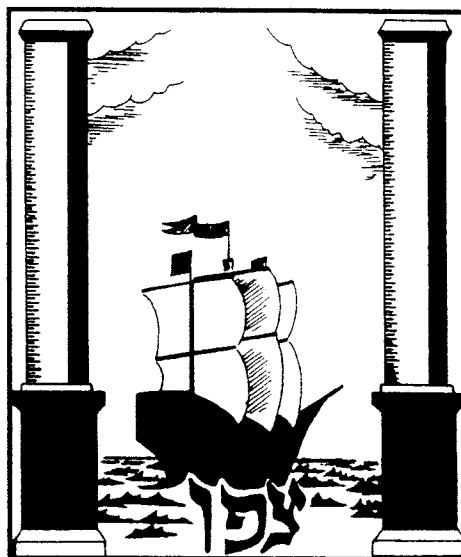


Zeitsprünge

Forschungen zur Frühen Neuzeit

Band 3 (1999)

Heft 1/2



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Giordano Bruno Revisited:

Roger Penrose's Theory of the Three Worlds

In the concluding part of his *Shadows of the Mind*, Roger Penrose hypothesizes the existence of three worlds: the world of conscious perception, the physical world, and a Platonic world of mathematical forms. Each of the three worlds seems to »emerge« mysteriously from – or at least to be intimately related to – a fraction of its predecessor (the worlds being taken cyclically).¹ This construction is surprisingly similar to a doctrine developed by Giordano Bruno, and recurring also in some 17th-century eclectic authors, such as Conrad Berg and Johannes Clauberg. Bruno theorized a »circuitus« between a world of ideas (located in God or in the divine mind), physical reality, and the human soul and its contents. This doctrine of the three worlds has traditional, more precisely Hermetic and Neoplatonic, roots, but in Bruno's work this theory is presented for the first time in the context of the all-encompassing view of a physically homogeneous, infinite universe. To be sure, Penrose's research in the relation between physics and philosophy of mind does not root in Renaissance science or philosophy. Yet, his theory of the three worlds echoes the above-mentioned theory of ideas, rather than concepts of ideas developed by 17th-century authors such as Descartes, Spinoza, Locke, Malebranche, and Leibniz. Therefore, a comparison with this Renaissance view and its »modern« version in Penrose seems pertinent.

Penrose's view of a Platonic world of mathematical forms is essentially related to Kurt Gödel's philosophy of mathematics. Platonism was interpreted by 20th-century philosophy of mathematics in several different forms. Absolute Platonism, holding the existence of a (static) world of ideal objects, has been shown untenable by the Russell-Zermelo paradox. Successively, Platonism was attacked also by Weyl, Kronecker and Brouwer.² By contrast, Kurt Gödel, perhaps the most prominent mathematical Platonist of the 20th century, developed a form of »open-ended« Platonism. That axioms and fun-

¹ R. Penrose, *Shadows of the Mind. A Search for the Missing Science of Consciousness*, Oxford/New York/Melbourne 1994, p. 413 f.

² For a general study of mathematical Platonism and its main critics, see P. Bernays, »On Platonism in mathematics«, in: *The Philosophy of Mathematics*, eds. P. Benacerraf and H. Putnam, Cambridge (Mass.) 1988 (first edition 1964), pp. 258-271. This article was first published as »Sur le platonisme dans les mathématiques«, in: *L'enseignement mathématique* 34 (1935), pp. 52-69.

damental concepts can be »found« or »discovered« means according to Gödel that they exist »objectively«. Although he did not think that they form a closed world, Gödel attributed a robust objectivity to the mathematical concepts and axioms.³ Pointing at the investigation of the most fundamental questions of set theory, Gödel rejected negative approaches to Cantor's set theory of intuitionist mathematicians and criticized their fundamental assumption, namely that mathematical objects are our constructions. Yet, the axioms of set theory do not form a closed system; quite on the contrary, the concept of set suggests their extension by new axioms.⁴

In this paper, the remarkable affinities between Bruno's »circuitus« doctrine, concerning the three worlds of ideas, physical reality and human soul, and Penrose's Platonism are spelled out in some detail. Analogously, attention is paid to the questions whether a »circuitus« theory is envisaged also in Popper's view about a third world, and how the world of ideas can be made accessible.

