

# FAITH AND THOUGHT

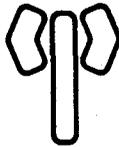
VOLUME 114 ● NUMBER 1 ● APRIL 1988

*A Journal devoted to the study of the inter-relation of the  
Christian Revelation and modern research*

GENERAL EDITOR: Dr. A. B. Robins



Published for  
THE VICTORIA INSTITUTE



by  
THE PATERNOSTER PRESS

Enrico Cantore

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## The Christic Origination of Science

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### Introduction: From Fact to Principle

This essay investigates the contributions Christ, living and acting in his disciples, made to the rise of science. *Christic* refers here to Christ while *Christian* refers to his disciples; *Christianity* accordingly designates the totality of Christ's disciples taken as a cultural unit. *Science* means the systematic study of the intrinsic intelligibility of nature or observable reality. *Humanism* means—according to its original and still more common usage—the doctrine of human dignity, open to religion.<sup>1</sup>

This essay starts from two realizations. Contrary to a common prejudice, history has proven the intimate association of science and Christianity, since the former arose only from the latter; this influence, however, has not yet been adequately investigated. In fact, at least ever since Whitehead's seminal remarks, historicals have increasingly documented the decisive role of Christians in the rise of science.<sup>2</sup> An outstanding example is Jaki's survey of all the cultures (Chinese, Indian, Graeco-Roman, Arab, etc.) which achieved the technical presuppositions of science such as logical and mathematical sophistication, refined technology, advanced scholarship and the like.<sup>3</sup> Jaki proves that only Christianity generated 'live-born science', and this because of the typical Christian dogma of creation. Hence his insistence on 'the crucial role played in the origin of

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1. See for instance Wm. Hallock Johnson, *Humanism and Christian Theism* (New York: Revell, 1931); 'Secular vs. Christian Humanism', *Eternity* (Jan. 1982), pp. 15-18; Raymond J. Seeger, 'On the Humanism of Science', *Journal of the American Scientific Affiliation* 36 (1984), pp. 19-27.

2. Alfred N. Whitehead, *Science and the Modern World* (1925), ch. 1; R. Hooykaas, *Religion and the Rise of Modern Science* (Grand Rapids, MI: Eerdmans, 1972); Eugene M. Klaaren, *Religious Origins of Modern Science: Belief in Creation in Seventeenth-Century Thought* (Grand Rapids, MI: Eerdmans, 1977). For the influence of Patristic theology see Thomas F. Torrance, *The Ground and Grammar of Theology* (Charlottesville: University Press of Virginia, 1980), esp. pp. 52-60; David C. Lindberg, 'Science and the Early Christian Church', *Isis* 74 (1983), pp. 509-30.

3. Stanley L. Jaki, *Science and Creation: From Eternal Cycles to an Oscillating Universe* (New York: Science History Publications, 1974).

science by ... belief in ... the creative act of God'.<sup>4</sup> This view is becoming consensual. For instance, the Marxist Joseph Needham, an authority on the history of Chinese science and technology, preceded Jaki in stating that China failed to develop science proper because it 'lacked the idea of (divine) creation'.<sup>5</sup> However, such consensus tends to remain sterile, as can be seen from these two authors. Thus Needham effectively ignores Christianity and traces the origin of science to 'the analyzable differences in social and economic pattern between China and Western Europe'.<sup>6</sup> Jaki, in turn, is satisfied with such a baffling thesis as 'the existence of a single intellectual avenue forming both the road of science and the ways to God'.<sup>7</sup>

This essay faces the issue of principle raised by the above disclosure of fact. For the discussion of this issue—as Needham, for instance, points out—is important to avoid the seemingly 'inescapable dilemma' of ascribing the origin of science to either 'pure chance' or 'racialism however disguised'. Indeed, 'chance' must be rejected because it entails 'the bankruptcy of history as a form of enlightenment for the human mind' while 'racialism' asserts without proving that 'one particular group of peoples ... possessed some intrinsic superiority to all other groups of people'.<sup>8</sup>

This essay will follow a *humanistic-genetic approach*. We shall take for granted that science profoundly affects the way people conceive and practice human dignity.<sup>9</sup> On this basis, we shall investigate the reasons for the fact that science arose solely from Christianity. We shall consider three main questions: (I) How is it possible to understand this fact? (II) What does this fact actually amount to, that is, what did Christianity uniquely do to originate science? Why and how did it do it? (III) What message should we extract from this fact and its explanation?

## I. The Humanistic Implausibility of Science

How is it possible to understand the fact that science arose only from

4. S. L. Jaki, *The Origin of Science and the Science of Its Origin* (Chicago: Regnery Gateway, 1978), p. vii.

5. Joseph Needham, *The Great Titration: Science and Society in East and West* (London: Allen & Unwin, 1969), pp. 36f.

6. Needham, *op. cit.*, p. 217.

7. Jaki, *The Road of Science and the Ways to God* (Chicago: Chicago University Press, 1978), p. vii.

8. Needham, *op. cit.*, p. 216.

9. See for instance my *Scientific Man: The Humanistic Significance of Science* (New York: Institute for Scientific Humanism Publications, 1977); for the brief introduction, my

Christianity? Undoubtedly, at first blush the question may appear far-fetched, and even more bizarre the tentative answer that science ultimately arose because of the personal activity of Christ. But we should not be confused by this reaction due to two instinctive yet misleading prejudices of contemporary public opinion: one prejudice being that science is a spontaneous or natural cultural phenomenon and the other that science has nothing to do with religion. Indeed, if science were so natural from the cultural point of view, why did it not viably arise until 1600 A.D.? Also, if science had nothing in common with religion, why did it arise only from Christianity? Great scientists of the past and the present tend vigorously to refute these prejudices on the strength of their own creative experience. Thus, for instance, Galileo himself was surprised that science—as embodied in the heliocentric doctrine—could assert itself at all. Against those who 'wonder that there are so few followers of [it]', Galileo professed himself 'astonished that there have been any up to this day . . .

