

The Dialogue of Metaphysics and Religion with Natural Science: Some Continental Examples

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In a private conversation with an occupant of Rutherford's chair of Physics at Cambridge University, I was struck by his distance from that overall association of metaphysics and religion which we take as normative, even though, at this moment, it is understandably diversified. "I am prepared to consider the possibility of mind—though most of my colleagues are not." That British scepticism here is not aggressive conceals from many the intellectual distance that has grown up between science and religion; it also ensures that, despite the heroism of individuals¹ who rise above the ethos, debate is in fact rudimentary: the anti-religionists consider the battle won. English culture and *paideia* have lost an overarching conception of their unity. That is not the case elsewhere.

But when had this conception broken down? The background, but little known, work of Anneliese Meyer, from the Vatican Library, showed the anticipations of "modern" science in late medieval science.² A.N. Whitehead saw the contribution which medieval scholasticism had made to a rational culture, including subsequent natural science.³ Both Descartes as the mechanist of man and animals and mathematician, and Newton as mathematician-mechanist of the Cosmos, kept their faith, as did Leibniz as mathematician-theodicean. "The Enlightenment", about whose extent there is incomplete agreement, expressed itself in France in the unbelieving ideal of the *Encyclopédie*, in Germany in the religious rationalism of Christian Wolff. The position of Kant was not one of pure enlightenment.⁴ The last speculative endeavours to include natural science within an overall, complete philosophy including religion were those of Hegel⁵ and Schelling,⁶ who both lived into the beginnings of experimental science in magnetism, electricity and chemistry, and both saw that by this the earlier mechanistic conceptions had been surpassed. Though Hegel did not live to see it, Schelling saw his own philosophy of nature rendered irrelevant by the increasing arithmetisation of science.⁷ Schelling showed himself to be a believer; the position of Hegel was more ambiguous.

It is interesting that the Protestant mathematician, Georg Cantor, and

physicist, Max Planck, both seminal thinkers, expressed spontaneously a conception of the place of religion and metaphysics as at the apex of thought, without receiving any formal invitation to dialogue. We shall give brief pointers to their thought, as also to two cosmologist-priests of the twentieth, and this, century: the German Bernhard Philberth, and the French Dominican, Jean-Michel Maldamé.

Georg Cantor

How Georg Cantor (1845–1918) opened a dialogue with the Church, writing to German Catholic theologians about the significance of his discovery of an absolute infinity,⁸ is a completely forgotten history.⁹ This was in his conception of infinite sets of *transfinite* numbers.¹⁰ Cantor considered in a new way the age-old problem, going back at least to Zeno, of the infinite divisibility of a continuum:¹¹ if a continuum were made up of an infinitude of points, even between fixed limits, there could be no progress along it.

The position on number in the seventeenth century, the age of Newton and Leibniz, was that “number could only be predicated of the finite. The infinite, or absolute ... belonged uniquely to God”.¹² The potential infinite was the root of calculus, brought in to appreciate curved and spiralling lines. But he produced *transfinite* numbers as actual infinities, each as mathematically real as a finite whole number. Where potential infinities were represented by ∞ , Cantor represented the natural, regular order of an entire actual transfinite set by ω . This stood in relation with ν , understood as the entire sequence of natural numbers. The original ω was thought of as following ν , as much a real number as any in the natural sequence. As ω contained the whole infinite series derivable from the order of the set, it would be a limit approached but not reached by natural numbers. But a unit could be added to ω as first transfinite number and produce additional transfinite ordinal numbers ($\omega, \omega+1, \omega+2, \dots, \omega+\nu$), which could then, in its entirety, be denoted as 2ω (producing a further transfinite set, $2\omega, 2\omega+1, 2\omega+2, \dots, 2\omega+\nu$). Provided that there is no largest ν , it would always be possible to add to this second number class, but, in order to rise to a third and successively higher classes, Cantor introduced a hemming-in principle, designed to produce natural breaks in the second number class and bounding it, which then distinguished it from the third.¹³ New transfinite sets could always be generated, but that possibility, as also that of the potential infinite, depended on the existence of an absolute infinite,¹⁴ as, in some sense, actual.

These transfinite sets, with their own arithmetic, opened up a new province for mathematics; they also entailed that the old mechanistically conceived sciences, contained within numerical schemas, could not be final.

