

How Does a BioLogos Model Need to Address the Theological Issues Associated with an Adam Who Was Not the Sole Genetic Progenitor of Humankind?

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The question in the title of this paper raises an initial question: in general how should we go about the task of relating theological truths to current scientific theories? Theological truths revealed in Scripture are eternal infallible truths, valid for the whole of humanity for all time, although human interpretations of Scripture are not infallible and may change with time over issues that are not central to the Gospel.

Scientific theories, by contrast, represent the current ‘inference to the best explanation’ for certain phenomena as judged by the scientific community based on criteria such as the interpretation of observations, experimental results, mathematical elegance and the ability of theories to generate fruitful research programmes. Scientific theories are not infallible and will certainly change. However, change does not necessarily imply replacement. Usually scientific theories are not replaced, but modified. In this respect they are often likened to maps that incorporate many different types of data: the maps are revised, as required, to incorporate new data and are improved in the process.

Scientists sometimes use the word ‘model’ to propose one big idea, or a cluster of ideas, that together help to explain certain scientific data. To the despair of philosophers of science, the use of such words in scientific discourse can lack precision. The word ‘model’ is a case in point, its use sometimes overlapping with the term ‘theory’. Usually, however, ‘model’ has a more focused meaning: the way in which certain sets of data can be rendered coherent by explaining them in terms of a physical, mathematical or even metaphorical representation.

During the early 1950s there were several rival models describing the structure of DNA, the molecule that encodes genes. Linus Pauling proposed a triple-helix model. But Jim Watson and Francis Crick had the huge advantage that they obtained the X-ray diffraction pattern results of DNA in advance of publication from another scientist called Rosalind Franklin. The double-helix was in fact the only model that would incorporate all the data satisfactorily, as Watson and Crick published in their famous one-page *Nature* paper in 1953. Since that time everyone has known that DNA is a double-helix, it’s really not a triple-helix or some other structure. In science models are very powerful.

Not all scientific models win the day so decisively. For many years in my own field of immunology there were endless discussions about how the class of white blood cells known as ‘T cells’ are educated within the body to attack foreign invaders but not (usually) to attack ‘self’, meaning our own tissues. Those discussions are now virtually over because the general model that has emerged explains most of the data quite well, bringing in to the story research results from many different laboratories. But the successful model that prevails is far more ‘messy’ than the exceptionally elegant double-helical model for DNA. The most successful models are not necessarily the simplest. The best models are those that explain the data adequately.

Sometimes rival models exist for long periods of time in the scientific literature because they explain the data equally well. In that case a given model is said to be ‘under-determined by the data’. Everyone agrees with the data that do exist - the disagreement is about how to fit the data together to create the best model. Eventually new data emerge that count in favor of one model rather than another, or that decisively refute a particular model.

When we come to the question as to what ‘BioLogos model’ might best address the relationship between the Adam of Genesis and the anthropological and genetic account of a humanity that did not have a single couple as the source of its genetic endowment, then we need to keep in mind these various ways

in which the term ‘model’ is deployed in scientific discourse. We will start with an initial ground-clearing question: “Is model-building appropriate in relating theological and scientific truths?” and, having given an affirmative answer to this question, we will then go on to consider what model might be the most appropriate for relating the theological and scientific narratives.

Is model-building appropriate?

There are some who would maintain that the truths presented by the early chapters of Genesis are theological truths that are valid independently of any particular anthropological history. The purpose of the Genesis texts is to reveal the source of creation in the actions of the one true God who has made humanity uniquely in His image. The Genesis 3 narrative of man’s disobedience is the ‘story of everyman’. We have all sinned and fallen short of the glory of God and this passage presents this truth in a vivid narrative style that is about theology rather than history.