Nor can I ever sufficiently admire the outstanding acumen of those who have taken hold of this opinion and accepted it as true; they have through sheer force of intellect done such violence to their own senses as to prefer what reason told them over that which sensible experience plainly showed them to the contrary.<sup>10</sup>

Einstein, in turn, used to insist on the religious connotation of science. Thus, for instance, he dismissed the psychological explanation that Max Planck's 'inexhaustible patience and perseverance' in quantum research was due to 'extraordinary will-power and discipline'. His own explanation was of a basically religious kind:

The state of mind which enables a man to do work of this kind is akin to that of the religious worshipper or the lover; the daily effort comes from no deliberate intention or programme, but straight from the heart.<sup>11</sup>

Such experience of creative scientists provides the key for understanding why science arose only from Christianity. This key is the *humanistic implausibility of science* which consists in the virtual impossibility for people living in the prescientific age to accept and implement the humanistic presuppositions of science itself, that is, a series of theoretical convictions and ethical motivations without which

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essay 'Humanistic Significance of Science: Some Methodological Considerations' in *Philosophy of Science* 38 (1971), pp. 395-412.

10. Galileo Galilei, *Dialogue Concerning the Two Chief World Systems—Ptolemaic & Copernican*, tr. S. Drake (Berkeley, CA: University of California Press, 1967), pp. 328-29.

11. Albert Einstein, *Ideas and Opinions*, tr. S. Bargmann (New York: Crown, 1954), p. 227.

science cannot exist. We can identify at least four such presuppositions which need to be widely shared by a culture before science can be produced by that culture. The first two are the unwavering persuasions that nature has a transensible structure and that this structure can be penetrated by the human mind; the other two are the unquestioning assurances that the intellectual exploration of such structure is inherently rewarding and obligatory for humans.

The persuasion about the *transensible structure of nature* is the fundamental theoretical conviction. Indeed, people would never do science unless they were certain that the structure of nature that can be observed through the senses is true, but only in a superficial manner, so that it points beyond itself to a more genuine and realistic truth. For science demands that the mind go beyond the sensible appearances of nature. But this step amounts to a wrenching change of attitude for prescientific people as can be seen by the difficulty of accepting the heliocentric system referred to by Galileo. For the acceptance of this system required a seemingly reckless attitude: what seemed to be self-evident, i.e., the turning of the sun around the earth, had to be judged misleading; whereas what appeared to be nonsensical, i.e., the turning of the earth around the sun, had to be deemed most reasonable. Hence the first aspect of the humanistic implausibility of science: science could only arise if people were prepared to turn around their instinctive way of considering nature in relation to themselves and their dignity.

The persuasion about the *transensible structure of nature* is the complementary theoretical conviction on which science rests. Indeed, people would never do science unless they were certain that the transensible structure of nature can be truly understood by the human mind, that is, known with precision in its countless manifestations and also grasped as a unified whole. For this is clearly what science demands of its practitioners to start to exist. It requires that they aim at *discovery*—i.e., the intellectual detection of some hitherto unknown feature of nature—and that they do so with antecedent trust of being able to succeed in their effort, no matter how remote from ordinary views the feature of nature may be they set out to explore. Hence the second aspect of the humanistic implausibility of science which compounds the first: science could only arise if people not only became certain about the transensible structure of nature but also were ready to assume as unquestionable that such structure was graspable by the human mind.

The assurance about the *inherent rewardingness of the intellectual exploration of nature* is the fundamental ethical motivation of science. Indeed, people would never do science unless they were certain that

the efforts required for seeking the understanding of nature were worthwhile in themselves rather than because of some effects they might produce, such as technological applications, public acclaim and so forth. For science, being the quest for discovering the unknown, would never exist were its practitioners to count beforehand on being eventually able to use their discoveries for practical purposes. Actually, a scientific researcher cannot even be sure ahead of time that he will eventually achieve the discovery he set out to attain. Accordingly, science could not start to exist unless those who first engaged in it deemed the intellectual exploration of nature to be the inherent reward of their efforts, and this because such an exploration actualized their human dignity as seekers for truth. Hence the third aspect of the humanistic implausibility of science: science could only arise if people were ready to commit all their resources to the intellectual exploration of the transensible structure of nature as to an enterprise which deserves to be carried out for its own sake, independently of any further advantages that can arise from it.

The assurance about the *inherent obligatoriness of the intellectual exploration of nature* is the other basic ethical motivation of science. Indeed, people would never do science in the more demanding sense of the term—that is, engage themselves in the exploration of hitherto completely unknown areas of nature—unless they were certain that their efforts were not only worthwhile in themselves but also somehow obligatory for them. For the trail-blazing work of science is so daunting that it can hardly be endured by the persons who feel attracted by it unless they are sustained by a sense of *noblesse oblige*. That is to say, they must be convinced that it is their duty, as scientifically gifted individuals, to engage in research and persevere in it, no matter how great the difficulties involved, under penalty of injuring human dignity in themselves and others. Hence the fourth aspect of the humanistic implausibility of science: science could only arise if people were able so comprehensively to overcome their instinctive objections toward the exploration of the transensible structure of nature as to regard this exploration not only as its own reward but also as their inescapable obligation as dignified human beings.