1. Mundus triplex: Bruno, his sources, and later authors

Bruno's theory of the three worlds, for the first time formulated in his *Sigillus sigillorum*, is a metaphysical construction connecting the human soul to physical reality and its ideal origin. It suggests a circle of »descensus« and »ascensus« between the ideal world, physical reality and the human soul. This guarantees that knowledge of the supreme world may be based upon that of natural reality,⁵ though not exclusively so.⁶ In similar wordings, the

For a broader historical approach, see L. Rivka Kfia, »The ontological status of mathematical entities: The necessity for modern physics of an evaluation of mathematical systems«, in: *Review of Metaphysics* 47 (1993), pp. 19-42.

³ See K. Gödel, »Russell's mathematical logic«, in: K. Gödel, *Collected Works*, vol. II, eds. S. Feferman et al., New York/Oxford 1990, pp. 119-141 (first published in 1944).

⁴ K. Gödel, »What is Cantor's continuum problem?«, in: K. Gödel (like fn. 3), vol. II, pp. 176-187 (first published in 1947).

⁵ Giordano Bruno, *Sigillus sigillorum*, in: *Opera latine conscripta*, eds. F. Fiorentino et al., 3 vols., 8 parts, Neapoli/Florentiae 1879 - 1891, vol. II.2, pp. 164-165: »Itaque a mundo supremo, qui est fons idearum, in quo dicitur esse Deus vel qui dicitur esse in Deo, descensus est ad mundum ideatum, qui per illum et ab illo dicitur esse factus, et ab isto ad ipsum, qui utriusque praecedentis est contemplativus, quique ut est a primo per secundum, ita cognoscet primum per secundum. Unde circuitu quodam fit a primo ad tertium discursus, et a tertio recursus ad primum, vel (si mavis) reflexione quadam a primo ad tertium fit descensus, a tertio ascensus ad primum per medium.«

⁶ See, for example, *De imaginum compositione*, in: *Opera latine* (like fn. 5), vol. III, p.101: »Ita animus sensusque noster species eatque favores quosdam immediate a superno mundi sibi procurat, comparat et recipit, quosdam vero per medium rerum naturalium atque sensibilibium.«

view is also formulated in other works of Bruno.⁷ The distinction between three worlds is essentially a Neoplatonic interpretation of the Scholastic doctrine of universals, existing »ante rem«, »in re«, and »post rem«, in terms of a theory of ideas.⁸ On this construal the human soul can represent the »corpus idearum« at a mental level.⁹

Bruno's doctrine of three worlds essentially echoes Neoplatonic sources. The background of this doctrine regarding the relation between God, the world and man is to be found in the *Corpus Hermeticum*.¹⁰ The distinction between »mundus archetypus« and »mundus sensibilis« is common also to many medieval authors. It recurs in *The Sphere* of John Sacrobosco, which was well-known to Bruno,¹¹ and in many of his commentators.¹² Fine-grained

7 Cf. also *De la causa, principio et uno*, ed. G. Aquilecchia, Torino 1973, pp. 15 and 69; *Oratio valedictoria*, in: *Opera latine* (like fn. 5), vol. I.1, pp. 14-15: »Hic ergo tandem inter homines sapientia aedificavit sibi domum rationalem et intentionalem, quae est post mundum, ubi inspicitur umbra primae domus archetypae et idealis, quae est ante mundum, et imago secundae sensibilis et naturalis, quae est mundus«; *De imaginum compositione*, ibid., vol. III, pp. 89-90, 94, 101, 198; *De magia*, ibid., vol. III, p. 403; *Theses de magia*, ibid., vol. III, pp. 458 and 462; *Lampas triginta statuarum*, ibid., vol. III, p. 206; *De minimo*, ibid., vol. I. 3, p. 136.