They also pointed to the infinitude of God. These views come together in a letter which he sent to the Dominican, Pater Thomas Esser, where he wrote of the “unbreakable bond which links metaphysics with theology ... [and that] for its scientific development and presentation, theology needs the service of the whole of philosophy. ... [In consequence, progress in metaphysics makes it more helpful to theology] ... so that the mysteries of faith can be seen in an insight which is deeper, fuller of content and symbolic”. All this follows from the Dogmatic Constitution (cap.I) of the first Vatican Council on God as “Inexpressibly excelling over all things that are and can be conceived apart from Him”.¹⁵ Cantor was also enthusiastic about Leo XIII’s encyclical, *Aeterni Patris* (1879), which encouraged the development of natural science in relationship with scholastic, especially Thomist, philosophy.¹⁶ Cardinal Franzelin, Jesuit theologian at Vatican I, was concerned that the positing of a concrete *transfinitum* in *natura naturata* would “in a certain sense” entail a pantheistic identity of God with the world, but Cantor was able to satisfy him that he did not posit it in *natura naturans*, and considered it not an uncreated but a created infinity,¹⁷ needed for a complete explanation of natural phenomena.¹⁸ He was able to assure the Jesuit, Pater Ignatius Jeiler, who, with his eye on Cantor’s expression “absolute infinite”, had written that it was in fact potential, that he did not see it as “pure act and most simple being”, and that the transfinite was “made up of infinite parts in act, in equality with a unity which is certain [*uni certae*], which have no communication with each other, existing simultaneously”.¹⁹ But finally, his enthusiasm for a correspondence with Catholic theologians declined,²⁰ his stance became non-confessional in relationship to an invisible church with no visible head.²¹

Max Planck

Max Planck (1858–1947) is renowned for his discovery that radiation is emitted, transmitted and absorbed in discrete quanta. Though the precise object of his interest was the smallest particles of nature, because radiation arose from the behaviour of particles and waves on the atomic scale, his interest rose to the macrocosm, because he always had in view the universal thermodynamic postulates.²² He accepted the first law of thermodynamics that the energy supply of the world is constant. Concerning the second law—of entropy, that, by an irreversible process, available energy subsides into an equilibrium in a disorder which inhibits its utilisation—his discovery that energy was radiated in discrete quanta had, in consequence, shown that the functioning of energy could not be explained by a mechanical, but only by a statistical, law.²³ His thinking rose connaturally to the hypothesising of universal laws and their testing; so his discoveries took their place by the side of the speculation of Einstein and

others on cosmic relativity. Within a Kantian-derived²⁴ framework his wider speculations turned round the overall relation of the mind's categories to the physical world as absolute in the sense of separate from them, even though its real nature was obscured from us.²⁵ Through measurements we can be sure that the agreements of the results which emerge from the mechanical or electrical processes deriving from elementary particles show us the universal constants, which are "the immutable building blocks of the edifice of theoretic physics".²⁶ A scientific positivism, based on measurements, depending on the prejudice that other factors, including the personality of the experimenter, are irrelevant, "lacks the driving force" to serve as leader; it is essentially critical, its glance is directed backward. But progress, advancement, requires new associations of ideas and new queries, not based on the results of measurements alone, but going beyond them".²⁷ From which he went on to say that an advance in our insight, would come from "identifying with each other the two everywhere active yet mysterious forces: the world order of natural science and the God of religion"; and while (in Kantian fashion) ethics (including the source for solace) can be reserved for religion, God is the starting point, while natural science is the goal, of every thought process.²⁸ Therefore "Religion and natural science do not exclude each other ... [but] mutually supplement and condition each other".²⁹ And so Planck told the nazifying Germany of the 1930s that "Religion and natural science are fighting a joint battle in an incessant, never relaxing crusade against scepticism and against dogmatism, against belief and superstition ... [and therefore] 'On to God!'"³⁰ With this viewpoint, it is not surprising that Planck, in a consistent Kantian vein (but in a new setting, and considerably simplified) should say, "the ultimate reality [for scientific investigation] is of a metaphysical character and can never be completely known". It is "not the starting point, but the goal of all scientific endeavour".³¹ It "does not stand spatially behind what is given in experience, but lies fully within it".³²

Planck was raised and remained a practising Lutheran; from 1920 to 1947 he was an elder in a Berlin Protestant parish.³³ However, like Cantor, he seems to have undergone a disenchantment with his earlier orthodox stance. In two brief personal letters of 1947, he wrote that he "does not believe in a personal God, let alone a Christian God".³⁴

The witness of Cantor and Planck as Protestant laymen to the mutual relevance of science and theology remains, despite the personal shift in their religious conviction. Such tentatives characterise the scientific domain. More significant for the dialogue is the position of priests who are expert scientists, whose religious conviction provides the overview in which, without interference, the scientific data must find their due place. Recent cosmology offers a challenge to religious interpretation.