In sum, the origin of science is very surprising because it demanded such a radical change in the way people conceived and practiced their dignity with regard to nature that it could hardly occur without the mediation of some unique humanistic factor; the more so, when one considers that science can viably exist only if its humanistic presuppositions are widely shared. For science is public in principle, affecting as it does the overall way people think and act. Hence it

cannot survive, much less thrive, unless the cultural milieu in which it is started by some pioneers is largely prepared to welcome and support it. This being the case, it makes sense to hypothesize the activity of Christ in Christianity as that unique factor which makes it possible to understand why science arose at all.

## II. The Humanizing Activity of Christ Toward Science

What does Christianity uniquely do to originate science? Why and how did it do it? In light of the preceding, we shall answer these questions in three successive steps as follows: (A) Christianity developed the humanistic presuppositions of science; it succeeded in doing so because Christ (B) rebuilt the foundations of humanism and (C) educated his followers to the methodological autonomy of science.

### *The Christian Development of the Humanistic Presuppositions of Science*

The unique contribution Christianity made to the origination of science was to develop the humanistic presuppositions of science itself. Four hints taken from the history of prescientific Christianity suffice to indicate the nature of this contribution: (i) the conviction about both the reality and the transcendence of the cosmos, (ii) the appreciation of material labour as a quasi-liturgical service of God, (iii) the estimation of natural things as God's messengerial gifts to humans and their fraternal companions, and (iv) the conviction of intellectual research as a humanizing obligation toward God.

(i) ***The conviction about both the reality and the transcendence of the cosmos*** is especially evident in medieval art. For this art is characterized by what has been called 'the figural interpretation of reality' which presents two simultaneous features. One is the affirmation of the genuine reality of sensible things, 'in continual fight against merely spiritualistic and neo-Platonic tendencies'; while the other is the insistence that this reality has a meaning which points beyond itself:

Earthly life is absolutely real, of the reality in which the Logos has penetrated, but for all its reality it is only . . . a 'figure' of what is authentic, future, final and true . . . the earthly event is a prophecy or 'figure' of that part of reality immediately and completely divine which will become actualized in the future.<sup>12</sup>

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12. Erich Auerbach, *Studi su Dante*, tr. M. L. DePieri Bonino and D. Della Terza (Milan: Feltrinelli, 1966), p. 218.

In other words, earthly things are both real and transcendent because they bear the impress of the Son of God who created them and continually supports them. An example of such 'imitative medieval art whose immediate purpose was the sensible representation of transcendent contents' is 'the idealism and naturalism of Gothic sculpture and painting'.<sup>13</sup>

This attitude was something new when compared with non-Christian cultures. For it exhibited 'a new ability to give sensible form to things', one in which 'sensible experience arose to new life'.

To give to the real event its legendary strength, to insert it with all its spiritual dignity and its miraculous power in the everyday experience; this is the naturalism of the early Middle Ages which culminated in a spirituality which embraced the whole earthly life . . .<sup>14</sup>

Another example of the same new way of considering nature is the symbolism of Dante's *Divine Comedy* which stresses the transcendent aspect of things: 'For things are not things merely. Things in the created universe are both things and signs.'<sup>15</sup> Yet Dante's symbolism is most realistic, for it pays close attention to the objective concreteness of things:

The sign which is found in things inheres in them objectively . . . the sign is thought to be in the thing and yielded by the thing. God has put it there. Man does not contribute it out of his own mind and heart. He discovers it.<sup>16</sup>

Hence a first humanistic connection between science and Christianity is clear: the education of the human mind to the perception of a transensible structure of nature, the invitation to discover an objective, if hidden, message of meaning conveyed by the sensible appearances of nature itself.

(ii) ***The appreciation of material labour as a quasi-liturgical service of God*** is embodied in the operative motto of the Benedictine order *Ora et Labora* (Pray and Work). It manifested a new humanistic mentality—and one with important scientific implications—for it proclaimed as never before in the history of humankind the dignifying significance of the human intercourse with nature. Indeed, this mentality assumed that material labour was not meant to remain purely material, since it had to be undertaken and conducted in imitation of and in association with the Son of God who became a

13. Auerbach, *op.cit.*, p. 20.

14. Auerbach, *op.cit.*, pp. 19–20

15. Charles S. Singleton, *Dante Studies 1—Commedia: Elements of Structure* (Cambridge, MA: Harvard University Press, 1965), p. 27.

16. Singleton, *op.cit.*, p. 28.

labourer for our sakes. Accordingly, Christianity was the first culture which made many of its members esteem the working involvement with nature as genuinely humanizing, thus going beyond the lingering reservations of other religiously advanced cultures, such as the sapiential tradition of the Old Testament (cf., for example, Sirach 38:24–34).

With regard to science, this mentality proved important for at least two reasons, one technological and one motivational. The technological reason lies in the fact that, by systematically engaging themselves in material labour, these Christians were able substantially to contribute to the technical presuppositions of science (observation of nature, use of instruments, etc.). Thus the period between 1250 and 1350 has been called 'the century of inventions' because in it 'foundations had already been laid for the later technological ascendancy of Europe'.<sup>17</sup> But the motivation that was fostered by this attitude was even more important for the rise of science. For these Christians were able to develop an involvement with nature which was both practical and intellectual, since educated persons were numerous among them. As a consequence, they introduced the idea that the intercourse with nature was an inherently rewarding and obligatory occupation, the means to glorify God and serve neighbour, and actually a way to share in the cosmic wisdom of God himself: 'There was a sense in which the cathedral builders, like the clock-makers, had a celestial prototype'.<sup>18</sup>

(iii) *The estimation of natural things as God's messengerial gifts to humans and their fraternal companions* found its highest expression in the *Canticle of Brother Sun* by St. Francis of Assisi. Though Francis was himself no intellectual, his poem documents how Christianity humanistically prepared the advent of science because it so movingly embodies the common views of the time about the meaning of nature as the carrier of a transensible intelligibility which both commands and rewards the attention of the people.

