Christology and the Birth of Modern Science

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To connect Christ and the birth of modern science may sound a jarring note in this post-Christian age of science. Not a few devoutly Christian scientists would be surprised on being told about such a connection. Non-Christian scientists, who make up the vast majority of the body scientific all over the world, would dismiss the idea out of hand. In doing so they would echo the reply which Darwin sent in 1879 to the third letter written to him by W. Mengden, a 17-year-old student in Germany.¹

By 1879, Darwin had for more than forty years turned his back on Christian faith which he identified with a strictly literal interpretation of the Bible and especially of its creation story. So long an alienation from Christian faith blinded Darwin to the fact that with his reply he gave his own answer to Christ’s historic question, “And you, who do you say I am?”

In his first two letters the young student asked Darwin whether evolution was compatible with belief in God. The ambiguity of Darwin’s replies evidently prompted young Mengden to pose similar questions to Ernst Haeckel, who had for some time been Darwin’s chief champion in the German-speaking world. Haeckel, as reported by Mengden in his third letter to Darwin (dated June 2, 1879), had agreed with Darwin that belief in God was compatible with holding the theory of evolution. In his reply to the young student, Haeckel chose to be ambiguous with respect to the personal character of God, although this was not allowed within Haeckel’s pantheistic monism. Much less did Haeckel refer to the materialist character of evolution as he and Darwin held it. It was, however, with no ambiguity that Haeckel described his and Darwin’s views on Christ: “He [Darwin] cannot believe in the supernatural.”

Mengden reported this to Darwin because he felt that no one, apart from Darwin, could help him “to get hold of the truth.” The truth had Christ as its central point for the young student who displayed a penetrating insight by posing, in the

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same breath, two questions. One was whether one could believe in Christ as described in the Bible, the other concerned the definition of God that could be held by one who accepted Darwin's theory. These questions were, for young Mengden, still in the gymnasium, far from being purely academic. He saw them in the perspective of life and death, and all the more so, since he was in the grip of most serious thoughts following the recent death of his best friend.

The young student did not so much as suspect that Darwin was the wrong man to provide answers to those questions. They demanded philosophical depth for which Darwin had no eyes. He did not even care to clear up the muddle in which he had been about purposiveness in nature and about the nature of the human mind. Much less did he want to part from his tactic to appear a mere agnostic instead of what he had really been for many years—a plain materialist. Only with this in mind can one see the thrust of the summary of Darwin's view on evolution and theology which he had asked his son, Francis, to send on his behalf to the young student:

I am much engaged, an old man, and out of health, and I cannot spare time to answer your questions fully—nor indeed can they be answered. Science has nothing to do with Christ, except insofar as the habit of scientific research makes a man cautious in admitting evidence. For myself, I do not believe that there ever has been any revelation. As for future life, every man must judge for himself between conflicting vague probabilities.

The significance of that summary should be easy to see. It is typical of the views that prevail about Christ and revelation in a culture that first and foremost claims to be scientific. The summary also reveals the most vulnerable point of that empiricism by which our secularist culture lays so great a store. Within that empiricism, the highest premium is put on caution which familiarity with scientific method should generate about facts. Yet the same empiricism has not failed to promote a crude discrimination among various kinds of facts. In particular, it fostered studied neglect about the facts of history which, unlike the data science deals with, do not repeat themselves. Undoubtedly, the most towering among those facts is Christ and the religious history that centers on Him.

Darwin's remark about Christ is about a hundred years old. Then, in the 1870s, the secularization of the Western World was in a fairly advanced stage. Yet, the process was still largely intellectual, carried out mostly by an exploitation of science for materialistic and agnostic ideologies. Secularization was far less advanced in the realm of morals. In the Western World the principles of Christian morality still prevailed, in public at least, although the first attacks on the indissolubility of marriage had already been successfully carried out. Immorality, in its various forms, was widely practiced, but not publicly condoned, let alone approved by legislation as is done today.

Today secularization is complete both intellectually and morally. Christian morality is openly flouted while immorality is supported by civil legislation. As to
Christ, secular scholarship no longer grants Him a major historic role, let alone a
divine status. He is just one of the major religious figures.

