

The Language of Genetic Technology: Metaphor & Media Representation

Copyright of Emily Ryall ©

This paper assesses the language used in discussion of scientific issues and the role that metaphor plays in describing scientific observation and phenomena. In particular it focuses upon the way in which the media embrace such metaphors in discussions of genetic technology. Specific focus is given to the metaphors adopted by the media in applying genetic technology to sport as it is this arena that appears to hold the fiercest speculation about the potential application and subsequent results in attempts to create the 'perfect' athlete. It develops from Lakoff & Johnson's (1980) work on metaphor in which they maintain that it is not reserved for poetic language (as is often believed) but is a necessary part of our everyday language. However, it is suggested that a literalisation of these metaphors, illustrated through examples in the media, elicit particular (limiting) 'pictures' of the world. It is argued that we need to acknowledge that the vocabulary we use and the metaphors we choose affects the picture of the world that we see. Ultimately, we need to be careful that the picture we hold of genetic technology does not arise purely as a consequence of being bewitched through our language.

Recent media speculation on the applications and effects of developments in genetic technology when applied to sport have tended to elicit predominantly negative or fearful pictures of genetically modified athletes with super-human abilities, with phrases such as, "Frankenstein athletes,"[28] and "sporting Armageddon"[27]. However I wish to argue that such pictures arise as a consequence of being misled by the metaphors that are used to describe and explain genetic processes and phenomena. Whilst accepting Lakoff & Johnson's (1980) claim that metaphor is a necessary part in our understanding of the world, I will argue that a literalisation of these metaphors, illustrated through examples in the media, elicit (limiting) pictures of the world. Ultimately, it is argued that we need to be careful that the pictures we hold about genetic technology in sport do not arise purely as a consequence of being bewitched through our language.

Lakoff and Johnson's influential work on metaphor proposed the convincing argument that metaphor wasn't simply a rhetorical aid, as traditionally viewed, but rather a fundamental part of language that provides us with our conception of the world. They maintained we do not view the world first and then ascribe words to depict that world; rather 'reality' or 'what is out there' (in terms of social reality) is understood and constructed through our language, and much of the language we use involves metaphorical allusion. Metaphor, they argue, provides us with the means to make connections and links between abstract and concrete concepts and reflect upon these concepts; so an understanding of these abstract concepts is based on an association with tangible perceptions and experiences. For instance, metaphors provide us with a partial understanding of complicated ideas such as: time, communication, and argument. In addition to this, metaphorical concepts have an element of flexibility within them that can be stretched beyond the information given by raw sensation, hence the traditional view that metaphor is a rhetorical and aesthetic device. This may provide an indication as to why a

reliance on a metaphor can provide us with a misconception as to how things 'really' are. This is not to say that one is able to dig beneath the metaphor to reveal an objective, external world for a non-metaphorical language would not be language as we understand it. There are many examples that illustrate our understanding of the world is dependent on metaphor. These include: the belief that an atom is a tiny solar system with the nucleus at the centre and electrons spinning around it; and the notion that light consists of particles and that it also consists of waves. On the former; since the early part of the twentieth century, physicists have relinquished the view of the atom as a solar system, yet it is still provided as an effective and educative picture of atomic structure. Similarly, the apparent conflicting notions of light being both a wave and a particle remains useful depending on which aspect of light is being considered; our depiction of what is true about the world is dependent on how we understand the situations in which we find ourselves. The use of metaphors in the supposedly 'objective' sciences not only aids with our comprehension but is also an illustration how the whole of scientific practice is tied in with other cultural practices and narratives.

Essentially, although metaphor can provide an alternative picture of the world, it is still necessary to be wary of the view that one believes it presents. Metaphor is a double-edged sword in that whilst it can provide an alternative, illuminating and novel conception of the world, this new perspective can be just as bewitching (in believing that it provides a more accurate representation of reality) than previous conceptions.

This may be seen in areas where there is a general lack of understanding or comprehension on a simple level, or an area that requires a specialised vocabulary, such as genetics. A false picture arises when metaphor used in these areas begins to be literalised. This is a problem that has been recognised by some researchers in this field, for instance, Carl Cranor (1994) expresses the concern that some authors have about the prevalent use of metaphor in genetics. This is despite the fact that it is difficult to conceive of any discussion on genetics without the use of metaphor. Nevertheless, Cranor argues that terms that label 'genes as master molecules,' and talk of 'genetic error,' 'genetic normality' and 'genetic causation,' may distort expectations and understanding about how genes work and how the 'knowledge' that results from using this language can determine political decisions on the structure of social institutions and practices. In this respect, one can recognise the application of theory to practice and why such discussion is valuable.

