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## **A typology for the theological reception of scientific innovation<sup>1</sup>**

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*The responses of members of the theological community to innovations from the sciences is generally richly varied rather than univocal. This article attempts to justify the idea that scientific ideas can feed constructively into the theological endeavour, and presents a five-fold typology for the responses theologians can make to a scientific novelty. This typology is illustrated with reference to the responses of some nineteenth century Anglican Clergymen to Darwin's 'Origin of Species'; and, as a 'thought experiment', it is used to suggest ways in which theologians might respond to possible future developments in Artificial Intelligence.*

**Keywords:** typology, doctrine, development, Newman, Darwin, Artificial Intelligence.

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Theologians may react in a variety of ways to insights from disciplines other than their own. Many factors, such as familiarity with the discipline in question, adherence to a particular theological or epistemic tradition, and personal temperament, may contribute to such variety. In this paper I shall suggest a framework for understanding the ways in which theologians, and by extrapolation the religious communities influencing and influenced by those theologians, can respond to innovative ideas from outside their religious tradition that can be seen to impinge upon it. This model will be considered with particular reference to the innovations of the sciences, since in Western countries these have impacted on traditional theological thinking with particular force; but the scheme outlined could in theory apply also to any kind of cultural or social innovation. This typology will be illustrated by an examination of the responses of some of his contemporaries to the ideas of Charles Darwin: these ideas produced, as they continue to do, an interestingly wide variety of reactions amongst theologically-minded people. It will then be used to analyse the responses that might be made to a future scientific development, which is likely to be upon us within a few decades, and which can readily be seen to have theological ramifications: the development of machine intelligence.

### **Background: the concept of doctrinal development**

It will be assumed in this article that it is actually possible for the theological teaching of the Christian Churches to develop and to encompass novelty; but it is worth noting first of all that this is by no means an uncontentious assumption.

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<sup>1</sup> This paper is based on a talk given at the Oxford Templeton Workshop, July 1999.

For many centuries it was held that the great truths of the Christian faith were delivered once and for all in God's revelation of God's self through the Scriptures and, paradigmatically, in the life of Jesus of Nazareth. In the words of the fifth-century St Vincent of Lérins, the orthodox Christian faith is that which has been believed *quod ubique quod semper quod ab omnibus* – everywhere, always and by all: 'For that is truly and in the strictest sense "Catholic," which, as the name itself and the reason of the thing declare, comprehends all universally', as St Vincent puts it.<sup>2</sup> There can be no addition to the primary revelation which culminated in that given to the apostles of Jesus: the job of theological commentators, and of the Church through its formal teaching, is merely to draw out what has always been present in that revelation. Some held that this was, in effect, simply an act of translation, of making obscure terms come alive in contemporary language: others held that the application of deductive logic was necessary in order to draw out from the Scriptures the teaching that they contained. The latter was the approach characteristic of mediaeval scholasticism. But nothing new or external to the Scriptures was necessary: indeed, it was sometimes said to be a characteristic of heresy that it involved the importation of novelty into Christian teaching. Doctrine might 'progress', through becoming more fully elaborated; but it could not 'develop' or 'change'.

This was, of course, the basis of some of the Reformers' complaints against the Roman Catholic Church: that by introducing novelties of teaching and practice the Roman Church had strayed from the pure faith of the earliest Christians. The Catholics of that time in turn retorted that the disputed practices were latent in Scripture, and they in turn charged the Reformers with novelty. Against this Reformation background, of appeal and counter-appeal to teachings and practices consistent with those of antiquity, it can be seen that for either side to talk about such teachings and practices growing and developing under external influences could only be self-defeating.

However, during the eighteenth and nineteenth centuries a new attitude towards the past began to emerge. The French *philosophes* began to use history as a didactic tool: for them, 'History was .... philosophy teaching by example'.<sup>3</sup> The writings of Gibbon may be viewed in a similar light. The same period also saw the beginning of historical study of the texts of the Bible, with the work of such scholars as Lessing, Greisbach and Strauss.<sup>4</sup> Also during this time, in a process which has been fascinatingly charted by Owen Chadwick,<sup>5</sup> the impact of historical studies was such as to convince some commentators that the teaching of the Churches did develop through the centuries, and did react to external pressures in ways that were not purely negative.