In this very secularist world of ours, not a few Christian theologians write and
speak as if they lived in an unreal world. This is particularly true of their writings
about a cosmic Christ, so prominent in the letters of Paul. What is the true value of
those writings, one may ask, if they contain so little about the cosmos, the real cos-
mos, which is now spectacularly investigated by science?

Theologians still have to learn that the science of the cosmos or universe de-
mands more than theological perspectives, let alone mere theological rhetoric. The
universe is the totality of hard, exact, empirical facts that demand more for their
handling than good intentions and pious words.

Our question here is whether there are some major facts of the history of sci-
cence that can be correlated with orthodox historical Christology and whether they
can be satisfactorily explained without it. There is at least one such monumental
fact. It is the fact of the birth of science in the fourteenth century. That century, let
us recall, had preceded by three hundred years the century of Galileo and Newton
to which that birth is usually assigned.

That birth is a most monumental historical fact. Having taken place in medieval
Christian Western Europe, it still assures a leading role to the Western World. The
present political transformation illustrates this all too well. Behind perestroika and
glasnost there lies the recognition of what President Reagan put in a memorable
phrase in London on June 5, 1989: “The Goliath of totalitarianism will be brought
down by the David of microchip.” In other words, the Soviet Union is suing for
peace because today it is technologically and scientifically far more behind the
West than it was thirty years ago.

One may also ask the question: Would there be a Western World today if sci-
ence had been born in ancient China, India, Egypt, Babylon, Greece or even among
the Arabs? In all those cultures there was plenty of talent and they could boast of
some promising discoveries. It is enough to think of the discovery of the magnet in
China, of the decimal system in India, of phonetic writing in Egypt, of Euclidean
geometry in ancient Greece. But none of those cultures produced science. In all of
them science suffered a monumental stillbirth.

This leads to the next question: What is science? Science is the empirico-quant-
itive investigation of things in motion. That this is so is demonstrated by each
and every branch of physics, the most exact of all sciences. Gravitation is the study
of bodies accelerated in a gravitational field; electricity and optics are the study of
re motion of photons; thermodynamics is the study of the flow of heat and of the
undom motion of atoms and molecules. In atomic and nuclear physics we study
re interaction of elementary particles, a study demanding ever-larger accelerators.

Ultimately, all those studies are based on Newton’s three laws of motion: the
w of inertial motion, the law of the equality of action with reaction, and the law
ich equates force with the product of acceleration with mass. Of these, the law
inertial motion is the first, conceptually as well as historically.

The birth of science can therefore be seen as the birth of the first formulation of
law of inertial motion. The first to formulate it was John Buridan, professor at

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the Sorbonne around 1330. He did so in his commentaries on Aristotle’s *Physics* and *On the Heavens*. In both of those works, motion is explained in terms of a continual contact of the mover with the moved. Aristotle mentions favorably the idea that a projectile keeps moving because the air separated by its motion closes in behind it and thereby keeps pushing it forward. Were this true, there would be no need for gasoline to drive automobiles.

Behind Aristotle’s sympathy for this idea lies his pantheism. For Aristotle, any motion on earth is a continuation of the motion of the celestial sphere which in turn keeps moving because of its contact, through desire, with the Prime Mover. The latter is never spoken of by Aristotle as a Creator. On three occasions, Aristotle rejected the idea of creation out of nothing, an idea incompatible with pantheism in which the world is necessarily eternal. The Aristotelian cosmos can have no beginning either ontologically or temporally.

Buridan’s explanation of motion could not have been more un-Aristotelian. He spoke of the start of motion in terms of an impetus given to a body. What he meant by impetus was a quantity of motion or momentum in modern scientific terminology. He also emphasized the resistance of the air. He noted:

...one who wishes to jump a long distance drops back a way in order to run faster, so that by running he might acquire an impetus which would carry him a longer distance in the jump. Whence the person so running and jumping does not feel the air moving him, but rather feels the air in front strongly resisting him.

