

“Progressive” evolution and “totipotent” stem cells: metaphors in British and German debates about the “life sciences”

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Abstract

The article analyses the role of metaphor and simile in representations of evolution and genetics in British and German popular science and media publications. It focuses on the metaphors of PROGRESS, AGENCY AND POTENCY which are used to interpret concepts such as “evolution”, “gene” and “stem cell”. Such metaphors are often presented as being imbued with scientific authority. We shall review these claims with special regard to the popular views of evolution as a “progressive” movement and to topical debates about embryonic stem (ES) cell research in Britain and Germany. On the basis of data from a pilot corpus, we propose that in British public discourse, ES cells tend to be depicted mainly as “objects”, “instruments” or “tools” of medical research. German public discourse shares these metaphors but seems to be characterised specifically by prominent discussions about ES cells’ “totipotency”, or on “scientists playing God” and “interference in Mother Nature’s design”. In conclusion, we shall discuss how the different metaphor preferences may account for contrasts in British and German public attitudes and legislature regarding ESC research.

Keywords: embryonic stem cell, evolution, genetics, metaphor, popular science.

Resumen

Evolución “progresiva” y células madre “totipotentes”: metáforas presentes en los debates británicos y alemanes sobre las “ciencias de la vida”

El presente trabajo analiza el papel de la metáfora y del símil en las publicaciones científicas divulgativas y en la prensa británicas y alemanas en cuanto a la representación de la evolución y la genética. Se centra en las metáforas de

PROGRESO, AGENCIA y POTENCIA, empleadas para interpretar conceptos tales como “evolución”, “gen” y “célula madre”. Lo habitual es que dichas metáforas sean plenamente asumidas y respaldadas por las autoridades científicas. Examinaremos este argumento prestando especial atención, por un lado, a la opinión más divulgada de que la evolución es un movimiento “progresivo” y, por otro, a los debates temáticos relativos a la investigación con células madre embrionarias (CME) en Gran Bretaña y Alemania. Tomando como base los datos obtenidos con un corpus piloto, nos encontramos en disposición de adelantar que en el discurso divulgativo británico las CME tienden a describirse, ante todo, como “objetos”, “instrumentos” o “herramientas” de la investigación médica. Esta visión también es compartida por el discurso divulgativo alemán, si bien en este último caso parece caracterizarse por notables discusiones sobre la “totipotencia” de las CME o sobre “los científicos juegan a ser dioses” y “la interferencia con la madre naturaleza”. En definitiva, estudiaremos de forma contrastiva las preferencias en las metáforas utilizadas en torno a la investigación con CME a fin de explicar las diferencias registradas entre la actitud mostrada por las sociedades británica y alemana y las legislaciones que les competen.

Palabras clave: células madre embrionarias, evolución, genética, metáfora, ciencia divulgativa.

1. Introduction

Metaphor is, so to speak, the life-blood of popular science. The dissemination of new information to a non-expert public would be impossible without it. Not only the contents but also the methodologies and the basic assumptions of scientific research are so complex and abstract that any “direct” access is effectively excluded. Even core domains of human experience, such as bodily states, emotions, or health and illness, have been found to be organized in terms of metaphors that we “live by”, as Lakoff and Johnson (1980) put it, and that we fall ill and die by, as Susan Sontag pointed out in her famous essay *Illness as Metaphor* (1978). On rereading her own essay later, Sontag (1991: 91) conceded that “of course, one cannot think without metaphors” but that did not mean “there aren’t some metaphors we might well abstain from or try to retire”, such as war imagery for the treatment of cancer (which she herself experienced as a patient), or the use of disease metaphors to stigmatize political enemies.