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2 St Vincent of Lérins, *Commonitory*, in the Library of Nicene and Post-Nicene Fathers, vol. XI (Edinburgh: T. & T. Clark, 1991), p. 132.

3 G. R. Cragg, *The Church and the Age of Reason 1648–1789* (Harmondsworth: Penguin, 1970), p. 243.

4 See S. Neill and T. Wright, *The Interpretation of the New Testament 1861–1986* (Oxford: Oxford University Press, second edition 1988), ch. 1.

5 See O. Chadwick, *From Bossuet to Newman: The Idea of Doctrinal Development* (Cambridge: Cambridge University Press, 1957).

## Newman on development

One culmination of this shift in perspective might be seen to be John Henry Newman's 'Essay on the Development of Christian Doctrine', first published in 1845, and the last of Newman's works to be written as an Anglican. This Essay, which has inspired a great deal of comment,<sup>6</sup> essentially notes that detailed historical study of the Early Church soon reveals that *no* Church in Newman's day resembled it very closely. (Newman's own view was that the Roman Catholic Church came closest, and this was one of the factors in his conversion to Catholicism soon after the 'Essay' was published.) It seemed clear to Newman that doctrinal development had indeed taken place.

If this is so then, as Newman was aware, an obvious question needs to be addressed: what counts as *genuine* development? If St Thomas Aquinas has contributed to the development of doctrine, why should it not be said that Luther and Calvin have too, let alone Schleiermacher and D. F. Strauss? We might today extend that list through another century and a half of controversial commentators on the Christian faith. In response to this dilemma Newman proposed seven tests for distinguishing between true and false developments of doctrine: between 'development' and 'corruption', as he expressed it. These tests are:<sup>7</sup> the preservation of the essential ideas underpinning Christianity (although Newman notes the difficulties of ascertaining what exactly these are): the continuation of the principles on and through which an idea has been developed: what Newman calls the 'Power of Assimilation', of which more will be said below: the definite anticipation of a development at an early period in the history of the idea to which it belongs: the logical sequence by which developments are drawn out of the original idea: the preservation of the past deposit of doctrine through the introduction of new ideas; and, finally, the continuation and preservation of a development through time – Newman believed it to be characteristic of a corruption that it is transitory in nature. All of these tests are copiously illustrated by Newman with historical examples.

However, as Chadwick comments, impressive as they sound these were in fact tests which 'convinced no one and which [Newman] himself once admitted to be incapable of performing their ostensible purpose'.<sup>8</sup> They are clearly *post hoc* tests, and are purely pragmatic in character. Newman seems to have thought that since historical study shows that some changes have occurred, it is necessary to account for this, and to ensure that developments that are acknowledged as genuine are kept to a minimum. But once we go so far as to admit that doctrinal development can occur at all, it is inevitable that new ideas will soon present themselves for our consideration.

The most interesting of Newman's tests in our present context is the third,

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6 See, for example, Chadwick, *From Bossuet to Newman*: N. Lash, *Change in Focus: A Study of Doctrinal Change and Continuity* (London: Sheed and Ward, 1973).

7 See J. H. Newman, *An Essay on the Development of Christian Doctrine* (1845 edition) (Harmondsworth: Pelican, 1974), p. 122 ff.

8 Chadwick, *From Bossuet to Newman*, p. 143.

that of an idea's 'power of assimilation'. This test follows from the observation that the Church has often taken over practices from the so-called 'heathen' communities in which it is located. These range from the allegedly 'Gnostic or Platonic'<sup>9</sup> vocabulary found in the fourth Gospel to the ritual use of such things as vestments, incense and rings in wedding services. These may originate outside the Church but are readily drawn in to form an enhancement of its thinking and its practices. Newman makes the analogy with a living organism, a characteristic of which is that it takes in things outside itself for nourishment and increases itself thereby. As Newman puts it, 'The idea never was that throve and lasted, yet, like mathematical truth, incorporated nothing from external sources. So far from the fact of such incorporation implying corruption, as is sometimes supposed, *development implies incorporation*' (emphasis mine).<sup>10</sup> There is, clearly, no reason why the ideas or practices thus incorporated into our theological thinking and leading to the development of Christian teaching should not originate from the sciences. In Newman, then, we find an allowance in principle that ideas like scientific ideas may usefully and constructively feed into the theological endeavour.

