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dedicated to explaining the several types of genomic sequencing and their various impacts.

Although the genomic information in *Creative Destruction* may not be as easily digestible for some as found in other books (e.g., *The Language of Life* by Francis Collins), *Creative Destruction* finds strength in explaining the impact of intersection between the different digital domains. The concept of incorporating genomic data and internal nanosensors to detect circulating cancer cells long before they are seen in conventional methods, or the ability to sense a myocardial infarction and relay this to your smart phone, much like a car alerts you when your oil is low, may both seem like science fiction, but Topol creatively uses these and other examples to show that such innovation is well underway.

The final section of *Creative Destruction* is an appeal to reform the current environment of medicine and pharmaceutical industry by incorporating digital practices and open intellectual collaboration. Topol forecasts how physician education must also inevitably change. As more genomic insight is gained, fewer diseases will be labeled idiopathic. The labeling system of diagnoses will have to encounter a complete overhaul when diagnosis becomes more and more individualized with a deeper understanding of interpreting personal genomics, an area that many physicians currently feel unqualified for and perhaps are uncomfortable doing.

While *Creative Destruction* is not able to fully allay all fears and questions regarding (1) how to filter through the overwhelming data generated by genomic sequencing and continuous sensors, (2) how to ensure equal access for all to these resources, (3) the potential of eugenics, (4) protection of genomic data from authorities and corporations, (5) how and when the exorbitant upfront cost will offset current fiscal inefficiency, and (6) preventing the formation of "cyberchondriacs," Topol does validate and recognize these and other controversial topics and makes an attempt to rectify them with the benefits he sees a digital revolution providing.

Whether you agree or disagree that creating a "virtual human being" by knowing the DNA data and viewing multiple continuous physiologic metrics in real time is ethical, moral, or beneficial, *Creative Destruction* is a well-written, systematic assessment for those who desire to understand how digital advancements are currently assisting the medical arena and in what areas industry leaders project them to be assisting in the near and distant future.

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## HISTORY OF SCIENCE

**SCIENCE AND EASTERN ORTHODOXY: From the Greek Fathers to the Age of Globalization** by Efthymios Nicolaidis. Baltimore, MD: The Johns Hopkins University Press, 2011. 288 pages. Hardcover; \$55.00. ISBN: 9781421402987.

Judging by its title, *Science and Eastern Orthodoxy* is located in the field of scholarship known as dialogue between science and religion, in this case, science and Eastern Christianity. However, this book better reflects historical research in the interaction between faith and knowledge, theology and science, religion and politics in the ancient Greek-speaking Roman Empire, Byzantium, post-Ottoman Greece, and the modern Greek state.

The research by Efthymios Nicolaidis is very timely because, as is well understood in Orthodox circles and by the author himself (see pp. 197–202), Western historiography, either of the sciences or relations between the sciences and Eastern Christianity, is very poor. In most contemporary Western discussions of science and the early church, the references, in the best case, are made to Patristic sources before the fifth century AD followed by a huge gap until the time of Roger Bacon and Thomas Aquinas, through whose activities (and under the patronage of the Roman Catholic Church) the first universities in Western Europe were established. The obvious question as to why this reduced history completely ignores a nearly thousand-year-long period of Byzantine contributions to the debates on science and theology remains unanswered. This is the reason why this book by Nicolaidis is of paramount importance in our efforts to gain an understanding as to why the impact of Eastern Orthodox thought on science and its debates with theology was different and less articulated when compared to the famous clashes between new scientific ideas and church teaching in the West.