Metaphor can be literalised due to a comprehension-gap between technology and language where language is always inevitably a step behind new scientific discovery, process and analysis. Taking words out of their usual 'language-game' and placing them into novel ones (producing metaphor) is a way of overcoming this comprehension gap. Even when scientists coin new words in an attempt to explain or describe particular phenomena, they necessarily revert to metaphor when they are explaining what this new term means. If a biologist wished to describe a particular process to a lay-person, she may well revert to metaphor and say, "Think of it like Z because it shares the similar features of 1, 2, and 3." Yet, in their attempt to understand this process the lay-person may also ascribe irrelevant or inappropriate features of the metaphor being used which may lead to believing additional aspects about Z that the biologist would not adhere to.

Hubbard and Wald (1997) argue that the metaphorical language that is used in genetics is bound to carry some residual baggage from usages in everyday language. They maintain that when biologists in an attempt to explain their research clearly use verbs like 'control,' 'program' or 'determine' they connotatively assign a role to genes and DNA that is far more active than it actually is. In contrast to the implications derived from such verbs DNA is remarkably inactive and only becomes active when interacting with other molecules.

When we speak of genes 'fighting' for survival, the picture it elicits is misleading. Genes have no preference whether they are reproduced or not: there is no agency or self-reflective will to determine what happens to that gene. As Richard Dawkins (1996, 155) said, "DNA neither cares nor knows. DNA just is." Nevertheless, even Dawkins himself has perpetuated particular metaphors now associated with genes, most notably associated with his book, *The Selfish Gene*. Consequently, Dawkins appears to be more guarded against misleading metaphors and attempts to be aware where particular metaphors fail. For instance, when he uses the metaphor of a river to describe the process of evolution, he warns his readers not to conjure up a particular tempting picture that such a metaphor elicits:

Now here is an important respect in which we have to be cautious about the river metaphor. When we think of the divide leading to all the mammals – as opposed to, say, the stream leading to the grey squirrel – it is tempting to imagine something on a grand, Mississippi/Missouri scale. The mammal branch is, after all, destined to branch and branch and branch again, until it produces all the mammals – from pigmy shrew to elephant, from moles underground to monkeys atop the canopy. The mammal branch of the river is destined to feed so many thousands of important truck waterways, how could it be other than a massive, rolling torrent? But this image is deeply wrong. (Dawkins 1996, 10)

Dawkins also refers to the distinction between the commonly used metaphors of recipe and blueprint when describing genetic reproduction. He believes that the blueprint metaphor is outdated and plainly misleading. A blueprint, he maintains, is something that is reversible; that can be constructed from examining the finished product. If life evolved from blueprint embryology, he argues, then it would support the Lamarckian theories of evolution. Dawkins (2003, 105) argues that the metaphor of a recipe is a more accurate representation; that genetics is more akin to a chef attempting to reconstruct a rival's soufflé from its taste than an engineer producing the blueprint from a car. As he says, "You can't isolate a particular blob of soufflé and seek one word of the recipe that 'determines' that blob." The same is true of genetics.

In another example, Nordgren (2003) points out that the usual use of the term 'responsible' implies a moral responsibility which necessarily involves a degree of freedom in action, that is, that a will could have determined another course of action, which in some way requires a degree of foresight. However, in the popular scientific publication analysed by Nordgren, the authors Hamer and Copeland (1999) use the term in a causal way. Nordgren (2003, 67) states, "when [Hamer and Copeland] talk about the causal responsibility of genes almost everything that is associated with 'responsibility' in its etymological senses is dispensed with. Genes are not called to appear in courts, neither are they in financial debt." Other metaphorical terms that are

activities of agents, he provides, are those of 'responding,' 'controlling,' 'having power,' and 'shaping.' Granting the gene with substantially more responsibility than it can actually 'carry' through ascribing particular metaphors (primarily in using metaphors concerned with intentionality and action) may unwittingly create a conception of the gene that is neither useful in scientific or technological development, nor helpful in attempts to understand the human condition. Genes have been attributed to every aspect of human behaviour and fate and so we are led to believe that genes determine our likelihood of cancer, heart-disease, diabetes and stroke; whether we are prone to becoming an alcoholic, burglar or genius; whether we will be tall, muscular, blond or homosexual. In all this, we are told that our genes 'decide'; in that they can be isolated and removed from the host body in which they 'inhabit'. Arguably, the choice of particular metaphors reinforces an ideological position or world view that arguably serves the interests and purposes of a particular group.