### **A proposed typology for responses to change**

Noting this background, it is surely legitimate to affirm that in the present day the Church is called to re-assess its traditional teachings by those developments in the sciences which may be seen to have theological implications. Many such developments have these implications, since the sciences are usually studying either the physical cosmos, which Christians affirm to be in some sense the creation of God, or the nature of living organisms, including human beings, which Christians likewise affirm to be the creation of God and, in the case of human beings, to be capable of entering into relationships with God. Fresh understandings of ourselves or of our world are therefore highly likely to have an impact on our ways of thinking about God. Even if Newman's tests for genuine development are left aside as too controversial, and even if it is noted that there may still be people who would deny that doctrinal development of any kind can occur, the assumption that scientific advances may, in principle, feed into the development of theological ideas would appear to be justified. It then becomes an interesting question to ask how theologians may respond to particular scientific developments. Indeed, this is a vital question: it is an important ministry of the theological community to communicate a well-thought-out response to new developments to the religious community at large, since (it is to be hoped) that community looks to theologians for a lead in such matters. The response of theologians is thus potentially highly influential within the community of the faithful.

Such responses to scientific innovation may be accommodated within a five-fold typology, as follows.

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9 Chadwick, *From Bossuet to Newman*, p. 158.

10 Newman, *An Essay on the Development of Christian Doctrine*, p. 131.

Response 1. The theologian may analyse the new development in the sciences, and decide that it is of such significance that maintaining a religious belief is no longer tenable in the face of it. The theologian may then relinquish his or her faith and advocate others doing the same. We might term this response 'capitulation'.

Response 2. The theologian may undertake a careful scrutiny of the new scientific development, and decide that it is sufficiently at odds with sufficiently important doctrines to warrant efforts being made to oppose it, lest people's minds be at best diverted, at worst corrupted, by it. This opposition may take various forms: attacking the scientific validity of the new finding, perhaps, or simply upholding the immutable truth of a source of revealed wisdom, such as the Bible. This response, then, is one of 'opposition'.

In both these cases it is a question of *either science or religion*: one or the other must give. In the case of response 1, it is the religion which must be deemed inadequate: in the case of response 2, it is the science.

Response 3. The theologian can ignore the novel findings of science altogether, or at least not bother to comment upon them. Indeed, it might be argued that science and theology deal with different realities, or domains, and as such can necessarily have little or no impact on each other. This response is, perhaps, far more common than is healthy. It might come about through theologians believing that science can have nothing to do with theology; or it might come about through a genuine humility (or perhaps timidity) on the part of theologians – through their not wishing to get embroiled in subjects on which they feel ignorant. Such humility is commendable, but it should perhaps be said that it is not always reciprocated by some of the scientists who feel compelled to pronounce on theological and philosophical areas. We might term this the response of 'neutrality'.

It is difficult, if not impossible, for advances in human understanding outside the theological arena, such as those afforded by the sciences, to break through and contribute in any positive sense to the development of Christian theology in any of these first three models – although they might contribute in a negative sense, in giving theologians something to react against. The remaining two responses, however, do allow for more positive interactions to occur.

Response 4. I call this the 'soft' use of science by theology. Here, the scientific development is analysed for ways in which it might cast light on traditional theological ideas. Again, this might be done in several ways. It might simply mean noting ways in which twentieth century science has shown earlier understandings of science which were antipathetic to religious belief as standing in need of qualification; or it might mean noting ways in which science can harmonise with traditional ideas; or it might mean mining the ideas and concepts of the sciences for metaphors and images that can helpfully take forward the theological endeavour.