The first ten chapters of the book deal with the problem of appropriation of the sciences and science education in lay and religious institutions in the Greek-speaking part of ancient and Medieval Europe. This, I believe, is the most valuable part of the book, for it gives a detailed and well-documented account of the complicated religious and political stance concerning the sciences in Eastern Christian societies. Particularly, in chapter three, there is an interesting discussion of the role of the iconoclastic debates in terms of their impact on the

perception of the sciences and science education in Byzantium. This is an example of how some religious views (taken to their extreme), devoid of philosophical insights and having a disregard of historical achievements, can reduce the study of nature to a primitive and unscholarly level. On the other hand, the iconoclastic controversy, with its anachronistically narrow perception of nature, gave rise to a new impulse of learning and a certain revival of the meaning of the sciences under the influence of a humanism which reflected Hellenic roots (see chapter four and its expansion in chapters five and six). Nicolaidis masterfully outlines the apogee of the Byzantine polemics about the sciences in chapter seven, which is devoted to the importance of *hesychia* (the practice of silence and quiet contemplation) for all Orthodox debate.

Nicolaidis discusses the thought of St. Gregory Palamas in chapter seven. Palamas is important for historical Orthodoxy, not only because of his defense of acquiring knowledge of God through contemplation and intuition, but also for his teaching on the *divine energies* through which God can be known through creation. He advances an important point, namely, that the ascent to the Divine through creation is possible only if the dimension of the Spirit is taken into account. In modern parlance, this insight gives the study of nature a para-eucharistic dimension, breaking the symmetry between theology and science, which is often assumed in modern discussions. Reading this chapter will give the reader a good idea of the importance and indispensability of historical insight, so necessary for contemporary discussions of science and religion.

On a bit of a critical note: when Nicolaidis (beginning in chapter eleven) turns to realms beyond Greek-speaking Orthodoxy (for example, Russia), the picture he presents seems to be rather brief and incomplete. However, this is understandable, since all the sources describing the polemic between Christianity and the sciences in Russia effectively originated at the end of the eighteenth century and are seldom available to Western scholars. This fact also concerns the broad discussions of Darwinism in the nineteenth century, as well as the numerous debates and publications about faith and knowledge in the beginning of the twentieth century. While this book deals with the contemporary situation in the Greek state, it omits any discussion of the situation in the Soviet and post-Soviet Russia, which is pregnant with events, publications, etc. In no way does this comment intend to create doubt about or diminish the quality of the book under discussion. I merely

want to signal the fact that when "Eastern Orthodoxy" appears in the title, one must understand that the book is mainly related to historical and contemporary Greek Orthodoxy. Perhaps a similar book should be written about the Russian Orthodox Church and its dialogue between Christianity and the sciences.

Another point: while Nicolaidis gives a detailed list of references to original and secondary sources, the reader might wonder why a large amount of the literature on the historical interaction between Christianity and ancient Greek culture and science is not mentioned. Certainly more theological references are needed to document the relation between ancient philosophy and specific views of nature on the one hand, and Christian doctrine on the other. Although this was probably not the major aim of the book, the Eastern Orthodox perspective is loath to separate a purely historical account of events from the spiritual contexts and experiences of the fathers of the church and their heirs. I suggest that the book by Nicolaidis is a complement to numerous books on the appropriation of Greek culture and philosophy by Christians, including such particular titles as the rather dated book by D. S. Wallace-Hadrill, *The Greek Patristic View of Nature* (Manchester University Press, 1968) or J. Pelikan's *Christianity and Classical Culture: The Metamorphosis of Natural Theology in the Christian Encounter with Hellenism* (Yale University Press, 1993).

Unfortunately, a purely historical assessment of events related to the sciences during the Patristic period does not take into account the fact that the sciences, considered as knowledge of the natural world, were always treated by the fathers of the church as part of a theological activity, as contemplation of the principles of the created world in order to praise the Creator. This reality suggests that the very definition of "science" (knowledge), as understood nowadays, is quite different from the one understood by Christians more than a thousand years ago. Definitely, an approach to knowing, originating in a deep spiritual attitude to God's creation, did not bring about new experimental advances, but, even for contemporary scholars, it offers hints and a certain methodology: not about how to *do* science, but rather how to *understand* science as a specific type of human activity. This lack of understanding of the proper meaning of science (as Heidegger expressed it, "science does not think"), namely, its *telos*, sometimes obscures the contemporary dialogue with theology. The fathers of the church, in spite of their limited interest in practical applications of knowl-

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edge, understood that clear existential purposes are necessary for the application of science, without which science does not make sense or may be potentially harmful for the human spirit.