8 Cf. Giordano Bruno, *De umbris idearum*, ed. R. Sturlese, Firenze 1991, intentio xxx, 43-44: »Analogiam enim quandam admittunt methaphysica, physica, et logica seu ante naturalia, naturalia, & rationalia. Sicut verum, imago, & umbra. Caeterum idea in mente divina est in actu toto simul et unico. (...) In natura per vestigii modum quasi per impressionem. In intentione, et ratione per umbrae modum.«

9 *Lampas triginta statuarum*, in: *Opera latine* (like fn. 5), vol. III, p. 51: »Intelligamus mentem primam parentem luminis, intellectum primum fontem idearum et ideam idearum, intelligentias specula, species in natura idearum vestigia, rationes illarum specierum in nostro intellectu umbras idearum«; *De imaginum compositione*, ibid., vol. II.3, p. 94: »Quae sane species ante naturalia appellatur idea, in naturalibus forma sive vestigium idearum, in postnaturalibus ratio seu intentio, quae in primam atque secundam distinguitur, quam nos aliquando idearum umbram consuevimus appellare«; idem, p. 97: »Sicut enim nostrae intentiones habent originem a rebus naturalibus, quibus non existentibus et ipsae non essent, velut nullo existente corpore nulla esset umbra; ita res ipsae naturales, mundus nempe physicus nequaquam esse posset, si metaphysicus ille, nempe idea portans omnia, ex actu mentis et voluntatis divinae se ipsam communicantis non praeexisteret«; *Theses de magia*, ibid., vol. III, p. 463: »(...) ut autem est species abstracta et separata materiae secundum actum cognitionis sensitivae vel rationalis, sic perficitur tertium ideae genus quod est causatum a rebus naturalibus, quae dependet ab illis sicut secundum genus a primo.« For a similar view, see Charles de Bovelles, *Liber de intellectu*, in: *Opera*, Paris 1510, f. 10r and 11v.

10 *Corpus Hermeticum*, ed. A. D. Nock & A.-J. Festugière, 4 vols., Paris, 1946-54, X.1-14, vol. 1, p. 113-120; cf. *Asclepius*, c. 10, in: *Corpus Hermeticum*, vol. II, pp. 308-9: man is the second image of God, created according to the image of the world; cf. also *Corpus Hermeticum*, VIII.5, in vol. I, p. 89. See also Cusanus, *De coniecturis*, eds. J. Koch & W. Happ, Hamburg 1971, I. i, p. 6.

11 Cf. *De umbris*, pp. 12, 42-43; see also C. Carella, »Le lezioni sulla Sphaera e il primo soggiorno a Venezia«, in: *Giordano Bruno. Gli anni napoletani e la »perigenatio« europea*, ed. E. Canone, Cassino 1992, pp. 79-83.

distinctions between the various levels of reality and the view of man as microcosm pervade the works of Renaissance authors, such as Marsilio Ficino¹³, Giovanni Pico della Mirandola¹⁴, and Cornelius Agrippa of Nettesheim¹⁵. Some fundamental differences distinguish Bruno from these authors, however. Bruno rephrased the Scholastic distinction regarding the universals, adapting it to his theory of ideas. Moreover, in Bruno the theme of man as a microcosm holds only for the human mind.¹⁶ Finally, unlike his sources, Bruno did not split up reality in various hierarchical levels. Most crucially, the new cosmology led Bruno to a partial departure from the Neoplatonic view of hierarchy: in an infinite universe there can be no qualitative hiatus between the sublunar and the celestial world. Bruno distinguished between, on the one hand, the world of God and of divine ideas («mundus supremus»), and on the other hand, the world of natural reality («mundus ideatus»). Within the latter, man develops a speculative activity. God and the divine ideas form the basis of the natural world and guarantee its knowability.¹⁷

Bruno's theory of the three worlds is echoed by some eclectic German authors. Johannes Clauberg (1622 – 1665)¹⁸ endorsed the view that ideas are present in the divine mind as «archetypae» of created things. Man's ideas of

12 See *The Sphere of Sacrobosco and its Commentators*, ed. L. Thorndyke, Chicago 1948, pp. 80, 153 (for the commentary by Robert Anglicus), pp. 248, 286 (for the commentary by Michael Scot), p. 365 (for the commentary by Cecco d'Ascoli), p. 418 (for an anonymous commentary).

