McGrath, Alister E.** *A Life of John Calvin. A Study in the Shaping of Western Culture.* Blackwell Publishers, Oxford, 1993.
- Maxwell, James Clerk.** *A Dynamical Theory of the Electromagnetic Field.* ed. and int. Thomas F. Torrance. Edinburgh: Scottish Academic Press, 1982.
- \_\_\_\_\_. *A Treatise on Electricity and Magnetism.* Oxford: Clarendon Press, 1881.
- McNeill, John T., ed.** *John Calvin: Institutes of the Christian Religion.* Philadelphia: Westminster, 1960.
- Miller, Perry.** *Jonathan Edwards.* Toronto: George J. McLoed, 1949.
- Molnar, Thomas.** *God and the Knowledge of Reality.* New Brunswick, NJ: Transaction Publishers, 1993.
- Moltmann, Jürgen.** "The Change of Values in the Western World." In *Reflections.* Princeton, NJ: Center of Theological Inquiry, Public Lecture Series of 1997. Vol. 1. 1998.
- Morris, Canon Leon.** *The First Epistle of Paul to the Corinthians.* An Introduction and Commentary. Leicester, England: Inter-Varsity Press, 1976.
- Nagy, József.** *A filozófia története,* Budapest: Pantheon, 1927.
- Neidhardt, W. Jim.** *Biblical Humanism: The Tacit Grounding of James Clerk Maxwell's Creativity.* Perspectives on Science and Christian Faith, Vol. 41., Number 3, September 1989.
- Newman, Jay.** *Religion and Technology.* A Study in the Philosophy of Culture. Westport, CT: Praeger, 1997.
- Newton, Isaac.** *Philosophiae Naturalis Principia Mathematica.* London, 1687.
- \_\_\_\_\_. *Optika,* London, 1714.
- Niven, W:D., ed.** *The Scientific Papers of James Clerk Maxwell.* New York: Dover Publications, 1890. - Ugyanezt a művet Cambridgeben, szintén 1890-ben, *The Collected Papers of James Clerk Maxwell* címmel is megjelentették.
- Novobátsky, Károly.** *A relativitás elmélete.* Egyetemi tankönyv. Tankönyvkiadó, Budapest, 1964.
- Nyíri, Tamás.** *A filozófiai gondolkodás fejlődése.* Budapest: Szent István Társulat, 1977.
- Olson, Richard.** *Scottish Philosophy and British Physics 1750-1880: A Study in the Foundations of the Victorian Scientific Style.* Princeton, NJ: University Press, 1975.
- Osterhaven, M. Eugene.** *The Faith of the Church.* Grand Rapids, MI: Eerdmans, 1982. (Magyar fordításban megjelent Az egyház hite címmel. Budapest: Kálvin Kiadó, 1995. Ford.: Czeglédy Sándor és Gaál Botond.)

**Pannenberg, Wolfhart.** *Toward a Theology of Nature.* Essays on Science and Faith. Ed. Ted Peters. Louisville, Kentucky: Westminster/John Knox Press, 1993.

**Peacocke, Arthur.** *Theology for a Scientific Age.* Minneapolis: Fortress Press, 1993.

**Peierls, R.E.** „Field Theory since Maxwell." In *Clerk Maxwell and Modern Science.* Six Commemorative Lectures. Ed. C. Domb. London: The Athlone Press, 1963.

**Péter, Katalin.** *Papok és nemesek.* Budapest: Ráday gyűjtemény, 1995.

**Planck, Max.** „Maxwell's Influence on Theoretical Physics in Germany." In *James Clerk Maxwell: A Commemoration Volume 1831-1931.* Assays. Cambridge: University Press, 1931.

\_\_\_\_\_. *Az egzakt tudomány értelme és határai.* Válogatott tanulmányok. Budapest: Gondolat, 1965.

**Polányi, Mihály.** *Tudomány és ember.* Három tanulmány. Budapest: Argumentum Kiadó, 1997.

\_\_\_\_\_. *Personal Knowledge.* London: Routledge and Kegan Paul, 1983. Megjelent magyarul *Személyes tudás* címmel. Budapest: Atlantisz, 1994.

**Polkinghorne, John C.** *Belief in God in an Age of Science.* New Haven: Yale University Press, 1998.

\_\_\_\_\_. *Reason and Reality.* The Relationship between Science and Theology. London: SPCK, 1991.

\_\_\_\_\_. *God in Relation to Nature: The 1998 Witherspoon Lecture.* In *Reflections.* Princeton, NJ: Center of Theological Inquiry, Public Lecture Series of 1998. Vol. 2. 1999.