Response 5. This I term the 'hard' use of science by theology. It involves studying the findings of science and, if they are felt to be irrefutable, re-moulding

traditional theological doctrines in the light of them. This re-moulding may be done purely under the influence of the scientific innovation in question, but it is more likely that it will be done through a critical re-examination of the theological material in question as a result of that influence, or perhaps through the re-discovery of alternative articulations of doctrine from past centuries. Insofar as a scientific understanding of the world, and the place of humankind within it, is used to shape doctrine, then part and parcel of this shaping process would be the recognition that, since scientific findings are never definitive for all time, so the religious teachings which are shaped by them can never be definitive, but will be subject to revision as our scientific understandings are revised. Some sacrifice of cherished ideas may be necessary in this case – this response might sometimes represent a ‘partial capitulation’ – but it might be urged that the benefits to be accrued in terms of a richer theological understanding and a revitalised apologetic for the Church are more than adequate compensation for any such sacrifice.

### **An illustration: nineteenth century responses to Darwin**

This five-fold scheme may be illustrated by an historical example. It transpires that these five responses may all be perceived in the reception of Darwin’s ideas on evolution, as set out in ‘The Origin of Species’, by the Anglican clergy of his day. ‘The Origin of Species’ was first published in 1859, just fourteen years after Newman’s ‘Essay on Development’; and given that the hard divisions between disciplines that we have today were not present in the middle of the last century, there were doubtless many people who read both. Many clergy were in fact in a good position to assess the new ideas being put forward by Darwin, being both theologically literate and, in many cases, practising scientists themselves.

The first and second responses outlined above may be illustrated by a contrasting couple of stories from Cambridge, Darwin’s old University. Leslie Stephen (1832–1904) was ordained in 1859. He subsequently became a tutor and fellow at Trinity Hall, Cambridge, but lost those positions when, during the 1860s, after painful questioning (according to his biographer), he came to have doubts about his religious faith. Darwin and other contemporary thinkers, such as Kant and J. S. Mill, were responsible for this doubt. He resigned his orders in 1875, and subsequently was very critical of the Church. Stephen, then, saw an incompatibility between evolution and the Christian faith, and his response was to leave his faith behind. His response to the new science was one of capitulation. (Incidentally, Stephen went on to achieve some fame as a man of letters, and to edit the Dictionary of National Biography. His daughter Virginia, who married one Leonard Woolf, also achieved no little reknown. The character of Mr Ramsay in ‘To the Lighthouse’ is said to be modelled in part on Stephen.<sup>11</sup>)

Thomas Rawson Birks (1810–1883) has been described as ‘Britain’s foremost

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11 M. Drabble and J. Stringer (eds.), *The Concise Oxford Companion to English Literature* (Oxford: Oxford University Press, Revised Edition 1996), p. 556.

evangelical anti-Darwinian'.<sup>12</sup> He became vicar of Trinity Church, Cambridge, in 1866, and went on to become Professor of Moral Philosophy at the University in 1872. In his new post, Birks defended the idea of a special creation – that God had created individual species fitted to the particular niches they inhabit – and charged Darwin and other evolutionary thinkers with contradicting the plain sense of the Bible. He also accused them of faulty scientific reasoning, urging, for example, that scientific observations showed few things to be as certain as the fixity of species. (Birks was by no means alone amongst early critics of Darwin in finding fault not with his theology but with his science.<sup>13</sup>) Birks, then, exemplifies the response to a novel scientific idea that sees it as threatening to belief, and needing to be opposed for that reason. His stance is one of opposition.

My third response, that of theologians simply showing little interest in a novel idea, was doubtless the way in which many of the clergy of Darwin's time responded to his theories. Owen Chadwick has commented of this period that 'In the pews, no doubt, continued to sit large numbers of worshippers who had never heard of Tylor, were indifferent to Darwin, mildly regretted what they heard of Huxley and, if they thought about it at all, knew that their faith rested upon moral considerations inaccessible to the physical sciences';<sup>14</sup> and no doubt what was true of the pews was pretty much true also of many pulpits. However, such indifference is seldom written about in history books, so particular examples of clergy responding in this way are difficult to pin down.