13 See Marsilio Ficino, *Theologia platonica de immortalitate animorum*, in: *Opera omnia*, 2 vols., Basileae 1576 (reprint Torino 1983), I. 1., p. 79, for a distinction between «corpora», «qualitates», «anima», «angelus», and «Deus». Cf. *In Phaedrum*, in: *Opera*, c. XI, p. 1372: «mundus corporeus», «animalis», «intellectualis», «primus intellectus»; *In Timaeum*, in: *Opera*, c. II, p. 143, for a «triplex mundus», namely, «divinus», «coelestis», and «humanus»; and idem, p. 1442, for a distinction between archetypal, rational, seminal, and corporeal world

14 Giovanni Pico della Mirandola, *Heptaplus*, in idem, *De hominis dignitate, Heptaplus, De ente et uno e scripti vari*, ed. E. Garin, Firenze 1942, p. 184, for a distinction between «intellectualis/angelicus», «coelestis», and «sublunaris»; idem, p. 192, for man as microcosm.

15 Henricus Cornelius Agrippa ab Nettesheim, *De occulta philosophia*, ed. K.A. Norwotny, Graz (=reprint ed. 1533), I. 1, p. 13, for a distinction between «elementalis», «coelestis», and «intellectualis»; II. 36, p. 296, for man as a «minor mundus».

16 *De umbris*, p. 48.

17 Notice that Bruno did not exclude the possibility of a direct grasp of the ideas; see, for example, *De imaginum compositione*, p. 101: «Ita animus sensusque noster species eatque favores quosdam immediate a superno mundi sibi procurat, comparat et recipit, quosdam vero per medium rerum naturalium atque sensibilibium.» Cf. *De umbris idearum*, pp. 77-78.

18 For biographical information and sources of Clauberg's philosophy, see W. Weier, *Die Stellung des Johannes Clauberg in der Philosophie*, Mainz 1960, pp. 1-6.

God and of the things created by God are defined as »ectypae«.¹⁹ Mediated by the sensible world, human knowledge is related to the divine ideas. Perceptual ideas depend essentially upon the sensible world.²⁰ Clauberg's view of the ontological and psychological function of ideas rephrases Bruno's theory of the three worlds: the contents of the human soul are related to the formal structure and to the origin of natural reality.²¹ Clauberg was probably not acquainted with the writings of Bruno, however, although he did have knowledge of ideas that are very similar to Bruno's, namely, through the work of the relatively unknown German author Conrad Berg.²² The latter edited a work by Johannes von Nostitz, a German follower of Bruno.²³ This may explain the unmistakable affinity between Clauberg's views and Bruno's. Like his Renaissance »precursors«, Clauberg situated the intelligible world in the divine mind,²⁴ and held that this world of ideas is mirrored in natural reality. This construal guarantees the intelligibility of natural reality, and, as in Bruno, enables the human mind to »follow« the ideas, i.e. to reproduce them on a mental level.