Those who adopt this position may also point to the dangers of a ‘concordist’ view of biblical interpretation. The term ‘concordism’ (in its traditional sense) generally refers to the attempt to interpret Scripture inappropriately using the assumptions or language of science. Calvin famously countered such tendencies in his great Commentary on Genesis, remarking on Chapter 1: “Nothing is here treated of but the visible form of the world. He who would learn astronomy and other recondite arts, let him go elsewhere.” But the term ‘concordism’ is also sometimes stretched to include virtually any attempt to relate biblical and scientific truths. Such a critique appears to be a step too far, for in that case our theology becomes too isolated from the world, contrasting with the famous ‘two books’ analogy in which the Book of God’s Word, the Bible, and the Book of God’s Works, the created order, both speak to us in their distinctive ways about the same reality. This powerful analogy has held sway for many centuries in the dialogue between science and faith, and the challenge is to see how the two ‘Books’ speak to each other, for all truth is God’s truth.

Building models to relate biblical texts to science requires no concordist interpretations of the text (in the traditional sense of the word ‘concordist’). The disciplines of both science and theology should be accorded their own integrity. The Genesis texts should be allowed to speak within their own contexts and thought-forms, which are clearly very distant from those of modern science. We can all agree that the early chapters of Genesis exist to convey theology and not science. The task of models is then to explore how the theological truths of Genesis might relate to our current scientific understanding of human origins.

The models that we propose are not the same as the ‘data’. On one hand we have the theological data provided by Genesis and the rest of Scripture, true for all people throughout time. Uncertainty here arises only from doubt as to whether our interpretations of the text are as solid as they can be. On the other hand we have the current scientific data that are always open to revision, expansion or to better interpretation. Nevertheless the data are overwhelmingly supportive of certain scientific truths, for example that we share a common genetic inheritance with the apes. The role of models is to treat both theological and scientific truths seriously and see how they might ‘speak’ to each other, but we should never defend a particular model as if we were referring to the data itself. The whole point of any model is that it represents a human construct that seeks to relate different types of truth; models are not found within the text of Scripture – the most that we can expect from them is that they are ‘consistent with’ the relevant Biblical texts. Let us never confuse the model with the truths that it seeks to connect to each other.

In practice any western reader of the Genesis text, raised in a culture heavily influenced by the language and thought-forms of science, can hardly avoid the almost instinctive tendency to build models or pictures in their heads as to what they might have observed had they been there when 'it' happened. This is the case irrespective of whether someone comes to the text as a young earth creationist, an old earth creationist, or some kind of theistic evolutionist. Given that we all tend to build models anyway, we might as well ensure that the model we do maintain has been thoroughly subjected to critical scrutiny. This is important not only for own personal integrity but also in the pastoral context in which we seek to avoid unnecessary cognitive dissonance in the minds of those under our pastoral care.

Models for relating creation theology with anthropology

The last common ancestor between us and the chimpanzee lived around 5 – 6 million years ago. Since that time we and the apes have been undergoing our own independent evolutionary pathways. Today we have religion, chimps do not. At some stage humanity began to know the one true God of the Scriptures. How and when did that happen?

The emergence of anatomically modern humans

Anatomically modern humans appeared in Africa from about 200,000 years ago. The oldest well-characterised fossils come from the Kibish formation in S. Ethiopia and their estimated date is 195,000 +/- 5,000 years old.¹ Other well-established fossil skulls of our species have been found in the village of Herto in Ethiopia and date from 160,000 years ago as established by argon isotope dating.² Some limited expansion of our species had already taken place as far as the Levant by 115,000 years ago, as indicated by partial skeletons of unequivocal *H. sapiens* found at Skhul and Qafzeh in Israel. But significant emigration out of Africa does not seem to have taken place until after 70,000 years ago, with modern humans reaching right across Asia and on to Australia by 50,000 years ago, then back-tracking into Europe by 40,000 years ago, where they are known as the Cro-Magnon people. By 15,000 years ago they were trickling down into N. America across the Bering Strait.³

The effective population size of the emigrant population from Africa has been estimated at between 60 and 1220 individuals⁴, meaning that virtually all the world's present non-African populations are descended from this tiny founder population. Even the bugs inside human guts tell the same story, with their genetic variation reflecting the African origins of their hosts.⁵ But within Africa different groups of humans were living for at least 130,000 years before the emigration, many of them isolated from each other for long periods of time. Therefore one would expect greater genetic variation between different populations of Africans than between different populations of non-Africans, which is in fact what is observed.