In sum, the *Canticle of Brother Sun* is the poetic *credo* of the medieval belief in the beauty, goodness and intelligibility of the created world. It sums up that tradition that can be seen in the hymns, the arts and the poetry of the period.<sup>19</sup>

This poem is particularly impressive because it stresses that absolutely everything takes place in God's creation—including

17. Arnold Pacey, *The Maze of Ingenuity: Ideas and Idealism in the Development of Technology* (Cambridge, MA: M.I.T. Press, 1976), p. 39, cf. pp. 56–86.

18. Pacey, *op.cit.*, p. 74.

19. Lawrence S. Cunningham, *Saint Francis of Assisi* (Boston, Twayne, 1976), p. 56.

explicitly suffering and death—makes eminent sense, no matter how displeasing it can be to human sensibility.

Concretely, this poem points to science in two principal ways. One is the evidence it gives of a common-place—namely, the doctrine of the so-called two books of divine revelation—which was to inspire such scientific pioneers as Kepler, Galileo and the founders of the Royal Society:

God is revealed to men by means of two books: the Bible and the world of nature. This was axiomatic in the medieval world . . .<sup>20</sup>

The other pointer is the persuasion conveyed by this poem that natural things are pre-eminently useful to people not as instruments of power but as messengers of meaning: 'Things prove useful precisely in so far as they signify God.'<sup>21</sup>

(iv) *The conviction of intellectual research as a humanizing obligation toward God* was the special legacy of St. Thomas Aquinas, the great synthesizer of the prescientific Christian world view. His inspirational relevance for science is increasingly acknowledged also by secular-minded historians.<sup>22</sup>

Thomas starts from St. John's teaching that, since all things were created by the Logos-Son-of-God, they manifest the light of God (cf. John 1:3–5): 'The very actuality of a thing is a certain light of it.'<sup>23</sup> Hence he derives two consequences: the greatness of things in the plan of God and the intellectual character of human dignity. 'Thus he speaks of 'the nobility of things' which consists in their 'existence'.<sup>24</sup> And he perceives the operations of nature as an expression of God: 'the very operation of nature is also an operation of the divine power.'<sup>25</sup> But he also clarifies that, precisely because things have been created by God, they have been made by him to operate on their own:

Thus therefore should one understand God's way of operating in (natural) things, that the things themselves have their own operations.<sup>26</sup>

20. Cunningham, *op.cit.*, p. 55.

21. Giovanni Getto, 'Francesco D'Assisi ed il Cantico di Frate Sole', in his *Letteratura Religiosa dal Due al Novecento* (Firenze: Sansoni, 1967), p. 60.

22. See for instance W. C. Dampier, *A History of Science and Its Relation to Philosophy and Religion* (London: Cambridge University Press, 1961), pp. 84–89; also Ernst Mayr, *The Growth of Biological Thought: Diversity, Evolution and Inheritance* (Cambridge, MA: Harvard University Press, 1982), pp. 91–2.

23. *Commentarium de Causis* I, 6; cited from Heinrich Schlier, 'Im Anfang war das Wort—Zum Prolog des Johannesevangeliums' in his *Die Zeit der Kirche* (Freiburg: Herder, 1955), p. 285.

24. *Contra Gentes* I, 28.

25. *De Potentia* q 3, a 7, ad 3um.

26. *Summa Theologica* I, q 105, a 5, c., cf. q 103, a6, c.; *C. G.* III, 69.

Thomas also derives the intellectual character of human dignity from God's universal illumination of humans (cf. John 1:9): 'The light of natural reason . . . is nothing but an imprint of the divine light in us.'<sup>27</sup> Accordingly, 'the rational creature is worthier than all temporal and bodily creatures';<sup>28</sup> also, 'the human being is above all the mind of the human being'.<sup>29</sup>

On the strength of these views, Thomas insists both on the realism of human knowledge and the human duty to pursue knowledge. He insists on the realism of human knowledge, because the mind depends for its illumination on things that exist outside it: 'The object of knowledge is the thing known according to its existence outside the knower.'<sup>30</sup> And he insists on the human duty to pursue knowledge, because only thereby can people fulfill the goal God intended to attain by creating the mind and the universe as a whole:

The goal of the human soul and its ultimate perfection is to go through the entire order of creatures by knowledge and love and so to reach the first principle that is God.<sup>31</sup>

In particular, Thomas champions the study of creatures as beneficial to religion, because 'this study leads to admiration of the most high power of God . . . inflames the souls of humans toward love of the divine goodness'.<sup>32</sup> Thus he indignantly rejects the opinion that 'it does not matter for the truth of the faith what one feels about creatures, provided one has the right feeling about God'. He reasons thus:

Any error about creatures entails a false opinion about God and leads the minds of people away from God.<sup>33</sup>

As a result, we have a first explanation of principle for the historical fact that science arose only from Christianity. This explanation is that Christianity was the only culture which succeeded in developing the humanistic presuppositions of science. For Christianity, as we have seen, truly enabled its members to accept as reasonable a transensible structure of nature and its intrinsic intelligibility; likewise it enabled them to regard the exploration of this intelligibility as both inherently rewarding and obligatory.