Bernhard Philberth (priest-cosmophysicist)

Bernhard Philberth (1927–) is an independent physicist, much appreciated in German-speaking lands, but hardly known outside them. He is a scientist, author, electrical and atomic physicist, who became a priest.³⁵ A new book on revelation, the only one in English translation, says that insights provided by recent physics shed light on the truths of faith,³⁶ but other theologically speculative remarks in this book have been criticised.³⁷ We can leave on one side the theological speculation, which is asking for reactions, because the light shed by analogies from physics on the truths of faith is a locus for the dialogue between science and religion.

The thesis of his *Der Dreieine, Anfang und Sein, Die Struktur der Schöpfung*,³⁸ is that, since only God Himself is absolute, when we make ourselves the measure of a humanly closed system, making human immediate insights and the “miserable” consequences of thought-processes supposed to be necessary, to be absolute, in order to impose a closed, world-picture, totally without contradiction and uniting everything together, sanity is lost [*dann ist das Heil verloren*]. It leads to violent conflicts, with even that love which is the nature of the Church subjected to divisions. This is the rule of the “Lord of this world”, of “the Spirit of denial”, of “the Father of lies”, who was a “murderer from the beginning”. One does not have to invoke the acts of a tyrannical dictator to explain this, because it still corresponds to the essence of a creation which is living, and is an mirror image of God. “But God is the Three-that-are-One [*der Dreieine*]”.³⁹ God, as One-in-Threeness, with Each-in-Threeness the Whole, is the beginning of everything; from where Philberth goes on to see the cosmic structure in a distantly reflected [*Abglanz*] threefoldness, which characterises creation. “Even our physical space is one Threefoldness in this play of forces in a hierarchy of unity, rest and order”. These forces are being, man and science, in a mounting, unequal series.⁴⁰ The intensity of the contemplation which results in the dense presentation of the multiple threeness in creation, a deep religiosity which opens out into space-time-energy as just one branch of a great tree, evokes the reader’s admiration. Its force is necessary to support the weight of scientific and mathematical material which follows. Unlike Cantor and Planck, Philberth takes the much more difficult course of bringing the findings of cosmology into a schema which is derived from a theology, made living by more than suggestive analogies (the way of a past cosmology), produced from its confrontation with a newer physics.⁴¹ Finally, he finds the three basic characteristics [*Wesenszüge*] of the threeness of being, in relation to cosmology, to be: three-dimensionality; complementarity (where mutually exclusive elements nevertheless exist together and must be taken together—like the dualism of waves and bodies in quantum physics);

which in turn demands a fixed standpoint (we are here in the realm of speculation), which he calls “fundamentability” [*Fundamentabilität*], which is an expression of a freedom deriving from the Three-that-is-One, which also contains the mystery of evil.⁴² A first major section considers the macro-cosmos considered by cosmology and the micro-cosmos considered in nuclear physics, and its history. A second major section begins with “All-might and Eternity”, then passes from divine creation (scientifically developed)⁴³ to a (more metaphysical) account of redemption as addressed to all creation,⁴⁴ leading to a long double section on the “Physics of Relativity”⁴⁵ (essential physics which considers space, and existential physics treating time—which includes the consideration of human freedom under the theological heading of “Predestination”,⁴⁶ taking in mass-energy equivalence, as also inertia and gravity) as a physics of continuities, and “Quantum Physics”⁴⁷ (itself with its complementarity of waves and bodies) as a complementary physics of discontinuities: “sudden and unmediated reactions”. He sets out their likenesses, where electrical and magnetic quantities are common to them both, and their complementary factors where, in time and space, relativity gives prominence to gravity and quantum physics to the waves of electro-magnetic fields; and where relativity can be characterised as the physics of essentialities [*Wesenheiten*], quantum physics as of events and reactions [*Ereignisse, Reaktionen: eine Aktualphysik*].⁴⁸ The humanism of his final considerations of the significance of art-forms and cultural units, as belonging to cosmic man, is noteworthy.⁴⁹

Bernhard Philberth sets out a deeply meditated position which moves between biblical and theological data and the mathematics of cosmology. The test of its success is that other specialised cosmologists would take seriously his cosmological reflections, detecting no distortion in the areas they have in common, and would be prepared to tolerate the order which he gives them in relationship to a God who is Three-and-One. He says that he can open up theology through a fruitful contact with physics, but at the same time he has given a relationship to parts of physics conventionally kept distinct, by displaying, as *vestigia Dei*, their findings and their scientific working out, in relation to the Christian Trinity.