This analysis of different types of scientific writing support Lakoff's and Johnson's claim that metaphor is fundamental to our thought and not merely a rhetorical effect. Such evidence suggests that metaphors are vital in providing us with any understanding of science, including genetics, when the raw data from scientific experiments comprises of numbers and statistical analysis . Metaphor allows us to construct a picture of a world from this 'raw' data.

Given the previous argument, it seems appropriate to approach the use of metaphor with caution, for the pictures created are merely that, and not reality in itself. Simply by being aware of the mesmerising pictures that language can elicit enables us to recognise our vulnerable position even if we are unable to draw ourselves away. Wittgenstein (1969, 28) writes, "it is, in most cases, impossible to show an exact point where an analogy begins to mislead us." It is not that the use of such linguistic devices should, or even could, be avoided but rather that we must continuously guard ourselves from their mesmerising power.

The language of genetic technology in sport

A further illustration of these claims can be given by the language used in the media's reporting of genetic technology in sport. These examples come from a variety of broadsheet, tabloid, magazine and web sources; the majority from British media but occasionally sources from other media outlets.

What can be shown is that the overall treatment of the issue of genetic technology in sport by the mass media has tended towards: the depiction of Frankensteinian-type monsters; a fear that 'normal' humans will turn into 'deformed' (with negative connotations) creatures; and by 'playing God' (again with a negative subtext) we will create an Armageddon which will see a battle between ourselves and the opposing will of autonomous genes. Arguably, these pictures are produced from a literalisation of the kinds of metaphors that are commonly associated with genetics that have already been discussed.

Many of the metaphors that can be seen in the media are ones that are embraced elsewhere in popular and academic literature. Particularly the metaphors of body as machine or human as computer have gained in

magnitude alongside the technological developments over the last half century. One of the most notable post-modern theorists is Donna Haraway who propounds the metaphor of human as cyborg. Much of this type of literature is an attempt to create a conception of the human that creates a more coherent picture when assimilated with this new, technologically dependent world. One might be too sceptical to believe that the mass media share a similar motivation with their choice of metaphors, for it is more likely to be a desire to provide the simplest causal explanations for what are, in essence, much more complicated multi-causal phenomena.

In his analysis of the ethics of genetic technology in sport, Miah (2002, 199-200) notes that this topic has been accompanied by a media full of speculation and sensationalisation. He argues the pictures that the tabloid media in particular present are fanciful and out of synchronisation with actual scientific application. Miah suggests that had these reports (and arguably the pictures that are created) been more cautious, the ethical debate may well be different to the general swathe of negativity and fear associated with this technology. The type of pictures created through the use of particular language by the media are exemplified with the athlete depicted on the front cover of Miah's (2004) book *Genetically Modified Athletes* which depicts a sprinting athlete carrying a relay baton. Though obviously human in its overall form, there is something disconcerting about this athlete. Its torso is longer and thinner, its head smaller and its face is rather cat-like: it is human but at the same time not quite human. This image appears to be consistent with the general portrayal of this issue within the media. However, whereas Miah has argued that it is the media lust for sensationalisation that has created such images, it may be a less intentional result that is brought about by being misled and confused by our language and the way in which metaphor encourages us to see things in a particular way.

Indeed, Miah himself aims to influence the political decisions that surround the development of genetic technology in sport and attempts to argue that the language (arguably the metaphors) used in the doping debate should not be directly transferred to the one on genetic technology. He is critical of the way in which there has been an onerous emphasis on drugs in sport which has driven the subsequent debate on genetic technology. For Miah (2002, 92), attaching such weight has skewed the perspective about what real harms are involved in performance enhancement and has prevented a holistic treatment and understanding of the broader issue of what is valuable in sport. Effectively, using the metaphor of drug in the discussion of genetic technology has negatively influenced this ethical debate. The connotations associated with drugs in sport typically are those that have produced harmful effects, such as steroids and EPO, and not common daily-used drugs such as aspirin, caffeine or alcohol. Anti-drug campaigners will point to the tragic cases of Florence Griffith Joyner, the tour de France cyclists such as Tommy Simpson and the Eastern bloc athletes in the 1970s and 1980s, and argue that even if the drugs do not lead directly to an athlete's death they will have some negative effect on health. When the metaphor of drug is added to metaphors used to describe genetic technology, such as 'the book of life' or 'the holy grail' – whereby genes are essentially a person's very being - a picture is painted whereby genetic technology creates much more fearsome effects than those ever produced by the use of steroids and this is indicated in the analysis of media reports given below.