27. *S. T. I* IIae, q 91, a 2, c.; cf. *I*, q 84, a 5, c.; q 93, a 4, c.; *I* IIae, q 19, a 4, c.; etc.

28. *S. T. II* IIae, q 7, a 2, c.

29. *S. T. I* IIae, q 29, a 4 c.

30. *De Veritate* q 14, a 8, ad 5um.

31. *C. G.* II, 87.

32. *C. G.* II, 2.

33. *C. G.* II, 3.

*The Christic Rebuilding of Humanistic Foundations*

Why did Christianity, alone among other cultures, succeed in developing the humanistic presuppositions of science? The answer is implicit in the foregoing survey. Indeed, Christians were able to achieve the outlined convictions and motivations precisely because they were Christians—that is to say, in so far as they were in vital communion with Christ. Thus the development of the humanistic presuppositions of science and the consequent origin of science itself must somehow ultimately be traced to the activity of Christ himself. But what activity, operating in what manner?

The clue to the detailed answer is offered by a well known anthropological datum: educated persons of all advanced cultures previous to Christianity balked as a rule at considering as objectively dignified and socially acceptable the systematic involvement with nature which is indispensable for scientific research. Impressive examples are the postures adopted by such scientifically gifted individuals as Aristotle and Archimedes. For Aristotle was a great observational biologist—the ‘father of biology’ according to many, and the chief hero of Charles Darwin himself. And yet Aristotle the ethicist has no room in his system of values for the material activity demanded by scientific research, so much so that he expects the sage—i.e., the genuinely dignified person—to dedicate himself solely to contemplation while leaving the involvement with matter to lesser humans such as artisans and slaves. The same dim view of material activity was taken by Archimedes, another great forerunner of modern science—and he was highly praised by Antiquity for that view, as we know from Plutarch:

Archimedes possessed such a lofty spirit, so profound a soul and such a wealth of scientific theory, that although his inventions had won for him a name and fame for superhuman sagacity, he would not consent to leave behind any treatise on this subject . . . regarding the work of an engineer and every art that ministers to the needs of life as ignoble and vulgar . . .<sup>34</sup>

Clearly, then, non-Christian educated persons tended to be afraid of material nature, regarding it as impure in itself and as a source of degradation for those who dealt with it. But this is the clue for the activity of Christ that led to the development of the humanistic presuppositions of science by his followers. For Christ disclosed that human sin rather than intrinsic impurity lies behind the widespread tendency to fear nature; also, he enabled his followers to reverse

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34. Cited from Freidrich Klemm, *A History of Western Technology*, tr. D. W. Singer (Cambridge, MA: M.I.T. Press, 1964), pp. 21-2.

their fear of nature and to work with him in fulfilling God's plan about the whole cosmos.

*Christ disclosed that human sin rather than intrinsic impurity lies behind the widespread tendency to fear nature.* He taught in this vein particularly when exposing the mentality underlying Jewish dietary laws and similar purity rules, saying, 'There is nothing outside a person which by going into him can defile him, but the things which come out of a person are what defile him' (Mark 7:15).<sup>35</sup> Christ insists that impurity comes only from the human heart and its sinfulness:

What comes out of a person is what defiles a person. For from within, out of the heart of the person, come evil thoughts. . . . All these evil things come from within, and they defile a person. (vv. 21-23)

But this Christic teaching obviously applied in general to the relationship of humans to nature and therefore discloses the root of the human tendency to fear nature.

The dynamism connecting human sin to the fear of nature is already evident from the biblical narration of the Fall. Adam and Eve sinned by refusing to acknowledge nature as God's messenger to them and thus they reduced nature itself to the mere instrument of their self-aggrandizement. Having been tempted to 'become like God, knowing good and evil', they 'saw that the (forbidden) tree was good for food and . . . a delight to the eyes and . . . to be desired to make one wise'. (Gen. 3:5-6). The result was a thorough upheaval in the relationship between humans and nature as originally intended by God and one which caused humans to fear nature itself. For nature was now 'cursed' by God because of the human sin (cf. vv. 17-19).

Paul, illuminated by Christ, further clarified such dynamism of human sin and fear of nature by outlining in some detail the inwardly personal character of sin, the radical inversion it causes in the relationship of humans with nature and the dehumanizing consequences this entails. Sin involves nature in the first place because it is an inward refusal by humans to recognize God through nature and thereby acknowledge their dependence on him. Indeed, the sinners

by their wickedness suppress the truth. For what can be known about God is plain to them . . . clearly perceived in the things that have been made. So they are without excuse; for although they knew God they did not honour him as God or give thanks to him. (Rom. 1:18-21)

Sin involves nature in the second place because, as a consequence, sinners radically invert the God-intended relationship of humans to

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35. Translation of Revised Standard Version, with occasional minor stylistic changes.

nature. Nature is no longer for them the means for communion with God but rather the means for the rejection of God:

They exchanged (literally, *inverted*; Greek *ellaxan*) the glory of the immortal God for images resembling mortal man or birds or animals or reptiles. (v. 23)

Sin involves nature in the third place because, as a further consequence, sinners become dehumanized, inwardly and outwardly. It does so inwardly, in that they are no longer able properly to judge the significance of things, and yet they claim to be better able than other people to do so. 'They became futile in their thinking and their senseless minds (literally, *hearts*) were darkened. Claiming to be wise, they became fools' (vv. 21-22). It does so outwardly, in that God abandoned them to their disgraceful instincts: 'Therefore God gave them up in the lust of their heart to impurity . . .' (v. 24; cf. vv. 26-31).

