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Faith and Reason in Roger Boscovich's Philosophy of Science

Frederick A. Homann, S.J.

Roger Boscovich was a powerful thinker and a truly renaissance man; the product of an outstanding 18th century Jesuit education. Fr. Homann's fine essay brings to light the life and achievement of this great man's scientific thought.

TO MARK THE TWO HUNDREDTH ANNIVERSARY IN 1987 OF THE DEATH OF THE Croatian Jesuit scholar Roger Boscovich, several international congresses were convened to explore the enduring value of his philosophical and scientific legacy. The Croatian province of the Society of Jesus sponsored a symposium in Zagreb, whose proceedings, in English translation, comprise "The Philosophy of Science of Ruder Boskovic."[1] Eleven papers, nine by Slavic scholars, probe Boscovich's epistemology, natural philosophy, experimental techniques, and metaphysics of finality. Other groups met in Milan, Rome, and Vienna, and we may expect their reports to amplify the reputation of a man who became part of our cultural history as natural philosopher, astronomer, physicist, mathematician, diplomat, and poet. Born in 1711, Boscovich entered the Jesuit order at age 15, and was enrolled in the Collegio Romano, predecessor of the present Pontifical Gregorian University. Here his philosophical training encompassed mathematics, physics, and astronomy, and acquainted him with Newton's *Principia Mathematica*, which early captured his imagination. On completion of theological studies, he was ordained, and celebrated his first mass at San Ignazio in Rome on 5 November 1740. He had already been appointed Roman College professor of mathematics, a late successor to the renowned Christopher Clavius (1547-1612). Boscovich's tenure let him develop an atomic theory of matter that started from Newton's theory of forces and was developed in a series of dissertations prior to his masterpiece *Theoria Philosophiae Naturalis*.[2]

The Zagreb proceedings remind us that Boscovich was both a great scientist, and a devout Catholic. He lived in the era of the Enlightenment, and died after the Suppression of the Society in 1773. As befitted a member of an apostolic order, his scientific work was not merely technical, but set into a larger human context, and located within a faith tradition. Innovative of substantial value, his research was explicitly related to revelation of God in material creation and in the Church. It was a high level academic contribution in the Church's response to the Rationalist/Empiricist challenge of Enlightenment philosophy. The problems he treated in the faith-reason balance are with us today, and the Zagreb proceedings at once detail his quite sophisticated philosophy of physical science and illuminate his approach to the task of finding God in all things, the world of atomic physics, as well as the page of Sacred Scripture.

Peter Henrici, philosophy professor at the Gregorian University, locates Boscovich's theory of knowledge against Leibniz, Locke, and Descartes. How do we know? What do we know? Indeed, do we know? Do ideas, cor-

rected and widened through reflection and theory formation, let us know what really exists? Boscovich thought an inner "Vox Naturae" forbade us to doubt either the existence of thinking substances, or of those perceived by the senses. More for mathematical than theological reasons, he denied the possibility that beside and outside the world accessible to our experience there are other worlds, not only theoretically conceivable, but also really existing as created by God, even though there is not the slightest possibility that we can know them. Assumption of such possibilities rests on the finiteness of our own world, leaving open innumerable other possibilities, and also on the divine omnipotence, an argument, Henrici notes, quite familiar to Nominalists, and used by Pope Urban VIII against Galileo to convince him that Copernicus' world system would, at best, be valid as hypothesis. Boscovich held that God chose only some of these possibilities to be realities.

Roger Boscovich

Boscovich agreed with Newton's claim that in natural phenomena we can hardly ever know real causes (in an Aristotelian sense). We may only explore and establish the natural laws of action. Our knowledge is limited because our ideas never picture the reality, although they are always caused by it. Henrici concludes that Boscovich must then espouse a consensus theory of truth, insofar as our ideas must be analogous, not with things, but with the ideas of others who perceive these same things. Had God created beings with other intellectual capacities, their ideas of material, corporeal substances would be radically diverse (and so too their geometric theory, as Boscovich often remarked.) Is this a harbinger of Kantianism? Henrici thinks not, insofar as Kant began from the subject, Boscovich from the object, a distinction substantiated, he finds, in the different ways Boscovich and Kant claimed that the realities of space and time affect us.