The language found within the media reports is separated into three areas: Genes, humans & identity contain reports that are concerned with our understanding of what constitutes a human being and how genetic technology might affect this; Gods and monsters follows from this in assessing the type of language that relates to the creation of new beings; whilst Fears, threats and scenarios picks up upon language that describes the application of genetic technology to sport as something that will be undesirable for human society and the depiction of an altered (and consequently worse) world.

Genes, humans & identity

The initial area that is focused upon draws upon the nature of human identity, the part played by genetics and the effect that genetic technology will have upon this. This aspect supports the thesis that a literalisation of the metaphors surrounding genetics may enforce a dualistic picture between the self and genes as seen in the statement, "humans have, for the first time, the ability to evolve ourselves." [12] The process of evolution in the natural world is an amoral one that has no creator or motive (in terms of agency) except the replication of genes. However, the language used implies the building of something better, more powerful, or more suited to particular tasks and situations as if there is a teleological aim, exemplified in the concentrated focus upon ever improving quantifiable performance in sport. The media's representation of this process suggests that humans will be able to have control over their own destiny, in; "champions have altered their genes." [1] They propose such technology will lead to a situation where "We can now choose what genes we want," [12] and "You could potentially re-engineer your body." [1]

Such statements demonstrate the distinctions that we implicitly make between ourselves and our genes. The 'we' arguably refers to something different to the 'genes' that are being chosen; moreover, this language provides both (as separate entities) with a degree of autonomous agency with different motivations and objectives. In treating the 'I' and 'my genes' as two different things is to fall foul of a category mistake which often results in the depiction of a battle between two distinct entities over the control of one body. It is therefore tempting to be drawn towards a dualistic perspective whereby there is a part of the self (as separate to our genes) that has the autonomy to 'choose'. Such a picture is again supported by the following statement: "Who's calling the shots, you or your new gene? What if in its enthusiasm, your new gene overdoes it and gives you too much of a good thing? Be careful of what you wish for." [37] Here, there seems to be a conflict of will, which sustains a dualistic perspective, in that both 'you' and 'your' genes are fighting over what happens to 'your' body. It is a warning as to what may happen if the gene wins this battle with an implication of fearful consequences (that is reinforced by the adoption of first and second person form of language).

That genes are a necessary part in human existence in that they influence, affect, or determine particular aspects of being, seems to be uncontroversial within the media: "Human nature is thought to be determined by its genes," [43] and "we have been taught to think of nature as one organism whose "building blocks", as we are frequently told, are genes." [43] Our "life forms [are] reduced to molecular codes" [23] and "we are pre-programmed by our genes." [19]

Yet, a dualistic picture is imposed by simultaneously indicating that humans will be able to pick and choose their genes as if shopping for clothing, cosmetics or computers. The metaphor of human as computer appears to be increasingly prevalent with the use of terms such as 'upgrade', 'portability', 'made-to-order', 'component' and 're-programme', in addition to the term 'virus' which, though originally a biological entity, became the metaphor describing the electronic type of virus. This has cumulated to the extent that the electronic form of virus is now pictured far greater than a biological one.

Admittedly, not all reports of this genetic technology go quite as far as suggesting the picture that humans will effectively be able to order the genes that they want from a catalogue. Many are slightly more cautious in eliciting this picture and instead adopt one in which we are simply able to alter or modify our genetic make-up and DNA not swap it for a different one, as can be seen in the following: "[A]thletes will begin tinkering with their own DNA,"[25] or "raise the complexity of... the DNA [they are born with], thereby improving people." [41] There can be a "well-aimed manipulation' of human genes"[25] which is "embracing the benefits of gene manipulation." [43] Nevertheless, the statement that athletes are able to 'tinker with their own DNA' implies that the something doing the 'tinkering' is different to the something that is being 'tinkered' with.

Furthermore, there is a concern that genetic technology produces problems with the concepts of identity and humanness: "what happens if human beings are made from non-human parts? Is a baby made from cloned DNA, gestated in a bubble and connected to a cellular phone still human?" [23] "The answer matters because it is no longer obvious what it means to call something or someone 'normal' or a 'person'." [23] "GM asks us to question what it means to be human" [26] which "challenges fundamental assumptions about our place in the world and our influence on nature." [26] There is the prospect that "All your personal strengths and weaknesses, in body and character, might already have been tested in life by someone else with exactly the same DNA. It would become more difficult to claim with certainty that you were truly your own man. Somebody else may have got there first." [16] Such examples additionally illustrate the misunderstandings and confusions surrounding the issue of cloning, genetic manipulation and identity.