In the case of metaphors in popular science there is a further aspect to be taken into account, i.e., their “place of origin” in the register of a special

scientific discipline. Metaphors of popular science often carry the baggage of a particular theoretical and methodological bias that may be well known to and critically reflected on by experts but is as unknown to the general public as the contents of a scientific discovery. By providing the crucial link between scientists' presentations of their work and the public's consciousness and awareness of it, metaphors fulfil a centrally important role of mediation between expert and lay cultures but also carry the potential of seriously misleading the public. On account of this ambiguity it seems promising to analyze the heuristic value of metaphors in popular science so as to better understand their socio-cognitive appeal.

The following discussion concentrates on the use of metaphors in the public debate on scientific notions of evolution and genetics. First, we shall study the metaphor of evolutionary development as PROGRESS, which seems to have survived many attempts by scientists to prevent its misinterpretation. On the basis of this historical "test-case" we shall then examine the use of metaphor in media reports on human embryonic stem (ES) cell research in Britain and Germany. The imagery employed in the two national discourses appears to be similar as regards the conceptual range of imagery employed; nevertheless we find differences in the emphasis on particular metaphor uses that can be related to attitudinal differences which affect legislation and policy-making. The investigation of such differences may shed a light on how scientific metaphors are "recycled" in the public debate to fit specific social concerns and interests.

2. Metaphors of evolution: never-ending progress?

In a 2005 British TV advert for Guinness beer, three lads are shown enjoying their pints and then experiencing instant evolutionary *regress* until they end up as amphibians in the primordial swamp (York, 2005). The advert tells, in reverse, evolution's story, as we all know it, i.e. a story of a "linear progression" through time. A range of life forms is projected onto a time-scale that links the distant past with the present, with humans as the supposedly most advanced manifestation of life on earth. Stephen Jay Gould explained the enduring attractiveness of this image of evolution in terms of a "chain of being or ladder of linear progress" by highlighting its function of "reinforcing a comfortable view of human inevitability and superiority" (Gould, 2000: 28-29).

The metaphor of evolution as PROGRESS is easy to comprehend and it flatters human self-perception as the pinnacle of an evolutionary “Chain of Being”. The “Chain of Being” complex can be traced in the Western philosophical tradition back to Neo-Platonist thought in the first two centuries *a.d.* (Lovejoy, 1936) and has been shown to be operational in public discourse and folk-ontologies to this day (Lakoff & Turner, 1989; Kövecses, 2002). In the history of science, the “Chain of Being” was temporalized over the course of the 18th century and applied to all living creatures. In 1754, Linnaeus, for instance, asserted that “all living things, plants, animals and even mankind (...) form one chain of universal being from the beginning to the end of the world” (Jones, 2000: 253).

This temporalized concept of the “Great Chain” still held true for Charles Darwin. In the *Descent of Man*, first published in 1871, he judged the view that the “world appear[ed] as if it had long been preparing for the advent of man” to be “strictly true” in the sense that if “any single link in this chain had never existed, man would not have been exactly what he now is” (Darwin, 2004: 192-193). As a scientist, Darwin was careful to stress the “apparent” conclusiveness of the “chain” metaphor in presenting evolution “as if” it were a continuous line of progenitors leading “up to” mankind. He was, of course, conscious of the fact that evolution was much more complex. In the context of his famous simile of “the great Tree of Life” in *On the Origin of Species*, he accounted for differences in evolutionary phenomena: on the one hand, growing twigs on the tree show the manner in which “species and groups of species have at all times overmastered other species in the great battle for life” (Darwin, 1901: 162); on the other hand, he acknowledged also the survival of the “thin straggling branch springing from a fork low down in a tree”, which was saved from fatal competition by having inhabited a protected station” (Darwin, 1901: 163). It seems that Darwin already saw the need to make it clear there is more to evolution than the PROGRESS of only the fittest “battle-hardened” competitors.