Père Jean-Michel Maldamé O.P.

Finally we draw attention to two of the books of Père Jean-Michel Maldamé O.P. (1939–), a theologian, also a specialist in science, not as specialised as Bernhard Philberth, though wider in range, professor at the Institut Catholique at Toulouse, and since 1997, Honorary Academician of the Pontifical Academy of Sciences.⁵⁰ These books are a) *Le Christ et le cosmos* (Paris, 1993) and b) *Le Christ pour l'univers, Pour une*

collaboration entre science et foi (Paris, 1998).

Where Philberth expounds his thought without supporting it with citations of others, the initial section of *Le Christ et le cosmos* refers to a rich bibliography of mainly French writing, in order to demonstrate “the incidence of cosmology on theology and especially Christology”.⁵¹ He points out that cosmology is only one of the sciences much in play,⁵² and also that the preoccupation with the initial singularity can make it forgetful that creation is more than that;⁵³ yet, in taking the intelligence to the limits of what is sensible,⁵⁴ it is indispensable for explaining the world in association with the victory of the risen Christ.⁵⁵ Interesting is the judgement that “scientific cosmology can have no incidence on Trinitarian theology”:⁵⁶ Philberth had shown the organisational capacity of Trinitarian theology in bringing cosmology into an order open to the Creator; surprising is the claim that Stephen Hawking (no doubt *praeter intentionem*) has in fact “founded a natural theology”.⁵⁷

“After the first inaccessible initial singularity, the universe became increasingly more complex to the point of producing life”.⁵⁸ Maldamé follows the debate into biology,⁵⁹ and reinterprets the cosmological anthropic principle⁶⁰ (“fully in accord with the dominant paradigm of twentieth century science”⁶¹), beginning thus: “the universe comes out of its original indeterminacy, to attain to consciousness by the emergence of man at the end of its history”.⁶² Man in general appears, in this light, to be a microcosm. Not man as the mere observer of it all,⁶³ and not only in general as its recapitulator, expressing the praise of God from the whole cosmos,⁶⁴ but in the transformed humanity of the risen Jesus Christ, “a being of the cosmos, but definitively and totally united with God ... [expressed] with a new profundity made clear by the scientific methodology”. Man had the choice to take [assume] cosmogony into himself, or to commit evil with consequences which extended outside himself. But now, “the recognition of the resurrection as the fulfilment of human and cosmic history calls us to understand the [cosmos’s] beginning in a new way”⁶⁵ “By the resurrection of Jesus, the ancient universe ... enters into glory”: not by passivity but by an act of the risen Christ, which “fructifies because it responds to Him”.⁶⁶ The theme continues with a corresponding soteriology culminating in a universal resurrection,⁶⁷ especially around the entailments of Jesus’ title of “Son of man”.⁶⁸ “The term of [human] destiny brings it about that the act of human life is transcendent in relationship to the diversity and dispersion, arising in the linkages of cosmogenesis and biogenesis”.⁶⁹ “Cosmology is ... indispensable for expressing better the measure of the world which will be associated in the victory of the Son”.⁷⁰

Le Christ pour l’univers is more Christologically set out than the

earlier book. It begins with the symbolic cosmic vision of Hildegard of Bingen, and passes to the perplexity of Pascal's expression of the paradoxes of his identity before the universe: infinite in its greatness and also in its tiniest detail; our reality prevents us from knowing its principles born of nothingness, and our littleness hides the infinite from view; we fluctuate between presumption and despair. All of which points to a soteriological significance for the twentieth century renaissance of a balanced cosmology.⁷¹