On the one hand it is held that genes play an intrinsic part in being and yet, on the other, there is a fear surrounding such technology that it will enable humans to (re)create themselves. This leaves open the philosophical problem of identity in what is the 'it' that is manipulating and choosing genes that enables such (re)construction. Where is the 'it' to be located if not within the genes? Additionally, what are the implications, if this technology uses non-human genes, on the concepts of human and humanness?

Gods and monsters

The terms contained within the Gods and Monsters category are primarily concerned with the appearance of genetically modified creatures. Many phrases indicate a highly toned and muscular individual as exemplified in the speculation that: "Weightlifters' arms and sprinters' thighs bulge as never before," [1] and "sport will be dominated by ultra-fast, super-strong, muscle-bound" [28] athletes. There are reports that "genetic scientists

are now creating mice with indestructible muscles"[37] and will go on to create "12-foot-tall basketball players." [37] These scientists have "genetically enhance[d] a fly's flight muscles so that they were 300 per cent stronger"[37] which will lead to "[d]esigner arms, legs and muscles,"[42] "to win Wimbledon or 'super-knees' for Olympic downhill glory,"[42] an "8ft shotputter who could throw the shot 100m into the crowd,"[20] and "Swimmers with lungs like bellows or feet like flippers." [38] Eventually, we "will be looking at lock forwards with the power of traction engines and racing pigeons that leave a vapour trail." [30]

This speculation surrounding genetically modified athletes produces language depicting modified athletes or mice (on which this technology has been tested) as something beyond or above the 'natural' incarnation. Many of the terms used are derivations of the idea of a super-human – that has powers and abilities beyond that of a human. On a significant number of occasions the muscle-bound cartoon character 'He-Man' is mentioned with reference to how genetically modified athletes might look. The State Governor of California, actor and former body-builder, Arnold Schwarzenegger is another common reference in descriptions of mice that have been genetically modified with a gene that increases their protein uptake ("an Arnold Schwarzenegger of mice"[37]). The picture drawn here is an effective one; the image of Arnold Schwarzenegger is easily visualised and often used because he is so recognisable, and represents an extreme of the human form in terms of muscle bulk and definition. When this image is applied to mice, one is brought to imagine a mouse with similar muscular form and features which conflict with our usual conception of what a mouse looks like. Yet, our image of a Schwarzenegger-like mouse is a mutated creature in a much greater way than Schwarzenegger himself can be said to be a mutated human. Whereas we can associate body-builders with being human, we do not apply the same flexibility to the forms of being allowed by mice: mice do not body-build and so the image of a muscle bound mouse is quite alien (and perhaps grotesque) to us.

Additionally, there are terms and phrases that provide an indication of the moral acceptability of genetic technology given by the connotations attached to specific creatures that will be created from the application of this technology. Scientists will create "Frankenstein athletes,"[28] or "athletes who are freaks of nature,"[41] which will be "tomorrow's freak performers"[36] in which "an unnatural creature [is] being formed in the laboratory." [43] It is a "Frankenstein world where genetics meets athletics,"[15] which is a transformation of "the human body as an invincible machine,"[15] who represent "a generation of world beaters who are hardly human at all." [37] These creatures will be "professional robo-athletes,"[32] or "Frankensteins." [44]

The frequent allusion to Frankenstein's creation; a being tormented by his own existence who in despair turns on his maker, seeks to serve as a warning that our desire to produce bigger, faster, stronger, and ultimately better athletes, will result in athletes who are ostracised from a society which is fearful of them. Essentially, it will not produce the outcome, viz. better sport, as is originally anticipated. Moreover, as Frankenstein himself is often depicted in popular conceptions of the fictional story as an eccentric and renegade scientist, the scientists who carry out genetic experimentation today are represented similarly (again illustrated in the next section).