Darwin also mentioned “decayed” limbs and branches that “may represent those whole orders, families, and genera which have now no living representatives, and which are known to us only in a fossil state” (Darwin, 1901: 163). Among the earliest of these branches are the more than 500 million years old fossils of the so-called “Burgess shale”, which were discovered in 1909 and whose scientific interpretation forms the main topic of Gould’s book *Wonderful Life*. The gist of his account is that “most Burgess organisms do not belong to familiar groups” and that therefore “the history

of life is a story of massive removal followed by differentiation within a few surviving stocks, not the conventional tale of steadily increasing excellence" (Gould, 2000: 24-25). Gould draws the conclusion that the course of evolution is contingent in the sense that if only a slightly different catastrophe had wiped out a slightly different group of organisms those hundreds of millions of years ago, evolution would still have proceeded but not in the same way "as we know it". If some, or most of the major branches of life's evolutionary "tree" broke off the main trunk early on, due to a chance catastrophe, it follows that the presently existing "branches", including the human species, owe their survival not to any superiority over other species but to the contingent fact that their "ancestor branches" were accidentally spared. Their evolutionary "fate" was determined by ancient catastrophes rather than by any inherent quality. In order to highlight the contingency of survival, Gould reformulates Darwin's TREE metaphor as that of a "copiously branching bush, continually pruned by the grim reaper of extinction" (Gould, 2000: 35).

Richard Dawkins, in *The Ancestor's Tale* (2005), counters the seeming naturalness of the "forward-looking" metaphor of "linear progress" by explaining evolution in terms of a "pilgrimage back" in time. At chosen intervals on their imaginary journey, his reader pilgrims meet their respective last common ancestor ("concestor") that they share with the respectively most closely related creatures. The purpose of Dawkins' (2005) telling his evolutionary tale backwards is that of disabusing the general reading public of teleological explanations in biology. But even he cannot avoid telling his story with a "forward" bias in some cases, e.g. when he speaks of "dinosaur shoes" that "were waiting to be filled" by species that could then "expand" into the "ecological spaces left by the dinosaurs" (Dawkins, 2005: 176, 234). These formulations rest, as the author himself points out, on "the conceit of hindsight" (Dawkins, 2005: 1-11, 375) –of course, any "expansion", or "filling of shoes" by other species could only have been unintended.

For all their efforts to counter the "forward" bias in conceptualising evolution, Gould and Dawkins thus still follow the habit of speaking about it "as if" it were "forward"-looking. In this, they follow Darwin himself as a frequent user of "as if" formulations and of the "tree-model" of evolution. Darwin's theory itself provides us with one of the most (in-) famous cases of popular misunderstanding of scientific metaphors. The interpretations of his theory by Herbert Spencer and Francis Galton inspired Social Darwinism and the Eugenics movement (Weindling, 1989;

Kevles, 1995; Rose, 1998; Weikart, 2004). Darwin must have been aware of the danger of misinterpretations: why else would he have gone out of his way to justify his key concepts, such as the “struggle for existence” as being used “in a large and metaphorical sense including dependence of one being on another” (Darwin, 1901: 78). In order to drive home the point that the readers should not think of the “struggle for existence” as a one-to-one-combat, he chose the example of a mistletoe, which “is dependent on the apple and a few other trees, but can only in a far-fetched sense be said to struggle with these trees, for, if too many of these parasites grow on the same tree, it languishes and dies” (Darwin, 1901: 78). Despite such provisos, this very notion of the “struggle” between a “parasite” and its “host” was mis-construed as a metaphor to justify racial genocide in Nazi Germany (Proctor, 1988; Kevles, 1995; Evans, 1997; Musolff, 2007). This racist exploitation of the “struggle for existence” metaphor was not contained in Darwin’s theory but could be linked to it by misunderstanding evolution as “progress through struggle”. If evolution is thought of as PROGRESS, and PROGRESS itself is conceived only as the outcome of a deadly struggle between competitors, then evolution appears to entail the elimination of “inferior” competitors by supposedly “superior” ones. The misinterpretation of the concept of evolution through the combination of PROGRESS and COMBAT metaphors serves as a reminder of the potentially disastrous political and social ramifications of misapplied popular scientific imagery.