Adam in the Genesis texts

The very first mention of 'Adam' in the Bible comes in Genesis [1:26–27](#) where the meaning is unambiguously 'humankind'. These verses are reiterated in the opening words of the second *toledoth* section of Genesis in 5:1–2: 'When God created *adam*, he made him in the likeness of God. He created them male and female and blessed them. And when they were created, he called them *adam*.' So *adam* can refer to humankind and it is only *adam* that is made in the image of God.

Then Genesis 2, enter a king - God's ambassador on earth! But this is a dusty king: 'the Lord God formed [Hebrew: *yatsar*] *adam* from the *adamah* [dust of the ground] and breathed into his nostrils the breath of life, and the *adam* became a living being' [Hebrew: *nepesh*, breath, soul] (2:7). The very material nature of the creation, including the man, is underlined by verse 9: after placing the man in 'a garden in the east, in Eden', God then 'made all kinds of trees grow out of the ground [*adamah*]'.
There are many important points packed into these verses. First, there is a perfectly good word for 'man' in Hebrew (*'ish*), the word most commonly used for man in the Old Testament (in fact 1671 times), so the choice of '*adam*' here for man seems a deliberate teaching tool to explain to the reader that *adam* not only comes from the *adamah*, but is also given the important task by God of caring for the *adamah* – earthy Adam is to be God's earth-keeper.

Second we note the use of the definite article in front of *adam*, so that the correct translation in English is 'the man', and the definite article remains in place all the way though to Genesis 4:25 when Adam without a definite article appears and 'lay with his wife again'. Personal names in Hebrew do not carry the definite article, so there is a particular theological point being made: here is 'the man', a very particular man, the representative man perhaps of all other men. However we are to understand the use of the definite article, there is no doubt that it is a very deliberate strategy in this tightly woven text, with no less than 20 mentions of 'the man' in Genesis Chapters 2 and 3.

But at the same time there is some ambiguity in the use of the word *adam*, perhaps an intentional ambiguity, which makes it quite difficult to know when 'Adam' is first used as a personal name.⁶ For example in some verses, instead of the definite article in front of *adam*, there is what is called in Hebrew an 'inseparable preposition', translated as "to" or "for" in Genesis 2:20, 3:17 and 3:21. Different translations apply their own different interpretations of when *adam* starts being used as the personal name Adam, and these differing interpretations depend on the context. So it is best not to be too dogmatic about the precise moment in the text when 'the *adam*', the representative man, morphs with Adam bearing a personal name.

The third important point highlighted in Genesis 2:7 is that '*adam* became a living being' or, as some translations have it, 'living soul'. The language of 'soul' has led some Christians to think that this verse is a description of an immortal soul that is implanted in 'the *adam*' during his creation, but whatever might be the teaching of scripture elsewhere on this point, it is difficult to sustain such an idea from this Genesis passage. The Hebrew word used here is *nepesh*, which can mean, according to context: life, life force, soul, breath, the seat of emotion and desire, a creature or person as a whole, self, body, even in some cases a corpse. In Genesis 1: 21, 24, 20 and 2:19 exactly the same phrase in Hebrew – 'living *nepesh*', translated as 'living creatures' – is used there for animals as is used here in Genesis 2 for 'the *adam*'. And we note also that *adam* became a *nepesh*, he was not given one as an extra, so the text is simply pointing out that the life and breath of *adam* was completely dependent upon God's creative work, just as it was for the 'living creatures' in Genesis 1. There is certainly no scope for understanding this particular passage as referring to the addition to *adam* of an immaterial immortal 'soul'.