The Old Testament conceives of a covenant which included the cosmos, to which the Messiah-king was also related; Saint Paul drew on the Alexandrine wisdom-literature to give cosmic dimensions to the resurrection of Christ.⁷² Better than regarding creation as a gift of being (which it is), it should be seen as a relationship of the creature (which excludes any conception of a passage); the biblical terms express just that.⁷³ He expounds the anthropic principle more scientifically than before,⁷⁴ but he gives much more attention to the conditions for the emergence of life with DNA. Properly speaking, cosmology cannot extend to "the universe as something living, conscious of itself".⁷⁵ With the new findings about genetic development, which are never without a development in the soul, material body and spiritual soul can be seen as united; a singular development characterises the advance of man over the animals, this being full of *promise*. So, by a different route, he arrives at the resurrection of Christ as the centre of salvation, with the cosmic reference of Easter.⁷⁶ Here the underlying continuity is lost in discontinuities, because to pass from death to life demands a power such as lay behind creation. "Thanks to the sciences [cosmology, biogenesis] we know that this fragment [of the created world: the body of the risen Christ] is the fruit of all cosmic history. It is the finality to the emergence of life. Jesus is the son of Adam. He is fruit of the tree of Jesse. In Himself he sums up the whole universe. The ancient universe is not led back to the nothingness from which it was extracted. It enters into glory. It receives it. It is the beneficiary of the action of God. ... Yet, the Risen Christ is not pure passivity. He is established as principle of a new universe. The entrance into glory puts the dynamism which made flesh and blood a living body to the service of God's designs. This act bears fruit because the universe responds to Him, ... It can only do so in the humanity which ... is the mouthpiece of the cosmos".⁷⁷

Here père Maldamé brings together the acts of Christ with a cosmic significance, passing to the texts of Paul. God as "all in all" is no simple finalising conception of Christ's reign: its apocalyptic dimension entails a struggle against the forces of evil, through which He brings everything to perfection. The mutual filling of Christ with the All, and the all with Christ, which is the new creation, with its reconciliations, healing and pardon,⁷⁸ as

the “entropy” of law passes definitively into a new covenant,⁷⁹ with the New Man prefiguring a new community,⁸⁰ in a cosmos transfigured, where time will be abolished in an eternal life before the vision of God.⁸¹

The state of timeless eternity can best be designated by symbols, as at the end of the *Apocalypse*: light, a city, a temple, a garden, espousals; especially that of a meal. And so “Humanity will be the source of a new universe ... fully humanised by the glorious coming of the Son.”⁸²

As peroration père Maldamé calls for a dialogue between science, and especially cosmology, and religion, not of convergence but of complementarity, based on their appreciation of the real: “the real for science is what is given in observation and experimental handling, linked to theoretical elaboration. For theology, the real is human life in its way of conversion to a single God revealed in the singularity of Jesus Christ. Their encounter is based on an ontology which rejects neither what is sensible nor what is in a state of becoming. It does not imply an identity of view”. So he brings together the light given by science with “the aspiration for salvation ... sensitive to the anguish at the irreversibility of time and to the richness of the gift which it provides”⁸³ “... the finality which was given in the resurrection of Christ is a principle which explains [éclaire] everything. This light bears on man, but also on the entire universe of which man is the heart”.⁸⁴

The witness of these four continental thinkers shows that the insular scientific presumption of the irrelevance of metaphysics and religion is not true. Their diversity of viewpoints suggests that what we can expect is a number of loosely-related essays at unity, but, outside an affirmation of the existence of God, no detailed cohesion.

- 1 One remembers the sensation caused by the publication of Sir Edmund Whittaker’s *Space and Spirit* (London etc. 1946), with its inference from the non-eternity of the world to its creation, and therefore to a Creator (pp.116–7), and its citation by Pius XII in an address to the Pontifical Academy of Sciences (to which Sir Edmund belonged) (original Italian version, dated 22 November 1951, in *Acta Apostolicae Sedis* (An. et vol XXXIV (Ser.II v. XIX) 25th January, 1952), v. pp.41–2. Père Maldamé (*Christ et le cosmos* (v., *infra*, after n. 50) p.81) comments interpretatively, “in the face of the facts, no-one would any longer” consider the possibility of an eternal world. cf. also Sir Edmund’s (Durham) 1942 Riddell Lecture, *The Beginning and End of the World* (Oxford 1942), pp.63–4 (creation is continuous), pp.39–40 (cosmic entropy argues for creation and a separate God). One also gladly acknowledges the life-long concern of Dr. Peter Hodgson.
- 2 More than half of her writings (including new editions) are to be found in the Italian series *Storia e Letteratura* (Rome): v. vols. 22, 37, 41, 52, 69, 97, 105, 112, 138. Some English translations of extracts from these are in *On the Threshold of Exact Science, Selected Writings of Anneliese Meier on Late Medieval Natural Philosophy* (Univ. of Pennsylvania Press, 1982).
- 3 “Fortunately the scholastic age of Alexandrian scholarship dominated Europe for centuries, and bestowed upon civilisation priceless treasures of thought”,

Adventures of Ideas (Cambridge 1933), p.150, cf. p.134.