This can only be speculation, but perhaps John Brodie Innes (1816–1894),<sup>15</sup> one-time Vicar of Down in Kent, where Darwin spent most of his life after his marriage, would have fallen into this category. Innes and Darwin by all accounts got on very well together, and remained in regular contact after Innes retired from his parochial ministry and went to live in Scotland. Innes recalled Darwin noting on one occasion that they had been firm friends for thirty years, and that 'We never thoroughly agreed on any subject but once and then we looked very hard at each other and thought one of us must be very ill'.<sup>16</sup> Innes may not have agreed with Darwin's ideas, but he clearly refused to let this fact impinge on a personal friendship. It seems not unreasonable to presume that those ideas did not really impinge much on his own Christian faith, either. If this is so, then his response was one of neutrality.

My fourth response, the 'soft' use of developments within science by theologians, is demonstrated in the writings of Aubrey Moore (1843–1890), a fellow of St John's College Oxford and tutor there and at Magdalen and Keble

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12 J. R. Moore, *The Post-Darwinian Controversies: A study of the Protestant struggle to come to terms with Darwin in Great Britain and America, 1870–1900* (Cambridge: Cambridge University Press, 1979), p. 201.

13 c.f. J. H. Brooke, *Science and Religion: Some Historical Perspectives* (Cambridge: Cambridge University Press, 1991), p. 285 ff.

14 O. Chadwick, *The Victorian Church: Part Two, 1860–1901* (London: SCM Press, 1970), p. 35.

15 I am grateful for the help of Gareth James, archivist at Trinity College, Oxford, in ascertaining the years of Innes' birth and death.

16 Quoted in A. Desmond and J. Moore, *Darwin* (London: Michael Joseph, 1991), p. 657.

Colleges.<sup>17</sup> In a paper delivered in 1883, Moore wrote: 'For the Christian theologian, *the facts of nature are the acts of God*' (emphasis mine).<sup>18</sup> In the essay 'The Christian Doctrine of God' which he contributed to the anthology 'Lux Mundi', first published in 1889, Moore penned the following remarkable passage:

Science had pushed the deist's God farther and farther away, and at the moment when it seemed as if He would be thrust out altogether, Darwinism appeared, and, under the disguise of a foe, did the work of a friend. It has conferred upon philosophy and religion an inestimable benefit, by shewing us that we must choose between two alternatives. Either God is everywhere present in nature, or He is nowhere. .... It seems as if, in the providence of God, the mission of modern science was to bring home to our unmetaphysical ways of thinking the great truth of the Divine immanence in creation.<sup>19</sup>

I doubt very much whether such thoughts were uppermost in Darwin's mind as he laboriously composed 'The Origin of Species', but no matter: the theological implications of his ideas were readily drawn out by others, in this case within a few years of Darwin's death. No radical changes to traditional theological ideas are being suggested here. On the contrary, a 'soft', metaphorical use is being made of Darwin's ideas in order to draw out their implications for the traditional doctrine of the immanence of God. The science is simply viewed in such a way that it is seen as offering support to traditional religious ideas, rather than undermining them.

Finally, my fifth response, which is the 'hard' use of science by theologians. This is the approach which welcomes scientific ideas, subjects them to no critiques other than scientific ones, and seeks to integrate them into our theological thinking, with the aim that our theology should truly incorporate all that is best in contemporary wisdom. For an example of this tendency amongst theologians in Darwin's own day, one need look no further than 'The Origin of Species' itself. In the second edition of that work Darwin includes the following statement:

A celebrated author and divine has written to me that 'he has gradually learnt to see that it is just as noble a conception of the Deity to believe that He created a few original forms capable of self-development into other and needful forms, as to believe that He required a fresh act of creation to supply the voids caused by the action of His laws.'<sup>20</sup>

As is now well known, the 'celebrated author and divine' in question was Charles Kingsley, who continued to think of himself 'as (I trust) an orthodox priest of the Church of England';<sup>21</sup> yet he was quite happy, it appears, to amend his views on God in order to accommodate Darwin's ideas.