3. Metaphors in genetics: stem cells and their “potential”

One of the most contested topic areas in current public debates is the application of genetic research results to fertility treatment and therapies, known metaphorically as “genetic engineering”. Favourite metaphors used in public discussions on this topic are based on the source domains of MOVEMENT and TRAVEL (e.g. “journey”, “race”, “obstacles” and “milestones” of genetic research, “the genetic map”), READING (“genetic alphabet”, “book”, “library”), CONSTRUCTION (“genes as building blocks”), TECHNOLOGICAL MANIPULATION and its unforeseen results (“genetic engineering”, “machine”, “Frankenstein’s monster”) and of genes as “self-propelled” and even “selfish, dynamic entities” (Hellsten, 2000 & 2002; Nerlich, 2005). Dawkins has made at least as great an effort to justify

and explain his metaphors as Darwin (Dawkins, 1989: 45, 278), but in *The Ancestor's Tale* even he shows signs of exasperation:

There is a temptation (...) to turn "gene survival in the past" into something like "intention to reproduce in the future". (...) Scientists who use such language (...) know very well that it is only a figure of speech. Genes are just DNA molecules. You'd have to be barking mad to think that "selfish" genes really have deliberate intentions to survive! (Dawkins, 2005: 46-47).

There is no reason to question the sincerity of Dawkins' reassurances concerning his use of the "selfish gene" metaphor "as" a metaphor—but will they fare better than Darwin's imagery? Of course, only history can tell, but when we look at some of the current debates about "stem cells" one may wonder if these biological entities are not only being reified but even deified. Some commentators ascribe magic, alchemistic qualities to stem cells, especially those taken from embryos, as having the "potential" to develop into any imaginable tissue:

- (1) Following pioneering work on mice (...), teams [of researchers] have used embryos donated by patients undergoing IVF. (...) These cells are known as stem cells and they have the potential to turn into cells of any type of tissue: skin, heart, kidney or brain, for example. (*The Observer*, 13 Nov. 2005)

The STEM metaphor source in "stem cell" links to the folk-knowledge about the domain of plants, i.e. that the stem of a tree is more essential to its existence and survival than the branches and twigs, and that plants can be re-grown from stems. Plant stems and stem cells are thus thought to have the "potential" to grow or re-grow into the full, complete version of the organism. The term *potential* here may seem innocuous enough, as its origin from Latin *potens* ("powerful", "capable" –Skeat 1993: 367) has paled sufficiently to make it a neutral-sounding reference. However, in the context of announcements of successful stem cell cloning experiments, the notion of stem cells as entities with unlimited developmental *potential* has become charged with extra meanings. Robin Lovell-Badge from the National Institute for Medical Research, in an article in *The Guardian*, thematised this polysemy:

- (2) *Potential* is a word used by people on all sides in debates about stem cells. They will refer to the developmental potential of a stem cell, its ability to give rise to one or more specialized cell types. Or to altered potential and

reprogramming, when a stem cell seems to break the rules and develops into a different kind of tissue. Some will talk about the potential of stem cells to aid research or (...) of potential to cure disease. (...) But potential is always conditional. It depends on research to prove something can work and that it is safe. This may take a long time, so caution needs to temper our optimism. But if we are not allowed to do research on embryonic stem (ES) cells then we will not be able to use them for cures. Any potential will be wasted. (*The Guardian*, 21 May 2005)

Lovell-Badge invokes the authority of science and the prospect of future therapies to highlight the definition of ES cells' "potential" in the context of an argument *pro* further ES research. In the same number of *The Guardian*, the president of the Institute on Biotechnology and the Human Future at the Illinois Institute of Technology in Chicago, Nigel Cameron, warned in a counter-commentary of the "downside" of ES cell research by way of using technological imagery, implicitly accusing the British government of a technocratic attitude: "Blair has taken Thatcher's policy to new heights by pressing cloning as a means of *mass-manufacturing* embryos to *generate* the stem cells" [*Italics added*] (*The Guardian*, 21 May 2005). He also praised Germany, on account of its cautious legislation on stem cell research "as the global centre of conscience on biotechnology" (*The Guardian*, 21 May 2005).