Boscovich, in any event, met Kant's (subsequent) demand for a limitation of human knowledge. We always know only the really existing world. Other different and unknowable worlds might exist, as a nominalist theology of divine omnipotence and incognoscibility would allow but Boscovich did not allow an entry into the divine mind by Leibnizean principles of sufficient reason and preestablished harmony. (I. P. Sztrilich's paper evaluates Boscovich's refutation of Leibniz's principle of sufficient reason.) Our task, rather, is to study the really existing, and cognitively accessible world in its natural laws. All could be different, but as Boscovich and Henrici agree, it is in this world of ours that God did, in fact, become man and save us.

Newton's macroscopic theory of forces was the basis for Boscovich's astronomy of planetary orbits and fixed stars. But he had to reconcile Newtonian gravitation with the question of the earth's motion to honor Church directives about the reading of Sacred Scripture. Zarko Dadic's paper reviews this process. On the theoretical level this meant replacing Newton's absolute space with a theory of relative space. Boscovich imagined a "starry space" with all the bodies our senses can perceive, i.e., the space where all observations and experiments are done. Newton's physics can be applied here, and so the earth moves around the sun with motions consequent on Newton's mechanics. But this is not Newton's absolute space, which is infinite and still, and, according to Boscovich, unknowable. His own "starry space" is in the process of moving to absolute space, and the number of possibilities to do so is infinite. The motion of the earth in absolute space would be different, depending on the motion of starry space to absolute space. Boscovich noted (in De Cometis) that if starry space moved in absolute space with the motion opposite to the motion had by earth in starry space, the earth would stand still in absolute space. Such a case, to be sure, is absolutely impossible, but if the Creator wanted precisely this case, then it is certainly fulfilled. Scriptural assertion of the earth's rest can be accepted along with Newton's physics. In short: "The earth will indeed stand still with absolute and real stillness in relation to motionless space, but move with relative and apparent motion relative to this moveable space."

Boscovich published his ideas from 1746 to 1756. The events of 1754 show the reservations many Jesuits had about them. Carlo Benevenuti, a Roman College

colleague who defended his views, was threatened with dismissal from the faculty by a Gesu Curia intent on protecting education in the Aristotelian tradition. Only the intervention of Pope Benedict XIV prevented the removal of Benevenuti to the provinces. (As compromise, he was changed from the Roman College chair of physics to the chair of Sacred Rites.) Boscovich pleaded for the repeal of the interdiction against Copernicus, and in 1757 the Congregation of the Index struck the clause from the Index of Forbidden Books that prohibited texts which taught the real motion of the Earth.

Theoria Philosophiae Naturalis is "a theory of natural philosophy reduced to a single law of forces that exist in nature." Very deliberately, Boscovich added an appendix relating his theory to a metaphysics of God and the soul. Miljenko Belic's paper starts from this appendix to probe Boscovich's concept of finality. Although not Boscovich's focus, finality appeared in his theory of the character and composition of physical nature, even if independent of that theory. At the start of the disquisition on God, Boscovich noted that "as for the Divine Creator of Nature, my theory distinctly shows the need that He should be fully recognized, and also His Supreme Power, Wisdom, and Providence ... There is no room for the worthless phantasms of those who think that the world appeared by chance, or that it has always existed by itself, governed by its own laws of necessity." His elimination of chance, and identification of the source of determinate laws, both done with the mathematics of probability, are filled with teleological nuances. Boscovich would have appreciated today's concern with the anthropic cosmological principle. He draws on his atomic theory and on emergent probability theory to establish the infinite impossibility that point force particles could have arranged themselves to form our existing world. To overcome this infinite impossibility, Boscovich must postulate a Being with "infinite powers of a supreme Creator, who chooses one of the infinite combinations ... who overcomes infinite indeterminacy."