In view of what has been said, one can point to a figure such as St. Maximus the Confessor, who is considered to be one of the most prolific and synthesizing theologians of the seventh century. For Maximus, knowledge acquired through experience is not valid because of the deception which has its origin in our senses (p. 44). However, in his theological writings, Maximus advocated the view that the contemplation of nature constitutes an indispensable part of the human ascent to God by removing the moral tension between the empirical (which is available through the senses) and the intelligible (which is grasped by the analytical part of the soul). It is obvious that as a monk Maximus did not participate in an empirical study of nature. However, he provides an invaluable insight about nature. Through the contemplation of nature, a person can infer the source of its contingent facticity, namely, the Creator. Maximus was not interested in particular mechanisms of nature and their effects, but it did not mean that he therefore disdained seeing nature as God's creation!

This position suggests that any history of the sciences, related to its interaction with Christianity, must be accompanied by the history of the appropriation of the sciences within nonscientific contexts. The characteristic stance of the Orthodox is that the question is really not about the literal treatment of scientific discoveries and theories, but rather about their appropriation for the sake of Christian ways of life and thought. This makes the contemporary dialogue between science and theology in the Eastern Orthodox perspective different from those purely academic approaches in the West.

In spite of these comments, this book provides the English-speaking reader with invaluable insights and references which cover nearly a continuous two-thousand-year period of interaction between faith and knowledge, science and theology, life and its understanding. This book will certainly make a serious contribution to existing scholarship on the history of the relation between science and Christianity. It fills an essential, and inadmissible, gap in research related to Byzantium, Eastern Europe, and Russia.

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**THE CYBERNETIC BRAIN: Sketches of Another Future** by Andrew Pickering. Chicago, IL: University of Chicago Press, 2011. 502 pages, index. Paperback; \$30.00. ISBN: 9780226667904.

Andrew Pickering discusses cybernetics as "a post-war science of the adaptive brain" (p. 6). Most of the book is not about cybernetics as a system of ideas or as a field that is still alive today, but rather it is an exploration of the work of several early and influential British workers in the field: Grey Walter (1910–1977), Ross Ashby (1903–1972), Stafford Beer (1926–2002), and Gordon Pask (1928–1996), with significant discussion of two other individuals: Gregory Bateson (1904–1980) and R. D. Laing (1927–1989). In the final chapter, Pickering states his purpose in writing:

The book is an attempt to rescue cybernetics from the margins and launder it into mainstream discourse ... By rehearsing the history of cybernetics and reading it in terms of a nonmodern ontology of not knowing and becoming, I have tried to convey my conviction that there is another way of understanding our being in the world, that it makes sense, and that grasping that other way can make a difference in how we go on. (p. 390)

Pickering sees several common characteristics in the work of these individuals. First, their work was characterized by a distinctive ontology—what he calls "ontological theatre"—which did not draw a dualistic distinction between people and things. Of relevance to this, most of the individuals (all but Beer and Pask) came to their interest in cybernetics through psychiatry, rather than by way of engineering and mathematics more commonly associated with the field. Finally, all were interested in the brain, not as an instrument of representation, but as an adaptive, performative instrument. However, their work went far beyond the study of the brain. Walter is famous for building artificial tortoises and for work on "flicker" and on biofeedback. Beer worked on operations research and biological computing, and eventually he applied cybernetic ideas to the Chilean economy as a consultant to Salvador Allende. Pask was involved with research on teaching machines.

One thing that keeps this book from being merely of interest to a student of the history of the field is the connections Pickering draws between the work of these men and ideas outside cybernetics that are still with us today. For example, two important areas of work in nontraditional AI were inspired by the work of early cyberneticists: Rodney Brooks (former director of the AI Lab at MIT and chief technology officer of iRobot Corporation) credits Walter's tor-