Fears, threats and scenarios

Within the media, there has been significant use of language that illustrates the moral acceptability of genetic technology in sport. The application of such technology is feared and can be illustrated by examples such as: “a frightening reality,”[36] “mounting fears,”[25] “horrors of human cloning.”[27] Reports suggest that “Genetic engineering is the next danger”[25]. There is a “fear that gene therapy”[25] will realise the “fear that the laws of nature themselves are no longer to be relied upon.”[43] The “spectre of Olympic athletes using genetic engineering,”[35] “inspire[s] terror,”[43] as “[t]hey threaten to become reality.”[42]

When something is feared, it is an indication that whatever the fear is directed towards is unwelcome and unwanted; it is a moral evocation that such a situation should not be allowed to occur. There are also more explicit examples of moral beliefs that perceive genetic technology as inherently wrong and the attitude held towards those that embrace or use it: this “Scourge of sport,”[36] created by “renegade geneticist[s]”[15] and “ruthless competitors,”[42] leaves us “powerless to stop this perversion of mother natures.”[28] There is “The struggle to combat genetic doping,”[17] against such “Gene cheats” [1][18] [25][28][33][36] where the “Gene Genie Casts [an] Ominous Shadow.”[18] “Drug cheats are on the verge of using genetic engineering to increase stamina and speed, sport scientists warn”[2] whilst another “recoils at the grotesque potential of gene manipulation.”[28]

Again scientists who are conducting such experimentation are labelled as ‘renegade’: they are working beyond the boundaries of accepted and ethical experimentation. The technology itself is feared and in some sense revered, hence the use of terms such as ‘genie’, and the athletes that use such technology are as much party to this ‘scourge’ as those who create it through being labelled ‘ruthless’ ‘cheats’.

The scenarios that are reported in the media are the manifestations of the perceived fears and threats of genetic technology. They describe the kinds of world in which we will find ourselves if we are not careful with the application of this technology. The application of genetic technology creates “a chilling picture,”[12] likened to a “brave new world.”[12] This “doping from hell”[36] will be “the ultimate sporting nightmare”[1] and “a disaster in human and social terms”[28] leading to a “sporting Armageddon”[27] and “sport’s doomsday scenario,”[14] We are warned “we may be facing the nightmare scenario”[37] and “scenarios involving genetically altered viruses running amok and genes spinning out of control”[37] whereby we have opened “a Pandora’s box”[14]. “Sport’s worst nightmare remains gene doping or genetic engineering”[24] where “science fiction has now turned into the worst possible nightmare.”[26] “Sport [is] braced as the gene genie escapes from its bottle”[3] and enters “this dark new world.”[24]

Such pictures paint an unhappy world and one where the fears alluded to previously become reality. Behind this is a belief that developing such technology and using it within the arena of sport is morally wrong: “an area which belonged to God and God alone,” [43] where we are “changing the genes of plants and animals in a way which nature, or God as the creator never intended.”[43]

Conclusion

The problems, inconsistencies and paradoxes in the subject of genetic technology and its applications on humans can be illustrated in the statement from the US Attorney General who ironically said, "I wish genetics had never been invented." [18] This sentiment appears, by what has been written in the media, to be shared by many others. It does not simply allude to the perceived fears and threats associated with the application of this technology but also the way in which we are being confronted with pictures that do not fit with the hegemonic conceptions and understanding of human life. These pictures challenge us to examine our beliefs about humans and human identity.

Essentially, this technology is perceived, to post-Enlightenment Western eyes, as a threat to our autonomy which is held as sacred. The media reflect and perpetuate the fearful scenario whereby humans lose control over technology and it subsequently becomes the dominant force, eventually diminishing and perhaps even eliminating the human race. When genetic technology is added to the weight and influence that evolutionary biology is having on an understanding of what it is to be human, it appears to produce more uncertainty and confusion. Hubbard and Wald (1997) expose this in their claim that simply by defining the human purely in terms of its genetic make-up influences the way that technology is viewed and used is a dehumanizing process whereby individuals are reduced to their genetic consistency and all behaviour is defined with relation to DNA codes. Consequentially, the pictures presented by (metaphorical) explanations don't sit comfortably with the implicit awareness that occurs in the phenomenological experience of being human. In effect, what the use of these examples seeks to show is that the language used in descriptions of the world affects the very world that is being described and that this has implications on the political and ethical judgements that are consequently made. Currently, the metaphors used in the description of genetic technology applied in the sports arena creates a world saturated with fear. The vocabulary used in this area is a speculative one that adopts metaphors that provides genes with both agency and intentionality. Consequently, this gives rise to the fear that both gods and monsters will inadvertently be created. It may be that such fearful scenarios can be avoided by rejecting those particular metaphors and adopting alternative ones that paint a different picture and ultimately a world in which we are much more content to live.

Quoted Media Articles

[1] Aschwanden, C. (2000). Gene cheats: Drug scandals in sport would be nothing compared to the potential for genetic engineering to create "super-athletes". *New Scientist*, January 15 2000. Issue 2221.