As a result, it is clear why sin leads people to a fearful attitude toward nature. The reason is ultimately the sinners' awareness that they are at the mercy of the powers of nature instead of being the dominators of nature as they set out to be. Hence, for instance, their bragging with bad consciousness about satisfying all their perverse inclinations: 'Though they know God's decree that those who do such things deserve to die, they not only do them but approve those who practice them' (v. 32). Hence also their servile cringing before the forces of nature; having become 'slaves to the elemental spirits of the universe' (Gal. 4:3; cf. Col. 2:8), they live in a perpetual superstitious anxiety about doing or not doing the proper thing in dealing with nature: 'Do not handle! Do not taste! Do not touch!' (Col. 2:20).

*Christ enabled his followers to reverse their fear of nature and to work with him in fulfilling God's plan about the whole cosmos.* Christ's activity was not only theoretical but also very much practical in helping people overcome the fear of nature instilled in them by sin. Thus through his self-sacrifice of love he overcame the inversion caused by sin in the relationship between humans and the totality of God's creation:

For in him all the fullness of God was pleased to dwell, and through him to reconcile [literally, *'to undo the inversion'*; Greek, *apokatallaxai*] to himself all things, whether on earth or in heaven, making peace by the blood of his cross. (Col. 1:20)

He also mediated the divine healing of the human heart: 'God's love has been poured into our hearts through the Holy Spirit who has been given to us' (Rom. 5:5).

Above all, Christ associated his followers to himself in fulfilling his God-appointed mission with regard to the totality of the cosmos. For God has 'a plan for the fullness of time: to unite all things in him [Christ], things in heaven and things on earth' (Eph. 1:10). Hence, in and through Christ, the Christians are entrusted with everything that exists:

All things are yours, whether . . . the world or life or death or the present or the future, all are yours; and you are Christ's; and Christ is God's. (1 Cor. 3:21-23)

The purpose of this entrustment is that, by actualizing their dignity as children of God, the Christians actively share in Christ's liberation of the cosmos from the influence of sin:

For the creation waits with eager longing for the revealing of the children of God . . . because the creation itself will be set free from its bondage to decay and obtain the glorious liberty of the children of God. (Rom. 8:19-21)

Consequently, the Christians should not fear the suffering and death entailed by their association with Christ relative to the totality of creation because only through them can they bring forth genuine and lasting life for themselves and for everything else:

We know that the whole creation has been groaning in travail together until now; and not only the creation, but we ourselves, who have the first fruits of the Spirit, groan inwardly as we wait for adoption as children, the redemption of our bodies. For in this hope we were saved. (vv. 22-24)

As a result, it is clear that Christ most profoundly and most powerfully rebuilt the foundations of the relationship between human dignity and nature. By the same token, it is also clear why Christianity was the only culture which succeeded in developing the humanistic presuppositions of science and, as a consequence, the only culture that brought forth live-born science. This therefore is the ultimate explanation of the origin of science—one which excludes both chance and racialism, to refer to Needham's 'dilemma'—the activity of Christ himself, operating in and through his followers. In this sense we are justified to speak of the Christic origination of science.

The conclusion reached here, though unusual, is not totally unprecedented. For instance, a similar view can be found in the works of the evangelical theologian Thomas F. Torrance who has reflected much on the influence of Christ on the origin of science:

Bathed in the Light of God that shines in concentrated form in Jesus Christ, the universe took on a radically different aspect.

The incarnation (of Christ) had the effect of sanctifying the physical

universe for God, thus requiring for it a new respect altogether, if only as the medium which God has established for communion between himself and mankind, but also as a creaturely realm of reality endowed with meaning and direction in the creative purposes of God which are yet to be consummated. Thus it was from the sheer goodness and beneficence of God, which overflowed into the world through Jesus Christ and were embodied in his physical existence in our space and time, that Christianity learned to read the authentic nature of empirical reality, no longer as something hostile, malevolent, or alien to the human spirit, but as the very sphere in which God's presence has come to dwell in order to share his own glory with it. The implications of this for a new scientific view of the universe can be seen . . .<sup>36</sup>

### *The Influence of Christic Education on the Methodological Autonomy of Science*

A major objection which surfaces is, if the activity of Christ originated science, how can science itself remain a distinctively human enterprise? For science is truly such—a proof of human creativity, an outstanding glory of the human race.

A concrete answer can be had by considering Galileo, and this for two reasons. The first reason is that Galileo became the scientist par excellence precisely because of the humanistic influence of Christ on the culture from which he issued and in which he thrived. The second reason is that Galileo was able so harmoniously to integrate science with the Christian faith as to discover that the faith fosters the methodological autonomy of science itself.