\_\_\_\_\_. *Science and Creation.* London: SPCK, 1988.

**Pólya, György.** *Schule des Derrkens.* Bern: Vom Lösen mathematischer Probleme, 1949.

**Popper, Karl R.** *A historicizmus nyomorúsága.* Budapest: Akadémiai Kiadó, 1989.

\_\_\_\_\_. *A tudományos kutatás logikája.* Budapest: Európa, 1997.

\_\_\_\_\_. *Megismerés, törtételelem, politika: válogatott írások és előadások.* Budapest: AduPrint, 1997.

**Randall, Sir John.** „Aspects of the Life and Work of James Clerk Maxwell." In *Clerk Maxwell and Modern Science.* Six Commemorative Lectures. Ed. C. Domb. London: The Athlone Press, 1963.

**Révész, Imre.** *Az egyháztörténelem alapvonalai.* Debrecen: Városi Nyomda, 1936.

- Russel, Bertrand.** *A nyugati filozófia története.* Budapest: Göncöl Kiadó, 1997.
- \_\_\_\_\_. *A History of Western Philosophy.* London: George Allen & Unwin, 1946.
- Russel, Collin A.** *Cross-Currents. Interactions between Science and Faith.* Grand Rapids, MI: Eerdmans, 1985.
- Sain, Márton.** *Nincs királyi út!* Budapest: Gondolat, 1986.
- Simonyi, Karoly.** *A fizika kultúrtörténete (A History of Physics in the Context of Culture),* Budapest: Gondolat, 1986.
- Stavenga, Gerben J.** *Science and Liberation.* A blind spot in scientific research - exploring a new structure of reality. Amsterdam: Thesis Publisher, 1991.
- Szabó, Árpád.** *Hogyan lett a matematika deduktív tudománnyá? I. és II.* Matematikai Lapok, Budapest: Bolyai János Matematikai Társulat, 1957. 14. szám.
- Székely, László.** *Az "antropikus elv" a kozmológiában.* Világosság, 1989/2. szám.
- \_\_\_\_\_. *Az emberarcú kozmosz.* Budapest: Áron Kiadó, 1977.
- Tarnas, Richard.** *The Passion of the Western Mind.* Random House, London, 1991.
- Tarnay, Brunó.** *Vallástörténet - keresztény szemmel.* Pannonhalma: Bencés Kiadó, 1995.
- Templeton, John Marks and Herrmann, Robert L.** *Is God the Only Reality?* New York: Continuum, 1994.
- Thomson, Sir J. J.,** „James Clerk Maxwell.” In *James Clerk Maxwell: A Commemoration Volume 1831-1931.* Essays. Cambridge: University Press, 1931.
- Tolstoy, Ivan.** *James Clerk Maxwell.* A Biography. Chicago: University Press, 1981.
- Torrance, Thomas F.** *Scottish Theology.* From John Knox to John McLeod Campbell. Edinburgh: T&T. Clark, 1996.
- \_\_\_\_\_. *Space, Time and Incarnation.* London: Oxford University Press, 1969.
- \_\_\_\_\_. *Karl Barth. An Introduction to his Early Theology, 1910-1931.* London: SCM Press, 1962.
- \_\_\_\_\_. *Belief in Science and in Christian Life.* Edinburgh: Handsel Press, 1980.
- \_\_\_\_\_. "Christian Faith and Physical Science in the Thought of James Clerk Maxwell." In *Transformation and Convergence in the Frame of Knowledge.* Belfast, Dublin and Ottawa: Christian Journals, 1984.

\_\_\_\_\_. "Immortality and Light." In *Transformation and Convergence in the Frame of Knowledge*. Belfast, Dublin and Ottawa: Christian Jourinals, Ltd., 1984.

\_\_\_\_\_. *Das Verhältnis zwischen christlichen Glauben und moderner Naturwissenschaft, Die geistliche Bedeutung von James Clerk Maxwell*. IBW Journal, Sonderheft 2, 1982. 1-24.

\_\_\_\_\_. "La scienza e il senso del divino nel pensiero di James Clerk Maxwell." Translation of 2 by Giuseppe del Re, in *Senso Del Divino E Scienze Moderna*, Libreria Editrice Vaticana, Citta Del Vaticano, Rome, 1992. 317-3 53.

\_\_\_\_\_. *Sermon at Corsock Parish Church*, Kirkcudbrightshire, James Clerk Maxwell Memorial Service, Nov. 4., 1979. 1-6.