- 19 *Exercitationes Centum de Cognitione Dei & Nostris*, in: *Opera omnia philosophica*, Amstelodami 1691, XV.11, p. 618: »Ex ideis aliae sunt ectypae, qualis est idea Dei & aliarum rerum ab homine non factibilium, aliae archetypae, quae rerum faciendarum formulae & exemplaria sunt & Philosophis ad causam efficientem referuntur (...)«; cf. idem, XVI.12, p. 620: »Archetypum enim interdum est idea, ea videlicet quae existentiam rei antecedit (...)«. Cf. *Ontosophia*, in: *Opera*, XXIII, 344-45, p. 339.
- 20 *Exercitatio XVI*, 22, p. 621: »Nempe sicut sunt ideae seu species in mente divina, quae ipsas res creatas & existentes realiter antecedunt: ita in nostris mentibus sunt ideae seu species quaedam consequentes, quibus repraesentantur res, ut jam à Deo factae & creatae sunt.«
- 21 For discussion, see my »Johannes Clauberg on perceptual ideas«, (in print).
- 22 This author was frequently quoted by Clauberg in the *Exercitationes*; cf. pp. 599, 605, 612, 677. Chr. G. Jöcher, *Allgemeines Gelehrten-Lexicon*, 4 vols., Leipzig 1750-51, mentioned a certain Conrad Berg, who died in 1592, and his son Conrad Berg († 1642), who taught theology at Frankfurt and wrote an *Artificium Aristotelico-Lullio-Rameum*, and *Themata theologie*. According to Clauberg, he wrote a treatise on ideas, which was inspired by Descartes (see *Exercitationes*, 619-22).
- 23 *Artificium Aristotelico-Lullio-Rameum (...) ductu et auspicio Johannis a Nostitz (...) elaboratum a Conrado Bergio*, Bregae 1615. For discussion, see R. J. W. Evans, *Rudolf II and His World. A Study in Intellectual History 1576 - 1612*, Oxford 1973, pp. 232-235, and M. R. Pagnoni Sturlese, »Su Bruno e Tycho Brahe«, in: *Rinascimento*, n.s. 25 (1985), pp. 309-333, on pp. 310-311, and note 6.
- 24 The scholastic view of the divine mind as containing the exemplars of creation was still a current view among 17th-century theologians; cf. H. Heppe & E. Bizer, *Die Dogmatik der evangelisch-reformierten Kirche*, Neukirchen 1958, pp. 153-154.

2. Roger Penrose's Three Worlds

In the final part of *Shadows of the Mind*, Roger Penrose discusses the issue of how the phenomenon of consciousness relates to our scientific world-view. He defends the central thesis that conscious understanding cannot have arisen as a feature of mere computational activity nor can computation ever simulate it. The conclusion is that whatever brain activity is responsible for consciousness, it must depend upon a physics that lies beyond computational simulation.²⁵ Penrose phrases his conviction in terms of »three different worlds, and the three deep mysteries that relate each of these worlds to each of the others«. The worlds are somewhat related to those of Karl Popper, but the emphasis is quite different.²⁶

Penrose distinguishes between the world of conscious perceptions, the physical world and the Platonic world of mathematical forms. The first world is most directly known; yet, we know least about it in precise scientific terms. It is not at all clear why it should have anything to do with the physical world, but apparently it does. The existence of the Platonic world rests on the profound, timeless, and universal nature of the concepts it contains, and on the fact that mathematical laws are independent of those who discover them. The world of physical reality seems almost mysteriously to emerge out of the Platonic world of mathematics. There is a second mystery: subtly organized material objects conjure up mental entities out of its material substance. Finally, there is the mystery of how it is that the mental world is seemingly able to »create« mathematical concepts.²⁷

Penrose illustrates the nature of the Platonic world with Plato's view of perfect mathematical forms and with his interpretation of the myth of the

²⁵ *Shadows of the mind*, p. 411. Within the possibilities that physical laws allow, Penrose attempts to find an opening for a hidden, non-computational action that the subtle organization of the brain takes advantage of; cf. the second part of his book.

²⁶ Popper distinguished between the physical world, the subjective or psychological world, and the objective world, consisting in the products of the human mind, such as, myths, fairy tales, scientific theories, art and music. Popper's World 3 contains mental constructs with some similarity to those that would reside in Penrose's extended Platonic world. However, Popper's world is not regarded as having a timeless existence independent of ourselves, nor as a world underlying the very structure of physical reality. Indeed, Popper regards World 3 objects as essentially man-made and rejects Platonism. See K. Popper & J. C. Eccles, *The Self and Its Brain*, Berlin/N.Y./London 1977, pp. 15-16, and 36-50.

²⁷ *Shadows of the Mind*, pp. 412-14.

cave.²⁸ From Plato he passes on to the role of mathematics in contemporary science, emphasizing the deep underlying unity that there is between mathematics and the workings of the world. The research by Galileo, Newton, Einstein and others has shown the close and genuine relationship between the Platonic mathematical world and the world of physical objects. Penrose analyzes the relations between the worlds also in a historical perspective, excluding possibly Kantian and nominalistic views of the Platonic world, as well as Berkeley's view of the physical world. In his view the world of perfect forms is primary – its existence being almost a logical necessity – and the other two worlds are both its shadows. A most remarkable feature of their interrelation is the fact that a small region of one world seems to encompass the entire next world. Thus, it is but a tiny part of the Platonic world that can underlie the structure of our physical universe. Likewise, our mental existence emerges from a minute portion of the physical world. Finally, only a tiny part of our mental activity is concerned with mathematical truth.²⁹