How do we relate the anthropological understanding with the profound theological essay that the early chapters of Genesis provide for us, with their carefully nuanced presentation of 'Adam'? There are two main models that seek to answer this question, which we will here label as the 'Retelling Model' and as the '*Homo divinus* Model', for reasons that will become clear in a moment. Both models accept the great theological truths about humankind made in the image of God and about the alienation from God brought about by human sinful disobedience. Both models accept the current anthropological account of human

origins. But the models differ markedly in the ways in which they relate these two sets of data.⁷ Although personally I favor the second model, our aim here will be to assess the strengths and weaknesses of each model as objectively as possible.

The Retelling Model

The Retelling Model represents a gradualist protohistorical view, meaning that it is not historical in the usual sense of that word, but does refer to events that took place in particular times and locations. The model suggests that as anatomically modern humans evolved in Africa from 200,000 years ago, or during some period of linguistic and cultural development since then, there was a gradual growing awareness of God's presence and calling upon their lives to which they responded in obedience and worship.⁸ The earliest spiritual stirrings of the human spirit were in the context of monotheism, and it was natural at the beginning for humans to turn to their Creator, in the same way that children today seem readily to believe in God almost as soon as they can speak.⁹ In this model, the early chapters of Genesis represent a re-telling of this early episode, or series of episodes, in our human history in a form that could be understood within the Middle Eastern culture of the Jewish people of that time. The model therefore presents the Genesis account of Adam and Eve as a myth in the technical sense of that word - a story or parable having the main purpose of teaching eternal truths - albeit one that refers to real putative events that took place over a prolonged period of time during the early history of humanity in Africa.

Some would wish to press this model further to suggest that the Adam and Eve of the Genesis account do in fact represent the very first members of our species back in the Africa of about 200,000 years ago. This suggestion, however, faces a significant scientific problem. All that we know of the emergence of a new mammalian species is that this is a gradual process that may take thousands of years. A reproductively isolated population gradually accumulates a unique ensemble of genetic variants that eventually generates a new species, meaning a population that does not generally interbreed with another population. A new mammalian species does not begin abruptly, and certainly not with one male and one female.

If we keep to the retelling model as summarized above, then the Fall¹⁰ is interpreted as the conscious rejection by humankind of the awareness of God's presence and calling upon their lives in favor of choosing their own way rather than God's way. The Fall then becomes a long historical process happening over a prolonged period of time, leading to spiritual death. The Genesis account of the Fall in this model becomes a dramatised re-telling of this ancient process through the personalised Adam and Eve narrative placed within a Near Eastern cultural context.

In favor of the Retelling Model is the way in which the doctrine of *Adam* made in the image of God can be applied to a focused community of anatomically modern humans, all of whose descendants – the whole of humanity since that time – share in this privileged status in the sight of God. Likewise as this putative early human community turned their backs on the spiritual light that God had graciously bestowed upon them, so sin entered the world for the first time, and has contaminated humanity ever since. Such an interpretation is made possible by the fact that the very early human community within Africa would have been no more than a few hundred breeding pairs. If the Retelling Model is taken as applying to this very early stage of human evolution, prior to the time at which different human populations began to spread throughout different areas of Africa, then these putative events could have happened to the whole of humanity alive at that time.

A further theological point consistent with the Retelling Model is Paul's teaching in Romans 2:14-15 that the Gentiles have the requirements of the law "written on their hearts" even without the specific Old Testament revelation. In like manner, it is suggested, very early humanity knew God as He wrote His law upon their hearts, and it was their disobedience to this light that led to their alienation from God. This in turn left a spiritual vacuum that humankind has been trying to fill ever since with all kinds of different religious beliefs, none of which (outside the Cross), bring about reconciliation with God.