\_\_\_\_\_. *Sermon at the Unveiling of the Memorial to James Clerk Maxwell*, at Parton Kirk, Kirkcudbrightshire, Nov. 4., 1979.

\_\_\_\_\_. *Reality and Scientific Theology*. Edinburgh: Scottish Academic Press, 1985.

\_\_\_\_\_. *Divine and Contingent Order*. Oxford: University Press, 1981.

\_\_\_\_\_. *The Legacy of Karl Barth (1886-1968)*. Scottish Journal of Theology, 1986. Vol. 39.

\_\_\_\_\_. *The Christian Doctrine of God, One being Three Persons*. Edinburgh: T&T. Clark, 1996.

\_\_\_\_\_. *Creation, Contingent World-Order and Time*. A theologico-scientific approach. Aarhus, Denmark, 1996. Manuscript.

\_\_\_\_\_. "Einstein and God." In *Reflections*. Princeton, NJ: Center of Theological Inquiry, Public Lecture Series of 1997. Vol. 1. 1998.

Tóth, Béla. *Maróthi és a magyar csillagászat*. Debrecen: Múzeumi Kurir, 1972.

Toynbee, Arnold J. *Válogatott tanulmányok*, Budapest: Gondolat, 1971.

Tracy, David. *The Analogical Imagination*. London: SCM Press, 1981.

Török, István. *Barth Károly teológiájának kezdetei*. Pápa: Főiskolai Nyomda, 1931.

Vályi Nagy, Ervin. *Nyugati teológiai irányzatok századunkban*. Budapest: Református Zsinati Iroda, 1984.

Vanyó, László. *Az ókeresztény egyház és irodalma*. Ókeresztény írók 1. köt. Budapest: Szent István Társulat, 1980.

\_\_\_\_\_. Szerk. *A kappadókiai atyák*. Ókeresztény írók 6. köt. Budapest: Szent István Társulat, 1983.

\_\_\_\_\_. Szerk. *Szent Athanasziosz művei*. Ókeresztény írók 13. köt. Budapest: Szent István Társulat, 1991.

Varga, Zsigmond. *Bibliai görög olvasó és gyakorlókönyv*. Bevezetés. Budapest: Református Zsinati Iroda, 1984.

- Végh, László. *Az antropikus világegyetem*. Fizikai Szemle, 1989/4. szám.
- \_\_\_\_\_. *Az "életrevaló" világegyetem*. Élet és Tudomány, 1988. június 10.
- \_\_\_\_\_. *Fenntartható fejlődés*. EP Systema BT., Debrecen, 1999.
- Van Huyssteen, Wentzel. *The Shaping of Rationality. Toward Interdisciplinarity in Theology and Science*. Grand Rapids, MI: Eerdmans, 1999.
- Von Glasenapp, Helmuth. *Az öt világvallás*. Budapest: Gondolat, 1975.
- Von Weizsäcker, Carl-Friedrich. "Idő, fizika, metafizika." In *A modern tudomány emberképe*. Szerk.: Krzysztof Michalski, Budapest: Gondolat, 1988.
- \_\_\_\_\_. "Zwischen Religion und Moral." In Vályi Nagy Ervin: *Nyugati teológiai irányzatok századunkban*. Budapest: Református Zsinati Iroda, 1984.
- Walls, Andrew F. *The Missionary Movement in Christian History*. Edinburgh: T & T Clark, 1996.
- Wartofsky, Marx W. *A tudományos gondolkodás fogalmi alapjai*. Budapest: Gondolat, 1977.
- Welker, Michael. *Creation and Reality*. Minneapolis: Fortress Press, 1999.
- Westermann, Claus. *Genesis*. Kapitel 1-11. Biblisches Kommentar Altes Testament, I. Teilband, Neukirchener Verlag, 1983.
- White, Lynn Jr. *Machina ex Deo: Essays in the Dynamism of Western Culture*. Cambridge, MA: MIT Press, 1968.
- Whitehead, Alfred North. *Process and Reality*. New York: Harper and Brothers, Harper Torchbooks, 1957.
- \_\_\_\_\_. *The Function of Reason*. Boston: Beacon Press, 1958.
- \_\_\_\_\_. *Science and the Modern World*. New York: New American Library, 1960.
- Wigner, Jenő. *Szimmetriák és reflexiók*. Válogatott tanulmányok. Budapest: Gondolat, 1971.
- Wright, David. gen. ed. *Dictionary of Scottish Church History and Theology*, Edinburgh: T & T Clark, 1993.
- Zemplén, Jolán. *A magyarországi fizika története 1711-ig*. Budapest: Akadémiai Kiadó, 1961.