[2] BBC NEWS ONLINE. (2001). Scientists warn of 'super athletes'. *BBC News Online*. November 30 2001. Available online: <http://news.bbc.co.uk/1/hi/sci/tech/1683873.stm> [Accessed November 22 2006]

[3] Bee, P. (2004). Sport braced as the gene genie escapes from its bottle: Peta Bee on the latest threat to fair play. *The Guardian*. September 13 2004.

[4] BIRMINGHAM POST, (2004). Marathon Mice Cause A Storm On Treadmills. *Birmingham Post*, August 25

2004. p9.

[5] Bond, D. (2003). A battle won, an unwinnable war. Sunday Times. October 26 2003. Sport Section. p14.

[6] Bose, M. (2004). INSIDE SPORT Pound voices fears on Athens drugs cheats. The Daily Telegraph. July 22 2004. p5.

[7] Bygrave, M. (2002). False dawns in the brave world of New Genetics. The Observer. December 22 2002. p20.

[8] Campbell, D. & McKie, R. (2004) Top athletes seek gene therapy boost: Sports stars could use cutting-edge technology developed to help patients as an 'undetected' doping method. The Observer. July 11 2004. p5

[9] Coe, S. (2002). Lifeguards of the gene pool as Britain reels from another doping scandal, genetic misuse in sport is back on the agenda. Daily Telegraph. March 23 2002. p1.

[10] Connor, S. (2004). American Association for Science: Gene Therapy Could Help Athletes Cheat. The Independent. February 17 2004. p20.

[11] Cribb, P. (2002). Myostatin and Myostatin Inhibitors: The Next Big Supplement Scam. AST Sports Science Inc. March 22, 2002. Available online: <http://www.ast-ss.com/articles/article.asp?AID=85> [accessed November 22 2006].

[12] DAILY MAIL (1998). Breeding Supergods. Daily Mail. January 29 1998. p35.

[13] Derbyshire, D., & Shears, R. (1998). Will the Athletics Cheats Alter Their Own DNA? Daily Mail, August 3 1998. p23.

[14] Entine, J. (2001). Drugs in sport: The gene genie is out of the bottle: Doping's next wave is already on us – and it could kill sport. The Guardian. December 1 2001. Guardian Sport. p16.

[15] Entine, J. (Date Unknown) Genetic engineering and sport: has the future already arrived? Peak Performance Sport Library. <http://www.pponline.co.uk/encyc/0658.htm> [Accessed November 21 2006]

[16] Farquharson, K. (2004). Playing God. Sunday Times. June 27 2004.

[17] Goodbody, J. (2002). World sport clamps down quickly on latest doping threat. The Times. October 1 2002. Sport Section. p44.

[18] Hamlyn, P. (2001). Gene Genie Casts Ominous Shadow – Special Report – Latest Advances In Science Carry Health Warning For Sport's Upcoming Generation. Daily Telegraph. December 4 2001. p6.

[19] Hattenstone, S. (2003). Darwin's child. The Guardian. February 10 2003. Guardian Features. p6.

[20] Henderson, M. (2004). Athletes may abuse 'mighty mouse' gene. The Times. February 17 2004. p12.

[21] Highfield, R. (2004). Gene Jabs 'are the future drugs for cheating athletes' American Association. Daily Telegraph. February 17 2004. p10.

[22] Highfield, R. (2004). Muscle boy shows way for super athletes. The Daily Telegraph. June 24 2004. p9.

[23] The Institute of Nanotechnology, 2002. Nanotechnology – What is it? <http://www.nano.org.uk/whatis.htm> [Accessed February 22 2007]

[24] Mackay, D. (2003). Suspicions rest on China as dark new world looms: Cynics fear Olympic host will want to shine at all costs. The Guardian. October 24 2003. Guardian Sport. p33.

[25] McKie, R. & Mackay, D. (2001). Gene cheats aim to conquer Olympics: Sports' governing body acts over fears athletes could change their DNA to go higher and faster. The Observer. May 13 2001. p12.