This passage introduces an epoch-making cosmological message steeped in a theological perspective. The latter will inconvenience only those who, with Popper, repeat that all science is cosmology and, again with him, fail to ponder the beginning of science as a study of things in motion, including their totality which is the cosmos or universe. It is no accident that, due to his anti-metaphysical and anti-theological perspective, Popper took the expansion of the universe for a most doubtful idea. In that perspective one can only falsify propositions, scientific or other, but never assert their truth. Fortunately for the future of science, Buridan had a confidence in scientific truth because he held firmly the ultimate truth about the cosmos or its createdness. To continue with him:

Since the Bible does not state that appropriate intelligences move the celestial bodies, it could be said that it does not appear necessary to posit intelligences of this kind, because it would be answered that God, when He created the world, moved each of the celestial orbs as He pleased, and in moving them He impressed in them impetuses which moved them without His having to move them any more except by the method of general influence whereby He concurs as co-agent in all things which take place; “for on the seventh day He rested from all work which He had executed by committing to others the actions and the passions in turn.” And these impetuses, which He impressed in the celestial bodies, were
not decreased nor corrupted afterwards because there was no inclination of the celestial bodies for other movements. Nor was there resistance which could be corruptive or repressive of that impetus. But this I do not say assertively, but rather tentatively so that I might seek from the theological masters what they might teach me in these matters as to how these things take place.\textsuperscript{10}

The theological masters said nothing, which is always a good idea when they are confronted with a proposition which is not theological but scientific. The impetus theory, as further developed by Nicole Oresme, the successor of Buridan and the future bishop of Lisieux, became a major success at the Sorbonne.\textsuperscript{11} From there it was carried to all universities in late-medieval Europe. Copernicus learned about it as a student at the University of Cracow and later used it as an explanation of the dynamical problems created by the earth’s motion.

Galileo held the impetus theory in the same form, namely, that the inertial motion of celestial bodies has to be circular. It was Descartes who first formally stated that all inertial motion has to be linear, a point which Newton borrowed. However, the all-important conceptual breakthrough was not the shift from circular to linear inertia, but rather from motion through continual contact with the mover to motion with no further contact with the mover once the latter had provided the initial impetus.

The birth of science, insofar as it is inconceivable without the birth of the idea of inertial motion, has, as shown by Buridan’s very words, explicit connection with the idea of creation out of nothing which only a personal, infinitely perfect Creator can perform. Only through such a creation can the universe enjoy a very specific kind of autonomy. This is not the autonomy of a necessarily existing eternal universe which invariably inspired an a priori approach to its regularities and has therefore stilled interest in empirical investigations. (Herein lies the true reason for those stillbirths of science in all ancient cultures.) The autonomy in question is rather a property given to the universe. As something given, it represents one of an infinite number of possible sets of laws, of so many possible autonomies. Since none of them can be derived on an a priori basis, the actual existence of any of them can but invite empirical investigation, an idea indispensable for scientific research.

It now remains to unfold the deeper aspects of the idea of creation out of nothing as held by Buridan, Oresme, Copernicus, Descartes, Galileo and Newton himself. It was a very Christian idea both in its origin and in its safeguards. The first point to note is that, apart from the Second Book of Maccabees, the Old Testament only implies the idea of creation out of nothing but does not teach it explicitly.\textsuperscript{12}

The idea of creation out of nothing was born within a New Testament framework. The starting point is Paul’s doctrine of Christ as the Son in whom the Father creates everything. By assigning to Christ the work of creation, Paul wanted to emphasize His equality with the Father to whom the Old Testament attributes the chief prerogative of creation. If, however, the Son is co-equal with the Father, the universe can be but a mere creature, however supreme.
Similarly, John refers to Christ as the Father's "only begotten" or *monogenes* (*unigenitus*) in whom all were created and without whom nothing that exists has come into being (John 1:3). The impact which the word *monogenes* had for the dogmatic specification of Christ as consubstantial with the Father is well known. Much less is known of the impact which that word had on the development of the Christian view of the universe. The extent of such an impact may be surmised if we recall that with the Greeks and Romans the word *monogenes* (*unigenitus*) had the universe for its supreme reference point. Examples of this can be found in the writings of Plato, Plutarch and Cicero, to mention only some major spokesmen of classical antiquity. They referred to the universe as the entity that alone was "begotten" from the divine principle because they saw in it the only genuine emanation from the Supreme Good or Prime Mover.