This Being is not just another element, though merely of greater magnitude, in the same set of beings, but is "outside the series (of mutually linked determinate states of events) ... that has chosen that particular series from among an infinite number of series of the same kind." Indeed, this Being, he insisted, gives the beings of our world their fundamental possibility.

Interestingly, from his own mathematical perspective, Boscovich explained how the fundamental possibility of beings other than God comes from God Himself. This he did when metaphysics, even in Catholic seminaries and universities, was at a nadir that would remain to the time of Pope Leo XIII and the resurgence of the philosophy of St. Thomas. (The content and mode of Roman College philosophy and theology still needs careful study, to match our knowledge of the school's distinguished role in the history of mathematics and physics.) Boscovich developed these ideas elsewhere in his *Supplementa* appended to Benedict Stay's *Philosophiae Recentioris Libri* X (Rome, 1755 onwards). Evidently he was heir to a wide diversity of intellectual currents deriving from Aristotle, Galileo, Descartes, Locke, Newton, and Leibniz. His was an era of new philosophico-scientific methodologies, experimental data, and mathematical technique. The Encyclopedists, notably Diderot and D'Alembert, proposed a materialist synthesis. Boscovich's counterproposal embedded the new learning in a synthesis open to Divine transcendence and revelation, even though the powerful metaphysics of Aquinas and its modern treatment by Marechal, Gilson, and Maritain was not available to him. As we learn from the Zagreb proceedings, Boscovich and Aquinas approach the faith-reason interface in radically different ways: Boscovich by mathematical probability inference, Aquinas by an existential act-potency analysis. Both must establish that their conclusions transcend the natural experiential starting points of their arguments.

The Zagreb proceedings evaluate many technical details to hone our knowledge of Boscovich's epistemology and natural philosophy. How to employ correctly the powerful new tools available, recognize their operative presuppositions, and estimate their scope, were the tasks at hand, if the Church was to be able to discern in the new learning aspects of divine manifestation in the created order. It is a recurrent task. Steven J. Dick's recent monograph, *Plurality of Worlds*, reminds us of the origins of the debate from Democritus to Kant.3 Contemporary quantum mechanics speculation proposes a "many universes" hypothesis, related to, but quite diverse from the one that Boscovich rejected. Aristotle was a philosopher of finality. Newton and Laplace allowed finality no place in their natural philosophy/physics. Today, the anthropic cosmological principle submits evidence that cosmological principle submits evidence that the physical universe was structured for the purpose of human life,' an argument based on fresh data not at hand for Boscovich, but similar to his process in intent. The Church recognized in

Galileo's work questions it would have to probe anew relative to its own teaching and mode of understanding, a task that Boscovich undertook, and that still exists, in a transformed mode, today. To estimate the success of an eighteenth century Jesuit thinker in this intellectual apostolate can serve to encourage contemporary Catholic scholars, and to sensitize them to the danger, and resources, of our own enterprise. The Zagreb conference proceedings do so admirably.

Notes

1*The Philosophy of Science of Ruder Boskovic.* Proceedings of the symposium of the Institute of Philosophy and Theology, S.J. (Zagreb, 1987), Valentin Pozaic, S.J., editor, 252p. The University of Notre Dame Press is the American distributor.

2J. M. Child's 1921 English translation of the Latin text has been reprinted, *A Theory of Natural Philosophy,* put forward and explained by Roger Joseph Boscovich, S.J. (Cambridge, M.I.T. Press), 1966, 229p.

3Steven J. Dick, *Plurality of Worlds* (Cambridge University Press, 1982), 246p.

4See John D. Barrow & Frank J. Tipler, *The Anthropic Cosmological Principle* (Oxford University Press, 1986), 706p.