Against the Retelling Model is the way in which it evacuates the narrative of any Near Eastern context, detaching the account from its Jewish roots. If the early chapters of Genesis are about God's dealings with the very early people of God who later came to be called Jews, then Africa is not the direction in which we should be looking. Much depends on how exactly the Genesis accounts of Adam and Eve are interpreted; on how much weight is placed on the Old Testament genealogies that incorporate Adam as a historical figure (Genesis 5; 1 Chronicles 1) and on the New Testament genealogy that traces the lineage of Christ back to Adam (Luke 3); and on passages such as Romans 5 and 1 Corinthians 15 that are most readily interpreted on the assumption that Adam is understood as a real historical individual. The second model seeks to address these concerns.

The *Homo divinus* model

Like the Retelling Model, this model also represents a protohistorical view in the sense that it lies beyond history as normally understood, but like the Retelling Model looks for events located in history that might correspond to the theological account provided by the Genesis narrative. But in this case the model locates these events within the culture and geography that the Genesis text provides.

According to this model, God in his grace chose a couple of Neolithic farmers in the Near East, or maybe a community of farmers, to whom he chose to reveal himself in a special way, calling them into fellowship with himself – so that they might know Him as the one true personal God. From now on there would be a community who would know that they were called to a holy enterprise, called to be stewards of God's creation, called to know God personally. It is for this reason that this first couple, or community, have been termed *Homo divinus*, the divine humans, those who know the one true God, the Adam and Eve of the Genesis account.¹² Being an anatomically modern human was necessary but not sufficient for being spiritually alive; as remains the case today. *Homo divinus* were the first humans who were truly spiritually alive in fellowship with God, providing the spiritual roots of the Jewish faith. Certainly religious beliefs existed before this time, as people sought after God or gods in different parts of the world, offering their own explanations for the meaning of their lives, but *Homo divinus* marked the time at which God chose to reveal himself and his purposes for humankind for the first time.

The *Homo divinus* model also draws attention to the representative nature of 'the Adam', 'the man', as suggested by the use of the definite article in the Genesis text as mentioned above. 'The man' is therefore viewed as the federal head of the whole of humanity alive at that time. This was the moment at which God decided to start his new spiritual family on earth, consisting of all those who put their trust in God by faith, expressed in obedience to his will. Adam and Eve, in this view, were real people, living in a particular historical era and geographical location, chosen by God to be the representatives of his new humanity on earth, not by virtue of anything that they had done, but simply by God's grace. When Adam recognised Eve as 'bone of my bones and flesh of my flesh', he was not just recognising a fellow *Homo sapiens* – there were plenty of those around – but a fellow believer, one like him who had been called to

share in the very life of God in obedience to his commands. The world population in Neolithic times is estimated to lie in the range 1–10 million, genetically just like Adam and Eve, but in this model it was these two farmers out of all those millions to whom God chose to reveal himself.

Just as I can go out on the streets of New York today and have no idea just by looking at people, all of them members of the species *Homo sapiens*, which ones are spiritually alive, so in this model there was no physical way of distinguishing between Adam and Eve and their contemporaries. It is a model about spiritual life and revealed commands and responsibilities, not about genetics.

How does this model relate to the fact that Adam is made in God's image? If we take Genesis 1 as a kind of 'manifesto' literature that lays down the basic foundations for understanding creation, in turn providing the framework for understanding the rest of the Bible, then the teaching of humankind made in the image of God is a foundational truth valid for the whole of humanity for all time. It is a truth that certainly encompasses the kingly responsibility given to humankind in Genesis 1 to subdue the earth; the truth also has a relational aspect in reflecting human fellowship with God, and the relational implications of what it means to be made in God's image are worked out in Genesis 2, through work, marriage and caring for the earth.

Of course with our western mindset we would like to ask the chronological question: when exactly did the 'image of God' start applying in human history? But the Genesis text is not interested in chronology. Neither does the *Homo divinus* model as presented here seek to address that particular issue, but simply accepts the fact that the whole of humankind without any exception is made in God's image. Instead the model focuses on the event from Genesis 2:7 in which God breathes His breath into Adam so that he becomes a *nepeš*, a living being who can respond to God's claim upon his life. The model is about how Adam and Eve became responsible children of God, involving a personal relationship with God, obedience to his commands, and the start of God's new family on earth consisting of all those who would come to know him personally. Paul says that 'I kneel before the Father, from whom every family in heaven and on earth derives its name' (Ephesians 3: 14–15). Families have to start somewhere, and God chose to start his new family on earth with two very ordinary individuals, saved by grace like we are, and sustained by the 'tree of life'.