Penrose's theory of the three worlds is based (1) on his interpretation of Gödel's famous incompleteness theorem³⁰ and (2) on his view of a non-computational physics. In Penrose's interpretation, Gödel's argument entails that human insight lies beyond formal argument and computable procedures. Moreover, it provides evidence for the existence of the Platonic mathematical world. As regards the second point, Penrose is convinced that within the strait-jacket of an entirely computational physics, there can be no scientific role for intentionality and subjective experience. And in his view, quantum mechanics seems more suited than classical physics to accommodate mental phenomena within the world of physical reality.³¹

28 From a historical point of view, Penrose's association of mathematical forms with ideas is problematic. In some works, Plato suggested that the ideas have a number-like structure. This does not entail, however, that the realm of ideas includes only mathematical concepts, as Penrose suggests. Moreover, in Plato's view mathematics and mathematical forms mediate between the realm of ideas and the physical world.

29 *Shadows of the Mind*, pp. 414-418.

30 Formulated in K. Gödel, »Über formal unentscheidbare Sätze der *Principia mathematica* und verwandter Systeme I«, in: *Collected Works*, vol. I, eds. S. Feferman, et al., New York/Oxford 1986, pp. 144-194.

31 *Shadows of the Mind*, pp. 418-420.

Concluding Remark

Many older theories that were allegedly marked as erroneous, may be found to contain more than simple-minded error and prejudice. Indeed, the affinity between Penrose's and Bruno's theory of the three worlds, shows that the latter's metaphysical and psychological theories, though containing surely superseded views, still possess an unexpected vitality. To be sure, Giordano Bruno's philosophy of mind does not have any modern followers in a strict sense. And most probably, Penrose is only acquainted with his name as that of an heretic burnt at the stake for scorning Christian faith and defending Copernicanism. Yet, the above-mentioned affinity invites to a closer examination.

Unstable principles play an important role in Bruno as well as in Penrose. Both embrace a genuinely Platonic view. There exists an ideal world which has a timeless existence independent of ourselves, underlying the very structure of physical reality. Both the physical as well as the mental world are mere shadows of this primary world. Obviously, Bruno did neither feel the need to argue for the existence of the supreme world nor for that of the third world. Penrose concludes on the basis of Gödel's incompleteness theorem, that mathematical concepts are discovered, rather than constructed by the human mind. Penrose's argument for the existence of the mental world as independent of the physical reality essentially begs the question, since it is merely based on the conviction that mental phenomena cannot be explained by computational physics. To underpin this conviction he appeals once more to Gödel's work, and invokes a rather controversial, non computational physics.

Philosophical and scientific realism characterize both authors involved. Bruno was convinced that the world of ideal structures could be known on the basis of sensual experience and intellectual abstraction as well as through direct access. Penrose holds that our conscious brain is woven from subtle physical ingredients that somehow enable us to take advantage of the profound organization of our mathematically underpinned universe – so that we are capable of some direct access to the very ways in which our universe behaves at different levels. According to both authors, direct access of ideas is argued for on the basis of an essential affinity between mind and the world of ideal structures. Notice, however, that in Bruno's psychology of cognition, intellectual intuition of ideas entails the immateriality of human soul. By contrast, in Penrose's view the human mind is some sort of very peculiar material entity.

In his theory of the three worlds, Bruno adapted traditional views to the quite revolutionary view of the infinite, physically homogeneous universe. Thus, the originally Neoplatonic view lost its hierarchical flavour. Remarkably, Penrose's argument seems to follow just the opposite course. Contemporary scientific and mathematical research, most notably quantum mechanics and Gödel, lead him to the postulation of three worlds, the interrelations of which he openly describes as mysterious. Indeed, his ideas about the mental and the Platonic world are largely a matter of faith. And, as he admits, his convictions should be confirmed by future developments in physical science.