The gain that derived for the universe through its being most intimately united with the Supreme Good or Prime Mover was only apparent. The divinization of the universe within Plato's or Aristotle's pantheism meant the destruction of the universe as a coherent entity. Permanence with no change, a chief attribute of divinity, could be grafted, not without some arbitrariness, only to the realm of the fixed stars. Already the realm immediately below it, the realm of the planets (including the sun and the moon) suggested by its changes a departure from divine, that is, unchanging rationality. This was implied in the word *planet*, which in its Greek form stands for an erratically wandering body. As to the terrestrial realm, not a few changes within it could easily appear the embodiment of partial irrationality. Such a non-uniformly rational universe could not invite the kind of scientific investigation which is summed up in the phrase, "all science is cosmology," insofar as this means that the same rational laws are valid throughout the entire universe.

It should be obvious that the understanding of the universe had to be very different in the Christian context in which a flesh and blood human being is considered as the only begotten Son of a Divine Father essentially different from the universe. This is not to suggest that Christians did not admire the universe. For them--the first chapter of Paul's letter to the Romans is a most memorable instance--the universe is the chief evidence of the Creator himself. For all that, as I have stated elsewhere,

...with Christians, inspired not by abstract *theologoumena* but by a most vivid vision of a most tangible *only begotten* Son of God, the universe could not retain its hallowed status as a "begetting" from the "divine," that is, the status befitting an entity sharing divine nature. With Christians the universe had to remain a mere creature. This had to be so in spite of the comprehensiveness of all created perfections that made for Christians the notion of the universe the most exalted notion conceivable apart from that of God Almighty.

This exalted status of the notion of the universe is implied in all forms of Christian creed. They all predicate the existence of God on the existence of "heaven and earth" or the existence of that universe which is a comprehensive totality. Greater
than that totality even God himself could not have created, so Aquinas declared
with his always economic use of words, an economy largely lost on most post-
Vatican II theologians. Although they often claim to be the heirs to the thinking of
John Henry Newman, they still have to emulate his disarmingly plain dicta such as,
“there is but one thought greater than that of the universe and that is the thought
of its Maker.”

To recall Newman is especially appropriate in view of his studies of the Arian
heresy and of his warnings that pantheism was to be the great conceit of the times
to come. Curiously, Newman, so able to read between the lines, called no attention
to the idea which Arius must have had about the universe, that is, to his cos-
mology. The fact is all the more curious because Newman begins his chapter on
Arian heresy with a recollection of Sozomenes remark that “Arius was the first to
introduce into the Church the formulae of the ‘out of nothing,’ and the ‘once He
was not,’ that is, the creation and the non-eternity of the Son of God.”

Newman should have pointed out that the formula “out of nothing” (ek ouk on-
ton, de nihilo) entered Christian parlance four generations before Arius, in the sec-
second half of the second century, through the writings of Athenagoras and Tertullian.
They resorted to that formula in order to make absolutely clear that the universe
did not arise out of an unformed matter, eternally co-existing with God. The spec-
ification of the universe as something created out of nothing had, by the time of
Arius, a standard feature of theological parlance, a fact of which Arius could not
be unaware. His reference to Christ as a being made out of nothing (Newman notes
that the Arians were quickly called “Exoukontii”) was a radical departure from an
already hallowed restriction of that expression to the creation of the universe
out of nothing.

The reaction to Arius was prompt and most animated. But, as is usually the
case, the reaction had implicit and explicit aspects because of the presence of such
aspects in the provocation. The explicitness related to what was startlingly new,
namely, to the Christological bearing of Arius’s innovation. Implicit in Arius’s
doctrine was the ultimate fate which was in store for the understanding of the uni-
verse in Arius’s demotion of Christ from the rank of the truly only begotten being
to that of a mere creature, however exalted.

Of course, Arius claimed to retain the notion of the Father as a true Creator. But
as far as can be reconstructed from his statements, he carefully avoided probing to
the problem of whether Christ as a mere creature could still be the Father’s
strument for creating out of nothing the universe of beings of which He was one.
he Christ of Arius could only be a demiourgos or a mere shaper of a matter yet
shaped but already existing.

In view of Arius’s strategy, that of careful concealment, he could not be ex-
ted to probe into the ulterior effect of his applying the expression monogenes to
ist as a mere creature. Still, because of the classic pagan use of that term, its
step should have seemed fateful. Its ultimate aim was to make Christianity
ptable to the Hellenistic world, a world still pagan for the most part. It was no
ent that bishops eager to cozy up to Constantine’s establishment, more pagan
Christian, tried to prevent the condemnation of Arius. Yet, if that condemna-
tion had been prevented, Christianity would have run a most serious risk of being transformed into a form of pantheism; first into its refined version already expounded by Plotinus, and then into its crudely animistic Porphyrian form.