- 4 Kant always interpreted “Aufklärung” in a sense which followed from his own philosophy; and the discipline of reason, its supposed motive force, by his critical philosophy was not completely negative in intention. His warning against excessive expectations from reason was principally aimed at Aufklärung—and pre-Aufklärung theology and psychology, but the defenders of a secular conception of rational enlightenment remain apprehensive even until now that the critique would render the secular exploitation of reason impossible.
- 5 Besides the *Naturphilosophie*, as *Enzyklopädie II*, v. his *Habilitation* dissertation: *De Orbitis Planetarum*.
- 6 For this v. the various (different) figures for a philosophy of nature, along with the natural philosophy section of the complete philosophies of the early Schelling. They all are forms of a philosophy of absolute identity: i.e. of the identity of real and ideal in the absolute.
- 7 Père Maldamé comes to the conclusion that, with an astronomy become astrophysics, “In the place of movement described by the mechanics of Descartes and Newton, and continued by Lagrange and Laplace, [cosmology] proposes a genesis: a description of transformations” (op.cit., p.35). But such was the philosophical search of Schelling after his philosophy of absolute identity had been lampooned out of existence by Hegel. Schelling had, in this earlier philosophy, maintained that each thing has its own time and space, which is not far removed from Einstein’s conception of “reference frames” for any point in space, and he had integrated time with spatial dimensions, which anticipated Minkowski’s claim for time as a new dimension: both a hundred years later.
- 8 An expression of Leibniz: “L’infini véritable ... c’est l’absolu”: quoted by Cantor, *Ges.Abh.* (v. next note), p.179.
- 9 For this, v. H.Meschkowski: i) *Probleme des Unendlichen, Werk und Leben Georg Cantors*, (Braunschweig 1961), ch.8; ii) art. “Cantor, Georg” in *Dictionary of Scientific Biography* vol.3 (New York, 1971). Also “Das Leben Georg Cantors” by A.Fraenkel in *Georg Cantor Gesammelte Abhandlungen* (ed. E.Zermelo, Berlin 1932, and later reprints), pp.452–83. Section IV and espec. V of its “Mitteilungen zur Lehre von Transfiniten” (v. pp.401 n.3 (=pp.401–4), p.405 n.1 and sub-note *) shows how widely read he was in the Church Fathers and Scholastics. While his “Grundlegen einer allgemeinen Mannigfaltigkeitslehre” (*Ges.Abh.* III, 4, Nr.5 (pp.165–209) says that the “absolutely realistic, but simultaneously not less idealist basis of his reflections”, with the “infinite relationships also possessing a transient reality” (p.181), “is in altogether essential agreement with the principles of the platonic system, as also with its essential he adheres to the “principles of the Platonic system, as also with the essential characteristics [Züge] of the spinozistic system”, as also that of Leibniz (pp.206–7). He also took Thomas Aquinas into account, though he rejected his opinion that a continuum consisted of *no* parts, saying he had handled it as “a religious dogma” (pp.190–1, 207). But best of all, for mathematician and non-mathematician, is J.W.Dauben, *Georg Cantor, His Mathematics and Philosophy of the Infinity* (Cambridge Mass. etc., 1979), chs.5 and 6.
- 10 For the place of Cantor in the place of mathematical history, v. U.Bottazzini, *The Higher Calculus: a History of Real and Complex Analysis from Euler to Weierstrass* (translated from the Italian by Warren van Egmond, New York 1986), pp.274–80.