- [26] Miah, A. (2004). Genetically modified athletes in Athens? Bring them on: Viewpoint: We should welcome technological advances that can make superhumans, says Andy Miah. *The Observer*. August 1 2004. *Observer Sports Pages*. p9.
- [27] O'Connor, K. (2000). A Form of Cheating We Won't Understand. *The East African Masthead*. December 4 2000. Available online: <http://www.nationaudio.com/News/EastAfrican/11122000/Sports/Sports0.html> [Accessed November 22 2006]
- [28] THE OBSERVER (2000). Genetics and Drugs. *The Observer*, May 7 2000. *The Observer Sport Monthly*.
- [29] Paton Walsh, N. (2001). Alter our DNA or robots will take over, warns Hawking. *The Observer*. September 2 2001. p1.
- [30] Pearson, H. (2004). Stop the boffins before they modafinil a mule or let rats enter the Olympics. *The Guardian*. February 21 2004. *Sports Pages*. p24.
- [31] Powell, D. (2001). Spectre of gene doping raises its head as athletes see possibilities. *The Times*. November 29 2001. *Sport Section*.
- [32] Purgavie, D. (2002). Mouse and superman. *The Times*. September 6 2002. *Times 2*. p4.
- [33] Radford, T. (2004). Gene cheats: the new risk posed to world sport. *The Guardian*. February 17 2004. p2.
- [34] Reynolds. J. (2004). Genetically Modified Mice That Spell Age Of Athletic Superhero. *The Scotsman*. August 25 2004. p9.
- [35] Rogers, L. (2001). Gene cocktails raise fear of 'super-athlete' cheats. *Sunday Times*. October 21 2001.
- [36] SUNDAY TIMES (2000). The new crises facing sport. *Sunday Times*. November 19 2000. *Sport Section*.
- [37] Swift, E.M. & Yaeger, D. (2001). Man or mouse: The genetic generation of world beaters. *The Guardian Unlimited Observer*. September 2 2001. p44. Available online: <http://www.observer.co.uk/osm/story/0,6903,543948,00.html> [Accessed November 22 2006]
- [38] Thompson, J. (2004). Gene Doping Will Produce Super Breed Of Athletes, Claims Scientist; New Hi-Tech Cheating Methods Could Be In Use At This Year's Olympics. *Independent on Sunday*. July 25 2004. p5.
- [39] Thornton, J. (2003). Mighty Mouse. *The Sun*. November 1 2003.
- [40] Wallace, S. (2001). Cheats 'could inject genes to beat system'. *Daily Telegraph*. December 4 2001. p1.
- [41] Walsh, D. (2000) An end to innocence. *Sunday Times*. October 1 2000. *Sport Section*.
- [42] Warner, A. (2001). IOC bans genetically-engineered sportsmen. *Reuters: London*. October 14 2001.
- [43] Warnock, M. (2001). We need have no fear of interference with nature. *The Guardian*. May 15 2001.
- [44] Wilson, N. (2004). Forget steroids and blood doping is the gene genie out the bottle? *Daily Mail*. July 28 2004. p74.

References

- Cranor, C. F. (Ed.) 1994. *Are Genes Us? The Social Consequence of the New Genetics*. New Jersey: Rutgers University Press.
- Dawkins, R. 1996. *River Out of Eden: A Darwinian View of Life*. London: Phoenix.

- _____ (Edited by Latha Menon). 2003. *A Devils Chaplain: Selected Essays*. London: Weidenfeld & Nicolson.
- Hubbard, R., and E. Wald, 1997. *Exploding the Gene Myth: How Genetic Information is Produced and Manipulated by Scientists, Physicians, Employers, Insurance Companies, Educators, and Law Enforcers*. Boston: Beacon Press.
- Lakoff, G., and M. Johnson, 1980. *Metaphors We Live By*. London: University of Chicago Press.
- Hamer, D. H., and P. Copeland, 1999. *Living with Our Genes: Why They Matter More Than You Think*. New York: First Anchor (Random House).
- Miah, A. 2002. *Philosophical and Ethical Questions Concerning Technology in Sport : the case of genetic modification*. PhD diss. De Montfort University, Bedford.
- _____ 2004. *Genetically Modified Athletes: Biomedical Ethics, Gene Doping and Sport*. London: Routledge (Taylor & Francis).
- Nelkin, D., and S. Lindee, 2004. *The DNA Mystique: the gene as a cultural icon*. Michigan: The University of Michigan Press.
- Nordgren, A. 2003. *Metaphors in Behavioral Genetics*. *Theoretical Medicine* 24: 59-77.
- Ryle, G. (introduction by Daniel Dennett) 2000. *The Concept of Mind*. London: Penguin.
- Wittgenstein, L. 1968. *Philosophical Investigations*. (Trans. G.E.M. Anscombe) Oxford: Basil Blackwell.
- _____ 1969. *Blue and Brown Books*. Oxford: Basil Blackwell.