Harnack did not see beneath the surface when he stated that had Arius not been resisted Christianity would have quickly been reduced to an obscure Jewish sect. As such it would have remained monotheistic, for a while at least. Most likely, Christianity would have become a welcome place for kabbalism with its pantheistic ramifications. It was in monotheistic Jewish ambience, which so resolutely opposed God’s self-revelation in Christ, that kabbala flourished from Patristic times on. It is also a fact, acknowledged in standard Jewish encyclopedias, that Jewish intelligentsia has, by and large, espoused pantheism. Spinoza and Einstein were no accidents in that respect.

It was well said that the Christology or soteriology of Athanasius is ontological and that of Arius is voluntarist. It was also well said by Harnack that in both cases there is an underlying cosmology. Curiously, he said nothing about those respective cosmologies insofar as they related not so much to the moral as to the physical world, where cosmology ultimately and primarily belongs. Yet, whatever the paucity of sources about Arius, they strongly suggest that underlying his voluntarist scheme of salvation there was a Stoic cosmology with its succession of worlds as places for the soul’s purification.

About such worlds the most important thing to note is that they cannot constitute a fully-ordered totality. Herein lies a fact long overlooked. The pagan Greeks, who coined the word cosmos for the universe (to pan) failed to speak of the universe as a fully-ordered entity. Order was conspicuously absent in Democritus’s cosmology and in the cosmology of subsequent atomists, such as the Epicureans. The universe of the Stoics was subject to periodic conflagrations, hardly a mark of orderliness. Plato’s universe was perfect only in its heavenly sections. The sublunary world was, according to Plato, only partly ordered. The same is true about Aristotle’s universe. There is the more disorder in Plotinus’s emanationist universe the farther it leads from the One.

Herein lies one of the reasons why science failed to arise among the Greeks of old. If all science is cosmology, then all true scientific laws must be equally, that is, consistently valid throughout the universe. In other words, science makes sense only if the universe is uniformly ordered. This is an idea that could not arise within Greek paganism or pantheism.

But the idea of a consistently or fully-ordered universe was a natural consequence of orthodox Christology. In fact, the idea of a fully-ordered universe played a pivotal part in Athanasius’s discourses on the true divinity of the Logos. A truly divine Logos, in Whom the Father created all, so Athanasius insisted time and again, could not produce a partially disordered universe.

Thus, at the very beginning of part two of his Contra gentes, Athanasius calle attention to the difference between God’s essential invisibility and man’s inabilit to comprehend anything not mediated through the visible. That man’s knowledge of God be worthy of a perfect God, God gave a perfect order to the physical universe. God achieved this objective by consigning the work of creation to
Word, that is, to His infinitely perfect Son. Or, to quote Athanasius's very words: “For this purpose God by His own word gave the Universe the Order it has, in order that since He is by nature invisible, men might be enabled to know Him at any rate by His works.” Shortly afterwards Athanasius states again: “God so ordered Creation that although He is by nature invisible He may yet be known by His works.”

In chapters 35, 36 and 37, Athanasius lists various examples of order in the physical universe and begins chapter 38 with the affirmation:

Since then, there is everywhere not disorder but order, proportion and not disproportion, not disarray but arrangement, and that in an order perfectly harmonious we needs must infer and be led to perceive the Master that put together and compacted all things, and produced harmony in them.

Athanasius brings that chapter to a close with the argument that only when there is no trace of cosmic disorder, that is, “when the order of the whole universe being perfectly harmonious...it is consistent to think that the Rule and King of all Creation is one and not many.”

Athanasius also finds in the perfect order of the universe a proof of the perfect unity between the Father and the Word. Furthermore, in chapter 40 he uses the same argument as a proof of the divinity of the Word: “If the universe subsist in reason and wisdom and skill and is perfectly ordered throughout, it follows that He that is over it and has ordered it is none other than the Word of God.” In chapter 42, Athanasius describes in detail the creative action of the Word inasmuch as it issues in cosmic order. The final product, to quote his words, is a “marvelous and truly divine harmony.”