In this model the Fall then becomes the disobedience of Adam and Eve to the expressed revealed will of God, bringing spiritual death in its wake, a broken relationship between humankind and God. In an extension of this model, just as Adam is the federal head of humankind, so as Adam falls, equally humankind falls with him. Federal headship works both ways. Just as a hydrogen bomb explodes with ferocious force, scattering radiation around the world, so sin entered the world with the first deliberate disobedience to God's commands, spreading the spiritual contamination of sin around the world. And as with the Retelling Model, the physical death of both animals and humans is seen as happening throughout evolutionary history. Both models suggest that it is spiritual death that is the consequence of sin. Genesis 3 provides a potent description of the alienation that humankind suffers as a result of sin, with a fiery barrier separating them from the Tree of Life (3:24). But under the New Covenant the way back to the tree of life is opened up through the atoning work of Christ on the cross: 'Blessed are those who wash their robes, that they may have the right to the tree of life and may go through the gates into the city' (Revelation 22:14).

The *Homo divinus* model has the advantage that it takes very seriously the Biblical idea that Adam and Eve were historical figures as indicated by those texts already mentioned. It also sees the Fall as an historical event involving the disobedience of Adam and Eve to God's express commands, bringing death in its wake. The model locates these events within Jewish proto-history.

For some, however, a disadvantage of the model will be the appeal to the Federal Headship of Adam to satisfy the need to see God's call to fellowship with Him as being open to the whole of humankind and, equally, to see Adam's disobedience as impacting the whole of humankind. The notion of Adam's headship is of course perceived through passages such as Romans 5:12 and 17, and 1 Cor.15:22, although Romans 5:12 makes it clear that spiritual death came to all men by them actually sinning. Each person is responsible for his or her own sin. The model is not therefore consistent with a strictly Augustinian notion of the inheritance of the sinful nature, but in any case many biblical commentators do not find this notion in Scripture, which emphasizes the fact that all have sinned and fallen short of the glory of God (Romans 3:23), rooting that fact in Adam's sin (1 Cor. 15:22), but also highlighting the personal responsibility that each person has for their own sin (Deut.24:16; Jer.31:30; Rom. 5:12).

The *Homo divinus* Model will not answer all the theological questions that one might like to ask, any more than will the Retelling Model. For example, what was the eternal destiny of all those who lived before Adam and Eve? The answer really is that we have no idea. But we can be assured with Abraham: 'Will not the Judge of all the earth do right?' (Genesis 18:25). Thankfully we are not called to judge the earth, and we can leave that safely in the hands of the one who 'judges justly' (1 Peter 2:23). The question asked about those who lived prior to Adam and Eve is not dissimilar to other questions that we could ask. For example, what was the eternal destiny of those who lived in Australia at the time that the law was being given to Moses on Mt Sinai? Again, we really don't know and, again: 'Will not the Judge of all the earth do right?' Christians who spend time speculating about such things can appear as if they are the judges of the world's destiny, forgetting that that prerogative belongs only to God.

Conclusions

The two tentative models presented here may be seen as a work in progress. Both models are heavily under-determined by the data, meaning that there is insufficient data to decide either way. Both models might be false and a third type of model might be waiting in the wings ready to do a much better job; let us hope so. But for the moment the various ideas that have been suggested seem to represent versions of these two models.

Is it likely that new data may come along that will render either or both of these models untenable? It is not impossible, though if that happens it is from science that the new data are likely to come. For example, the Out of Africa model for human origins could be over-turned by new discoveries, unlikely as that might seem at present. Equally it is not impossible that new data might come to light on the roots of monotheism that might influence the model-building exercise.