In the first place, it is clear that Galileo became the scientist par excellence because of the humanistic presuppositions of science which Christ had inprinted in the culture in which Galileo was to operate. Indeed, such attitudes had become so accepted in Galileo's environment that he could appeal to them as self-evident verities when publicly explaining the foundations of scientific research. Thus, for instance, Galileo rejected the still widespread tendency to study nature solely in order to 'save the (sensible) appearances', and this he did by assuming as self-evident the existence and intrinsic intelligibility of the transensible structure of nature. Contrasting the mentalities of the 'philosophical' astronomers and of the 'mathematical' ones, he took for granted that the former,

going beyond the demand that they somehow save the appearances, seek to investigate the true constitution of the universe—the most important and most admirable problem that there is. For such a constitution exists; it is

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36. Thomas F. Torrance, *Divine and Contingent Order* (New York: Oxford University Press, 1981), pp. 65, 67–68.

unique, true, real and could not possibly be otherwise; and the greatness and nobility of this problem entitle it to be placed foremost among all questions capable of theoretical solution.<sup>37</sup>

Likewise Galileo assumed as unquestionable the rewarding character of the intellectual exploration of nature:

When I consider what marvellous things and how many of them men have understood . . . I recognize and understand only too clearly that the human mind is a work of God's and one of the most excellent.<sup>38</sup>

In the same vein Galileo found it obvious that people should regard the intellectual exploration of nature to be an obligation of their dignity:

Sarsi says he does not wish to be numbered among those who affront the sages by disbelieving and contradicting them. I say I do not wish to be counted as an ignoramus and an ingrate toward nature and toward God; for if they have given me my senses and my reason, why should I defer such great gifts to the errors of some man?<sup>39</sup>

In the second place, Galileo was so deeply permeated by Christ's humanistic influence as to find in his Christian reading of the Bible the very evidence for the methodological autonomy of science, and this in the light of an unbroken tradition in the Christian Church. For Galileo highly respected the Bible:

I think in the first place that it is very pious to say and prudent to affirm that the holy Bible can never speak untruth—whenever its true meaning is understood.<sup>40</sup>

But Galileo also knew, with tradition, that God manifests and communicates himself to humans not only through the Bible but also through nature, and this according to the teaching of the Bible itself:

For the holy Bible and the phenomena of nature proceed alike from the divine Word, the former as the dictate of the Holy Ghost and the latter as the observant executrix of God's commands. . . .<sup>41</sup>

A hundred passages of holy Scripture . . . teach us that the glory and greatness of Almighty God are marvellously discerned in all his works and divinely read in the open book of heaven.<sup>42</sup>

37. *Letters on Sunspots in Discoveries and Opinions of Galileo*, tr. S. Drake (Garden City, NY: Doubleday-Anchor Books, 1957), p. 97.

38. *Dialogue* (cf. above, n. 10), p. 104.

39. *The Assayer in Discoveries*, p. 272.

40. *Letter to the Grand Duchess Christina in Discoveries*, 181.

41. *Ibid.*, p. 182.

42. *Ibid.*, p. 196.

Thus Galileo found it self-evident that God—being consistent within his own principles and respectful of the dignity of humans he had created with the ability to understand nature on their own—would never demand that humans forgo the use of their faculties in order to learn from the Bible about the structure of nature:

But I do not feel obliged to believe that the same God who has endowed us with senses, reason and intellect has intended to forgo their use and by some other means to give us knowledge which we can attain by them. He would not require us to deny sense and reason in physical matters which are set before our eyes and minds by direct experience or necessary demonstration.<sup>43</sup>

Consequently Galileo could not doubt that science should be recognized as autonomous relative to the Christian faith and this according to the teaching of the same faith. Even more, Galileo inferred therefrom that the discoveries of science were meant by God to help humans better to understand the very word of God in the Bible where this deals with the structure of nature:

In questions of nature which are not matters of faith it is first to be considered whether anything is demonstrated beyond doubt or known by sense-experience, or whether such knowledge or proof is possible; if it is, then, being the gift of God, it ought to be applied to find out the true senses of the holy Scripture in those passages which superficially might seem to declare differently.<sup>44</sup>

As a result the answer to the objection under consideration is clear: the Christic origination of science does not mortify but rather intensifies the humanity of science and its creativity. For Christ does not make scientific research superfluous for his followers demanding of them that they learn from the Bible what they can learn through the use of their faculties. Rather, he educates them creatively to use their faculties with autonomy relative to the Bible, an autonomy which even leads to a better understanding of the Bible itself.

To sum up we can define more precisely the Christic origination of science as *the humanizing activity of Christ toward science*. For Christ's mission was to enable people to actualize their God-given dignity and not, properly speaking, to make them scientific. However, by carrying out his mission Christ could not avoid making his followers able to produce science on their own. Thus Christ did indeed originate science, but indirectly and mediately, as we have seen. In other words, Christ originates science as a signal, yet only

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43. *Ibid.*, p. 183-4.

44. *Ibid.*, p. 199.

partial or peripheral, result of his overall formative-educational activity relative to humankind.

Indeed, Christ formed the human being anew or recreated him (cf. 2 Cor. 5:17). In particular, Christ gave the human being a new heart and consequently a new mind, like his own: 'We have the mind of Christ' (1 Cor. 2:16). Also, Christ associated all human beings to himself in fulfilling God's plan with regard to the totality of his creation. Accordingly, Christ continually educates his followers—through illumination, encouragement, warning and consolation—to cooperate with him in fulfilling the plan of God. But science falls within this divine plan. For God already at the beginning wanted humans to work not only physically but also intellectually as his representatives vis-à-vis the remainder of his creation (cf. Gen. 2:15, 19; Gen. 1:26). Christ, then, gave new emphasis to this work when he disclosed that all things originated from him, as the creative Word of the Father, and were intended for him, as the Father-appointed king of the universe. Accordingly, the followers of Christ could not help but feel stimulated by him to wholly involve themselves with nature as not just a gift but also a task from God demanding the engagement of their entire personality. Thus, in the execution of this engagement, they first developed the humanistic presuppositions of science and then originated science itself.

### III. Conclusions and Implications for Christians and Scientists

What message should we, Christians and scientists, extract from the Christian origination of science? Here are a few suggestions.