Germany has had a comparatively restrictive legislation on genetic research until now: only ES cell lines imported before 2002 may be subjected to experimental research whereas there is no such general restriction in Britain. Even though Germany has over the past five years followed the lead of Great Britain in setting up enquiry commissions and regulatory/supervisory bodies for bioethics that are represented and led predominantly by scientists, these differences have not diminished but rather increased (Oduncu, 2003; Dohmen, 2004; Eser & Koch, 2004; Quante, 2005; Bahnsen & Willmann, 2005). Recently, the discrepancies between the two national approaches have become even more apparent. In 2008, the German parliament managed with great effort to extend the time limit for the import of stem cells (their production in Germany is still forbidden). At the same time, British researchers have benefitted not only from generous legal provision for the creation of ES cells (as long as this serves the purpose of developing new therapies) but in May 2008, the British parliament permitted even the creation of "admixed", hybrid embryos (Spiewak, 2008; Warnock, 2008). In view of these tendencies, the enduring, and growing, differences in the public attitudes towards ES cell research in Britain and Germany would

appear to be motivated by deep-seated contrasting assumptions about the nature, prospects and values of human life in its early stages (Hervey & Black, 2005; Franz, 2006).

In the following section, I shall investigate whether and how these differences find expression in the imagery employed in the public debates on this topic in both countries. The findings are based on a pilot corpus of 110 topic-relevant British and German articles (52,000 words so far) from newspaper coverage in 2000-2008, including, for instance, *The Times*, *The Guardian*, *Daily Telegraph*, *The Independent*, and the *Economist* on the British side, *Die Zeit*, *Die Welt*, *Frankfurter Allgemeine Zeitung*, *Berliner Zeitung* and *Der Spiegel*, on the German side.

4. "Liberation biology" vs. restrictions on ES cell POTENCY

In Britain, both advocates and opponents of research on embryonic stem cells, employ the established imagery of "reading" and "technological manipulation", which depicts the referents as "objects" or "tools" of research (Hellsten, 2000 & 2002; Henderson, 2005). In positive reports, particular emphasis is laid on the "national" achievement of British scientists being at "the forefront" of global research efforts:

- (3) Scientists have created human stem cell cultures without using any animal cells for the first time. (...) Growing cells outside the body needs a *carefully controlled environment*. (*The Guardian*, 2 Jan. 2006)
- (4) Dr Woo Suk Hwang, once regarded as the world's *leading* stem cell pioneer, was branded a national disgrace yesterday (...) after an investigation found that the research on which his reputation rested was fabricated. (...) "This has set us back several years. *It was as if Dr Hwang had sent us a picture of him on top of Everest, but it happened not to be Everest. He lied to us about that and Everest is still there to climb. It's a challenge and it's a biggy*," said Chris Shaw, (...) who (...) heads one of only two groups in Britain to hold a human cloning licence. (*The Guardian*, 11 Jan. 2006)
- (5) Donor *breakthrough* for cloning research [headline]. [New] rules will permit teams at the University of Newcastle-upon-Tyne and the University of Edinburgh (...) to recruit egg donors from a much wider pool of women. (*The Times*, 14 Jan. 2006)

- (6) A decade after the creation of Dolly the sheep, we are living *in a glorious age of liberation biology*. New technologies are unveiled by doctors almost every week that make it possible to reduce the sum of human suffering in ways *that would have seemed like Star Trek science fiction* when she first came mewling into our world. (...) We should be honest enough to call this attempt to improve the genetic lot of humanity by its name –liberal eugenics. It has nothing to do with the evil of Nazi eugenics (...) (*The Independent*, 6 July 2006)

The imagery of “breakthroughs” and “climbing mountains”, of “liberation”, of “leadership” in and “control of a new technology” as well as the promise of positive “potential” pervades statements by British scientists, government representatives and media reports. They are, however, not without opposition. Warnings of “monsters”, “Franken”-creations and scientists “playing God” and comparisons with Nazi science also figure in the public debate (Wellcome Trust, 1998; Hellsten, 2000; Kitzingler et al., 2003). Reservations by religious groups, in particular the Catholic Church are faithfully, if sceptically, reported. Nonetheless, these misgivings and protests have not managed to dent significantly an optimistic and overall research-friendly stance on the part of successive governments and the general public.