The Contra gentes and the De Incarnatione (which begins with a reference to the same arguments as set forth in the former work) were widely read works. As such, they greatly strengthened the effectiveness of the Christological dogmas to form a cultural climate favorable to science. This is not to suggest that one could distill specific scientific laws from Christology. That would have been contrary to the subtly recondite manner in which God offers his revealed truths. Supernatural truths do not create natural truths; they rather presuppose them and effectively though subtly help the full unfolding of their potentialities.

A Christian—the best Scholastic theologians are a case—could very well remain on the rather low level of Aristotelian science. Imbued with Christological dogmas those Scholastics would not repeat with Aristotle, let alone with Plotinus, that the world was ordered only partially. In fact, Christian belief in the Creator led, in the case of Philoponus, to the recognition that a true order has to be uniformly valid. Many had noticed before him the various colors of the stars; but led by that belief in the Creator, he took those colors for a proof that the material of stars was not different from ordinary matter. If, however, this was the case, the heavenly bodies had to be governed by the same laws that governed bodies on earth.

Such was one of those indirect ways in which belief in the createdness of all matter could prepare minds to treat in the same way the heavenly and terrestrial
regions. Had such preparation not been at work in the minds of Buridan and
Oresme, they would not have been ready to discuss in the same breath the motion
of celestial bodies and a mere jump on earth. Thus was prepared, in a remote man-
ner, the way for Newton’s assertion that the fall of an apple and the fall of the
moon in its orbit obeyed the same time-squared law of free fall.

Clearly, Whitehead fell far short of the truth when, in placing the origin of mod-
ern science in the Middle Ages, he spoke only of the emphasis laid by the Scholastics
on rationality.25 The truth about that Scholastic rationality is far richer and
deeper. It is not an ordinary rationality but a respect for reason that derives from
belief in the divinity of the incarnate Logos.

Since the times of Francis of Assisi, it has become customary to celebrate the
birth of that Logos as a man with emphasis on the human charm embodied in it.
There is nothing inappropriate in that, as the divine Logos chose to begin His ap-
pearance among us as a helpless babe. Helpless as He could appear in his human
birth, the event meant the coming of the Creator of the universe and with it, in the
long run at least, the coming of science as well. The intrinsic connection between
these two comings is attested also by the fact that they become a blessing only if
embraced with profound humility and with a deep sense of responsibility.

Notes

1. The letters were published in The Life and Letters of Charles Darwin, ed. F. Darwin
(London: Murray, 1888), 1:307-309. Only a generic reference is made there to the contents
of Mengden’s letters which I quote, in my translation, from a photocopy of the German
originals in the archives of Cambridge University.

2. A proof of this is his esteem for Herbert Spencer as one of the greatest philosophical
intellects ever.

3. He failed to realize that man’s action, as far as it is purposive, is, though immediately
obvious, not something measurable. He repeatedly skirted the problem of the epistemologi-
cal challenge posed by the mind of geniuses, such as Newton, stating that it was more
profitable to speculate about the minds of dogs. For details and documentation, see my
Gifford Lectures, The Road of Science and the Ways to God (Chicago: University of

4. Witness his notebooks, dating from 1837-1839, from which various scientific passages
entered The Origin of Species.


10. Quoted from *The Science of Mechanics in the Middle Ages*, p. 536

11. The pioneering studies were, of course, done by Pierre Duhem, between 1906 and 1910. For details, see my *Uneasy Genius: The Life and Work of Pierre Duhem*, 2d enlarged ed. (Dordreeth: Martinus Nijhoff, 1987).

12. Nor can the word bara be invoked, as in two cases it is used to denote ordinary human action. For details, see my article, “The Universe in the Bible and Modern Science,” *Ex Auditu* (Creation: The Second Annual Frederick Neumann Symposium, Princeton Theological Seminary, October 16-19, 1987), 3:137-147.


19. Ibid. p. 208.


that the two options are not on the same level. The voluntarist presupposes the ontological but cannot logically provide it. Thus, Arius was epistemologically conditioned for offering but glimpses, however revealing, about his views on Christ’s nature. On the contrary, Athanasius’ ontological approach, centered on Christ’s nature, left him free to discourse on the voluntarist or moral consequences of Christ’s true nature in his De Incarnatione.