- 11 B.Russell saw the connection between Cantor and Zeno's paradoxes: v. *The Principles of Mathematics* (only vol.1 produced: Cambridge 1903), ch.XLII, pp.346–354, 358–60.
- 12 Dauben, p.123 (v. *Ges.Abh.* pp.175–83).
- 13 Following Dauben's account, pp.96–9. This draws on *Ges.Abh.* pp.195–9, which concludes, "By respecting these three principles it is possible to arrive, with the greatest sureness and self-evidence, at ever new classes of numbers, and with them to arrive at all occurring, different, successive powers in corporeal and intellectual nature, with the newly acquired numbers always having the same concrete determinateness and objective reality as the earlier ones"
- 14 But Cantor's *absolute* ordering was not as ordered as say Schelling's: "A manifold [*Vielheit*] can be so constituted that the assumption of a being together [*Zusammensein*] of all its elements into a whole leads to a contradiction, so that it is impossible to conceive of the manifold as a unity, a completed thing. Such manifolds I call absolutely infinite or inconsistent manifolds" (*Ges.Abh.*, p.443); cf. Dauben p.245.
- 15 Dated 1 February 1896. v. Meschkowski i) pp.122–4, including n.157: for source v.p.132 of Meschkowski's "Aus den Briefbüchern Georg Cantors", *Archive for History of Exact Sciences* 2, pp.510–13. In January 1894 he wrote (to Hermite) that Divine providence has denied him a post at Göttingen or Berlin which "constrained me, through a deeper penetration into theology, to serve Him and His Holy Roman Catholic Church better than I have been able with my exclusive preoccupation with mathematics", v.Meschkowski i), p.124 (taken from M. "Aus den Briefbüchern", pp.514–5; cf Dauben p.147). Meschkowski i) p.123, n.157, refers to a marginal addition in the draft, without indication of its place: "(With the reservation [that one would be] submissive to an infallible decision of the church)" ["Unter vorbehalt der Unterwerfung vor der unfehlbaren Entscheidung der Kirche"].
- 16 v. Dauben, pp.146–8.
- 17 v. Dauben, pp.145–6, citing *Ges.Abh.* pp.385–7. cf. Meschkowski I, pp.126–7.
- 18 Continuation (dated 15 February) of letter to Pater Esser of 1 February (cf., *supra*, n. 15), id., p.513 (cited by Dauben p.147): "From me, Christian Philosophy will be offered for the first time the true theory of the infinite".
- 19 Cited in Meschkowski i) (pp.257–9) from a private source. cf. his account of it, *ib.*, p. 124. Cantor quotes from the commentary on Aristotle's *Physics* (1591), by the "Conimbricenses": Jesuits of the Portuguese university of Coimbra.
- 20 Meschkowski i) p.141.
- 21 *ib.*, pp.126–9, 225.
- 22 cf. H.Hartmann, *Max Planck als Mensch und Denker* (Berlin 1938), p.117.
- 23 v. art. "Planck" by R.H.Stuewer, in *The New Encyclopedia Britannica* (15th edn. 1997), vol.25, cols.856b–866a.
- 24 On Kant and Planck, v. espec. C. Liesenfeld, *Philosophische Weltbilder des 20.Jahrhunderts, Eine interdisziplinäre Studie zu Max Planck und Werner Heisenberg (Epistemata (Reihe Philosophie) 113, Würzburg 1992)*, the whole section IB, especially pp.31–43.
- 25 v. his 1947 paper "Religion und Naturwissenschaft". translated (by F.Gaynor) in his *Scientific Autobiography and Other Papers* (London 1950), p.181: "natural science exhibits a rational order to which nature and mankind are subject, but a world order the inner essence of which is and remains unknowable to us, since only our sense data (which can never be completely