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17 Arthur Peacocke has drawn attention to this aspect of Aubrey Moore's work: see A. Peacocke, *God and the New Biology* (London: J. M. Dent and Sons, 1986), pp. 82–3.

18 Quoted in Moore, *The Post-Darwinian Controversies*, p. 261.

19 C. Gore (ed.), *Lux Mundi: A Series of Studies in the Religion of the Incarnation* (Fourteenth Edition, London: John Murray, 1895), pp. 73–4.

20 C. Darwin, *The Origin of Species* (Oxford: Oxford University Press, 1996), p. 338.

21 c.f. Moore, *The Post-Darwinian Controversies*, p. 306.

Still more remarkable, it now appears, are the remarks of Baden Powell (1796–1860), Savilian Professor of Geometry in the University of Oxford, in his essay ‘On the Study of the Evidences of Christianity’ in the celebrated anthology ‘Essays and Reviews’. Powell appears to take for granted ‘the rejection of the idea of “creation”’<sup>22</sup> in the face of the findings of contemporary geological and biological science; and he notes that

a work has now appeared by a naturalist of the most acknowledged authority, Mr. Darwin’s masterly volume on *The Origin of Species* by the law of “natural selection,” .... a work which must soon bring about an entire revolution of opinion in favour of the grand principle of the self-evolving powers of nature.<sup>23</sup>

Here again we see a readiness to change or adapt traditional doctrines in the light of Darwin’s ideas. Powell appears quite happy to engage in such a process in the light of contemporary science. It is to be regretted that he died soon after the publication of this essay and was therefore unable to participate in the celebrated Huxley-Wilberforce debate in Oxford in 1860. It is particularly striking to note that ‘Essays and Reviews’, with this reference to Darwin’s work, first appeared a mere *three months* after ‘The Origin of Species’ (and, it may be added, sold considerably better!).<sup>24</sup>

Here, then, are five examples from within a few decades of the publication of ‘The Origin of Species’ which serve to illustrate how diverse the contemporary response to that seminal work was just amongst Anglican clergy, let alone the clergy of other churches, and the laity. We might expect such diversity, and it is to be regretted that in this particular instance so little attention still tends to be paid to it outside scholarly historical circles: the popular myth that ‘the Church’ reacted negatively to Darwin has become entrenched to a remarkable extent.

### **A further example: possible future responses to a ‘thinking machine’**

As a further illustration of the five-fold typology outlined above, let us now consider a situation which is at present hypothetical, and yet which may well soon be upon us. The new millennium will no doubt see many scientific innovations as radical as was Darwin’s in his day. One which is likely to make its presence felt within this new century is that of machine intelligence. There are many issues, philosophical and practical, that currently stand in the way of our conceiving of a machine that can be said to think, to possess intelligence.<sup>25</sup> Rather

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22 *Essays and Reviews* (Leipzig: Bernhard Tauchnitz, 1862), p. 115.

23 *Essays and Reviews*, p. 125.

24 c.f. Desmond and Moore, *Darwin*, p. 500.

25 See, for example, D. M. Mackay, ‘In What Sense can a Computer “Understand”?’ *Science and Christian Belief*, vol. 1 no. 1 (1989), p. 27; R. Penrose, *The Emperor’s New Mind* (Oxford: Oxford University Press, 1989); J. Puddfoot, *God and the Mind Machine* (London: SPCK, 1996); J. Searle, *Minds, Brains and Science* (London: Penguin, 1989); F. Watts, ‘Brain, Mind and Soul’, in F. Watts (ed.), *Science Meets Faith* (London: SPCK, 1998).

than rehearse them again here, let us instead undertake a 'thought experiment'. Let us suppose that all the practical and theoretical objections have been overcome, and human beings have created machines which, to the satisfaction of all who study them, are capable of data processing in ways that appear indistinguishable from thought. It might then further be urged that such a machine is, to all intents and purposes, a conscious being.<sup>26</sup> Should such a machine be constructed, and should such novel suggestions be made of it, what will the theological community's response to it be? The above typology suggests that five kinds of response might be possible.