Given that both models presented here suggest that human evolution *per se* is irrelevant to the theological understanding of humankind made in the image of God, it is likely that a preference for one model or another will be made based on a prior understanding of the claims made by particular Biblical texts. It should also be apparent that the adoption of one model over another may well have an impact on other theological perspectives. For example, if the Genesis Fall account is the story of the gradual alienation from God that occurred during some unspecified early era in the emergence of *Homo sapiens*, as in the Retelling Model, then the interpretation of the Fall can readily start to centre around human antisocial behavior, or the emergence of conflict, or even just human behaviors required for basic survival. But, important as these things are, I would suggest that they do not bring us to the heart of the biblical doctrine of the Fall, which is not about sociobiology, but about a relationship with God that was then broken due to human pride, rebellion and sin against God – with profound consequences for the spiritual status of

humankind, and for human care for the earth. The Fall is about moral responsibility and sin, not about misbehavior, and sin involves alienation from God. A relationship cannot be broken by sin unless the relationship exists in the first place.

Such reflections are a reminder that models should never take the place of the data itself, otherwise we have a case of the tail wagging the dog. Sometimes in science we have to hold on firmly to different sets of very reliable data without any idea as to how the two sets can be built into a single coherent story. In relating anthropology to Biblical teaching we are in a much stronger position than that, since the models proffered go at least some way towards rendering the two data-sets mutually coherent. But no-one is naïve enough to think that such models are completely satisfying. On the other hand, one or other may give some useful insights along the way, and hopefully stimulate the building of better models in the future.

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Notes

1. McDougall, I. et al *Nature* 433: 733-736 2005.
2. White, T.D. et al *Nature* 423: 742-747, 2003; Clark, J.D. et al *Nature* 423: 747-752, 2003.
3. A useful account of the spread of humanity out of Africa can be found in: Jones, D. 'Going Global', *New Scientist*, 27 Oct, 36-41, 2007.
4. Fagundes, N.J. et al., 'Statistical evaluation of alternative models of human evolution', *Proceedings of the National Academy of Sciences USA*, 104:17614-17619, 2007. The 'effective population size' is defined as the number of individuals in a population that contribute offspring to the next generation.
5. Linz, B. et al., 'An African origin for the intimate association between humans and *Helicobacter pylori*', *Nature* 445-: 915-918, 2007.
6. This is well illustrated by the way in which different translations introduce 'Adam' as a personal name into the text: the Septuagint (Greek translation of the Old Testament) at 2:16; AV at 2:19; RV and RSV at 3:17; TEV at 3:20 and NEB at 3:21).
7. The two models equate to the Models B and C that are described in greater detail in: Denis Alexander, *Creation or Evolution – Do We Have to Choose?* Oxford: Monarch, 2008.
8. Model B has been well presented by Day, A.J. 'Adam, anthropology and the Genesis record - taking Genesis seriously in the light of contemporary science'. *Science & Christian Belief*, 10: 115-43, 1998.
9. Justin L. Barrett, *Why Would Anyone Believe in God?* Altamira Press, 2004.
10. Genesis does not use the term 'Fall' and it might be more accurate to title the account in Genesis 3 as 'How sin began', but since the language of the 'Fall' has become so embedded in the literature it will be used here as shorthand.
11. To the best of my knowledge the term *Homo divinus* was first used by John Stott in this way in the *Church of England Newspaper* June 17th, 1968, then in Stott, J.R.W. (1972) *Understanding the Bible*, London: Scripture Union. p. 63. The idea has also been helpfully discussed in several publications by R.J. Berry who provides a good discussion of issues raised in this section in: Berry, R.J. and Jeeves, M. 'The nature of human nature', *Science & Christian Belief* 20: 3-47, 2008. See also Berry, R.J. *Creation and Evolution, not Creation or Evolution*, Faraday Paper No 12, 2007 (free down-load from www.faraday-institute.org).
12. Some versions of this model do seek to incorporate the 'image of God' teaching into the model more clearly than is attempted here.