- excluded) supply evidence for it". The nuance of the relationship he found in Kant himself: "Kant did not teach that man actually prescribes laws for nature. He taught simply that whenever man formulates the laws of nature, he always adds something of his own too" (ib., p.176)
- 26 ib., p.170 (cf.pp.169–173).
- 27 ib., p.172.
- 28 ib., pp.182–5.
- 29 ib., p.186.
- 30 ib., p.187.
- 31 In a 1947 lecture, "Sinn und Grenzen der Exakten Wissenschaften", also in *Scientific Autobiography*, pp.107–8.
- 32 ib., p.102.
- 33 v. J.L.Heilbron, *The Dilemmas of an Upright Man, Max Planck as Spokesman for German Science* (Berkeley, 1986), pp.183–4.
- 34 v. C.Liesenfeld, op.cit., pp.15,17. This is also the overall conclusion in the last part of the article, "Planck, Max", "Philosophy, Religion", by H.Kangro in the *Dictionary of Scientific Biography*, vol.XI, pp.13b–15b.
- 35 In consequence of his independence, it is difficult to find precise information about him. He has a brief entry in *Kürschners Deutscher Gelehrten Kalender* of 1974; but disappears from later editions. The dust-jacket of his *Der Dreieine* (Stein am Rhein 1976⁴) lists an impressive list of international contributions; he himself has said publicly that he had been "advisor to different governments as well as the Vatican" (but he is not an academician of the Pontifical Academy of Sciences). His *Christliche Prophetie und Nuclearenergie* (Nuremberg 1961¹, last edn., Stein am Rhein 1991), which makes Saint John's *Apocalypse* "a protocol and almost exact description of a nuclear war with all its consequences" (so a review) is much appreciated by German Catholic and Protestant academics, but we exclude it here as being important, but not a direct entry into dialogue.
- 36 *Offenbarung*, abridged translation, *Revelation* (Plumpton, Australia, 1994), p.39. There is a shorter, different abridgement, *The Sovereign* (Plumpton, 1997).
- 37 By J.F.McCarthy, in "The New Theology of Bernhard Philberth" (*Living Tradition*, Nov.1994). They include his logical criticism of the formula "Mary as Mother of God". One appreciates the reviewer's concern, and Philberth's presumption of a false logical argumentation should not be answered by further logic: rather by an understanding of the mystic base of definitions, where the overlapping of categories of different origins alludes to the mystery which is beyond words: cf. my "Kategorialität in der Patristik", in *Kategorie und Kategorialität* (edd. D.Koch and K.Bort, Würzburg 1990), pp.49–74
- 38 i.e. "The Three-that-are-One, Beginning and Being, The Structure of Creation". The 4th (not the last) edn. (Stein am Rhein, 1976) has been used.
- 39 v. ib., pp.64–5. To make the irony of this passage clear, it is necessary to paraphrase it in English: most men attempt to explain the world by a one-in-oneness, but far more is seen when it is interpreted according to a three-in-oneness.
- 40 ib., p.21.
- 41 "This reflection back on to itself [*Rückbesinnung*] of theology at the hands [*unter der Faust*] of physics is not the end of theology, but a greater beginning. ... It permits the original and ancient truths of theology to arise in a new way", ib., p.45 (cf., pp.41–5); cf pp.439–40.
- 42 ib., pp.46–65.

- 43 ib., pp.324–331.
- 44 ib., pp.332–3.
- 45 ib., pp.334–437.
- 46 ib., pp.380–1.
- 47 ib., pp.438–531.
- 48 ib., pp.440–1. “Wesenheiten” are essences [*Wesen*] abstractly considered.
- 49 As arising from geometrical figures: ib., pp.569–79; followed by a section on man and woman (pp.579–82).
- 50 A fuller account of his work is in the “Présentation” by Mgr Doré to his *Le Christ pour l’univers*, p.7.
- 51 op.cit., p.8.
- 52 ib., p.110.
- 53 ib., p.131.
- 54 ib., p.272.
- 55 ib., p.265; cf. p.273.
- 56 ib., p.90.
- 57 ib., p.76.
- 58 ib., p.103.
- 59 ib., p.102.
- 60 Admirably summarised in ch.7.
- 61 ib., p.103.
- 62 ib., p.97.
- 63 ib., p.100. As the anthropic principle had originally proposed. cf., *infra*, n.74.
- 64 ib., p.133: as S. Irenaeus linked together deification and recapitulation.
- 65 ib., p.134.
- 66 ib., p.163.
- 67 ib., p.273.
- 68 v. chs.11–18. The power of its insights frustrates brief summarising. Saint Paul’s expression of God as “all in all” is better explained, he says, thanks to science (p.272).
- 69 ib., p.255.
- 70 ib., p.265.
- 71 ib., pp.15–19. One may doubt whether the importance given to Pascal’s ironies can bear the weight of significance often attributed to him.
- 72 op.cit., pp.43–62.
- 73 ib., p.87: “to found, to fashion, to mould, to breathe out, to call [...] express the foundational relationship and its actualization”.
- 74 One is grateful for the succinct expression of why it supposes the ultimate existence of an observer: “The human observer could not live in a universe other than his own. Since the observer exists, the universe must fulfil the conditions which makes this existence possible” (ib., p.97).
- 75 ib., p.112. Even less so for the sciences of man than for biology (p.115).
- 76 ib., pp.117–60.
- 77 ib., pp.189–90.
- 78 ib., pp.249, 260.
- 79 ib., p.258.
- 80 ib., p.268.
- 81 ib., pp.260–1: as a fulfilment of the original Sabbath.
- 82 ib., p.268 (cf. pp.261–8).
- 83 ib., pp.270–1.
- 84 ib., p.277.