1. *There is no automatic connection between the discipleship of Christ and science.* Since Christ originated science only indirectly and through the mediation of his followers, it is always possible to be a Christian and not realize the relationship of Christ to science. Thus, for instance, Byzantine Christianity did not give rise to science; also, many Western Christians never cordially welcomed science. On the other hand, since Christ originated science through his human followers, it is always possible for other humans to do science without being themselves disciples of Christ and even without reference to Christ.
2. *Science cannot be truly understood without reference to Christ.* Though science can be practiced without reference to Christ, it is obviously necessary to refer it to Christ in order to grasp its humanistic genuineness. For science ultimately stems from Christ via its humanistic presuppositions inspired and motivated by him.
3. *Science is undermined by the cultural rejection of Christ.* Though

science can be practiced without reference to Christ, it needs to remain faithful to its Christ-caused humanistic presuppositions to thrive and even to survive. Hence the cultural rejection of Christ undermines science. Sadly, but predictably, examples multiply in our post-Christian culture to prove that this is indeed the case. For instance, some quantum physicists now spurn the intrinsic intelligibility of nature and take pride in advocating 'the chaos behind the law'.<sup>45</sup> Other scientists scoff at the inherent 'rewardingness' of the intellectual exploration of nature, as for instance the Nobel Prize winner Steven Weinberg: 'The more the universe seems comprehensible, the more it also seems pointless.'<sup>46</sup> Still other scientists make science a positive instrument of theoretical dehumanization; e.g., Carl Sagan: 'I am a collection of water, calcium and organic molecules called Carl Sagan . . . Is there nothing here but molecules? Some people find this idea somehow demeaning to human dignity. For myself, I find it elevating . . .'<sup>47</sup>

4. *Christians have a great responsibility concerning science.* Since Christ originated science through his followers, he obviously expects them to be responsible for the preservation of the genuineness of science, theoretical and practical. Thus Christians should thank God for his gift of science through Christ, and repent of their failings which have scandalized many over the centuries into concluding that Christianity and science are incompatible. Christians should make scientists feel spiritually at home in the Church. Moreover, Christians should appreciate and encourage the efforts of many scientists to be faithful to their calling, especially with regard to the central concerns and aspirations of contemporary humankind, such as the quests for development, peace and education.

5. *Christian scientists have unique leadership tasks.* Though all followers of Christ are responsible for the genuineness of science intended by Christ, it is up to Christian scientists to take the lead in this regard. They should do so inside the Church, inside their professions and inside society at large. Inside the Church, they should help their fellow Christians effectively discharge their great responsibility concerning science. Inside their professions, they should illuminate and encourage their students and colleagues about

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45. John A. Wheeler, 'On Recognizing "Law Without Law" in *American Journal of Physics* 51 (1983), pp. 398-404. See also, along the same subjective lines, the widely acclaimed book by the physicist Heinz R. Pagels, *The Cosmic Code: Quantum Physics as the Language of Nature* (New York: Bantam Books, 1983).

46. Steven Weinberg, *The First Three Minutes: A Modern View of the Origin of the Universe* (New York: Bantam Books, 1979), p. 144.

47. In *Time*; Oct.30, 1980, p. 68.

the humanistic presuppositions of science; in particular, they should prove through their example that scientists can and should actualize their human dignity through their science and not in spite of it. Inside society at large, they should educate the public, especially the young, about what science is meant to be by God in Christ; also, they should strengthen all efforts aimed at making science genuinely beneficial to the needy, for science can do increasingly much to relieve the wants of Christ (cf. Matt. 25:34-40). In short, they should do whatever possible to keep science faithful to its Christic origination as a chief means to glorify God and to humanize people.

6. *The Christic origination of science should move Christians to recognize, respect and cooperate with all cultural traditions, notably Judaism.* For if Christ himself ultimately gave rise to science, he did so by operating not in a cultural vacuum but rather in a cultural plenum. In effect, science only started when the contributions of many non-Christian cultures were available: the arithmetic and geometry of the Indians, Egyptians, Babylonians, Greeks, Arabs, etc.; the technology of the Chinese, Greeks, Romans, etc.; the logic and philosophy of the Greeks, Arabs, Persians, Jews, etc.; the observational patrimony and the scholarly traditions of most nations on earth. Thus the influence of Christ on the origin of science was clearly a spirit of recognition, respect and cooperation vis-à-vis all cultural traditions as valuable, if imperfect, responses, to the self-manifestation and communication of God to humans through the intelligibility of the cosmos. As a consequence, since in our time more than ever science develops through the efforts of people of all cultures, it is obviously the duty of Christians to recognize, respect and cooperate with all cultural traditions, thus better to fulfill the plan of God in Christ for humankind as a whole.

Special consideration is due to Judaism for two main reasons. First, ancient Judaism bequeathed to Christianity the conviction which, as history and philosophy disclose, was the indispensable presupposition for the live birth of science—namely, the awareness of the creation of the cosmos by God through his word. For only starting from this conviction could Christians give rise to science, having realized that the word of God was a personal and incarnate one, Jesus Christ the very Son of God, who invited them to see the cosmos as a personal self-manifestation and communication of God to them. Second, modern Judaism excels as no other cultural group in the area of scientific creativity, and this clearly because of its religious tradition of the creation of the cosmos by the divine word.

Accordingly, for the sake of Christ the originator of science, Christians should gladly work with representatives of all cultures to

make science one of the main agencies for the fostering of human dignity in our time instead of allowing it to become a major threat to the same.