The first response might be to accept that machines can be conscious and to reject, in consequence, any God who is assumed to be the sole source of consciousness – the response of capitulation. A second response would be to deny that a machine could ever possess true consciousness – the response of opposition. This might be argued either on scientific or philosophical terms, or on the grounds that the creation of consciousness is the sole prerogative of God – as is illustrated, for example, in the story of God breathing the breath of life into Adam's nostrils (Gen 2: 7). The third response would be for theologians simply to ignore these new machines, leaving the practical questions surrounding them to the scientists and the theoretical questions to the philosophers. This is the response we have labelled 'neutrality'.

A fourth response would be to say that the development of machine intelligence offers us a fascinating new set of insights into God's dealings with human-kind, and into our relationships with God. Philip Hefner has suggested that we might be thought of as God's 'created co-creators':<sup>27</sup> if this is so, and if we think of ourselves as God's children, then perhaps we might think of conscious machines as God's 'grandchildren'. Provocative ideas of the inter-relationships of such machines, humans and God might flow from such a metaphor; and the rôle of human beings as the agents of the creative power of God might fruitfully be explored in the light of it. This corresponds to the 'soft' use of science by theologians.

Finally, a fifth response might be to say that the fact that human beings can create conscious machines tells us something about the nature of consciousness itself, and hence about the God who is presumed to be the originator of such consciousness. The mechanism by which consciousness will have been established to arise might be attributed to God in God's generation of consciousness in human beings; or, alternatively, it might be urged that the development of the ability to generate consciousness on the part of human beings means that it should no longer be attributed to the creative activity of God. Either way, an important new understanding of the way in which God is assumed to operate in creative activity will have been established.

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26 See D. C. Dennett, *Consciousness Explained* (London: Penguin, 1992), p. 431 ff.

27 c.f. P. Hefner, 'The Evolution of the Created Co-Creator', in T. Peters (ed.), *Cosmos as Creation* (Nashville: Abingdon Press, 1989), p. 211.

## Conclusion

This new millennium is likely to be characterised by scientific advances beyond our present imagining, some of which will almost certainly strike at traditional theological understandings of ourselves and of our world. This paper sets out a five-fold scheme for understanding the responses which theologians can make to such advances, illustrated by the ways in which theologians dealt with a scientific innovation in the past. The same scheme also suggests the variety of responses which might be made to future scientific developments. If we are to develop a truly systematic Christian theology – that is to say, a theology which is aware of the content both of the biblical and historical traditions of which we are the heirs and also of the truth claims of philosophy and science<sup>28</sup> – then the first three of the responses in the typology outlined above would all appear to be lacking. The first fails to take seriously the riches of the Christian tradition: the second fails to take seriously the external intellectual world which is impinging on the believer; and the third fails to take seriously both. It is therefore the present author's view that it is likely to be the fourth and fifth types of response that will be found most helpful by Christian believers in the long term.

Ian Barbour<sup>29</sup> and John Polkinghorne<sup>30</sup> have both outlined schemes for relating the 'worlds' of science and theology. Both favour approaches which seek to identify and strengthen links between the two, through dialogue (Barbour) or the search for ever greater consonance between scientific and theological thinking (Polkinghorne). Barbour suggests that this can lead to the integration of the two and the development of an 'inclusive metaphysics', whilst Polkinghorne expresses the concern that such an approach might lead to the assimilation of one of these disciplines by the other. The fourth and fifth of the responses in the typology outlined above are both able to further the agenda of a dialogue/consonance model, although it must remain a matter of debate whether such responses will eventually lead in the direction of integration or of assimilation. Theologians must now consider which of these responses is likely to be the most helpful in furthering the construction of a true systematic theology, and which should therefore be urged upon the wider religious community.

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28 c.f. C. Gunton, 'Historical and systematic theology', in C. Gunton (ed.), *The Cambridge Companion to Christian Doctrine* (Cambridge: Cambridge University Press, 1997), p. 11 ff.

29 I. Barbour, *Religion in an Age of Science* (London: SCM Press, 1990), ch. 1.

30 J. Polkinghorne, *Scientists as Theologians* (London, SPCK 1996), p. 6 ff.