In German public debates, we find the same range of metaphoric concepts and similes, with the Nazi eugenics comparison given high prominence, especially at the level of politico-ethical discussions (Sloterdijk, 1999; Habermas, 2001; de Berg, 2002; Hauskeller, 2004). This does not mean, however, that German public debate is dominated by the Nazi references (Döring & Nerlich, 2004; Nerlich, 2005), and the German sample of our pilot corpus does not appear to contain more instances of it than the British sample.

However, the German debates do seem to have one characteristic aspect in that they give particular prominence to thematisations of the degree of potential cell growth. This topic is not unknown in British debates (compare the notion of “developmental potential” in Lovell-Badge’s list of meanings of “potential” in British stem cell debates in example 2). The German lexical realizations of this concept include the noun *Potenzial*, the adjective “potent” as well as the colloquial *Alleskönner* (someone or something able to deal successfully with any task). The general concept of “potential/capability” of ES cells is further differentiated in German debates into “totipotency” (potential to develop into any kind of cell of the respective organism, which only applies to stem cells at a very early embryonic stage), “pluripotency”

(potential to develop into a range of cells) and "multipotency" (of cells at an adult stage, whose developmental range is limited to a particular type of tissue).

These grading specifications may seem not particularly contentious and therefore unlikely to feature in public debates, belonging as they do to a technical scientific register. However, their significance lies precisely in the apparent accuracy of definitions that are used to decide the question of when a group of stem cells should be regarded as being capable of becoming an organism (i.e. in the case of humans, a full human being). In its white papers to the German parliament, the National Ethics advisory council distinguished between "absolute totipotency", as the capability of an embryo to develop into a human being (which, if predicated of all ES cells, would exclude these from any research) from maximum "pluripotency", i.e. a developmental range that could be ascribed to cloned ES cells (*Nationaler Ethikrat*, 2001). In 2004, one member of the council, the scientist Jens Reich (formerly a leading representative of the East German civil rights movement) criticised the very concept of "totipotent" cells as a scientific category:

- (7) *Reich*: I think the identification of a cloned construct and an embryo is wrong. (...) Because this identification is only possible if you ascribe "totipotency" to a cloned cell, that is the potential to develop into a full human being. But the concept of totipotency cannot be operationalized for empirical research. And therefore I think this concept is useless as an underpinning for an ethical decision. [My translation] (*Die Zeit*, 26 Aug. 2004)

Reich's difficulty with the concept of "totipotency" is indicative of the tensions between the "functional" characterization of an entity for the purposes of biomedical research, for its legal definition and for its public conceptualization. There may well be doubts among scientists about whether cloned human ES cells may be at all "totipotent" –legally, they are prevented in Germany from putting this issue to the test. In the public debate, however, the fascinating idea of the "all-capable, totipotent" ES cells features prominently whenever changes in the law regulating the import and use of new stem cell lines is discussed in public (compare, for example, Lehmann, 2008, or Winnacker, 2008).

"Totipotency" turns out to be a deceptively technical/scientific-sounding version of qualifications of stem cells that are otherwise metaphorically

expressed by way of more traditional ascriptions of magic creative powers that feature prominently in the German debates (*Wunderwerke der Natur*, *Wunder des Lebens*, *Heilsbringer*; see Mönninger, 2001; Hammerstein & Neubacher, 2004; Bredow et al., 2005). One commentator even attributed not just “toti”-, but god-like “omni-potency” to them (*omnipotente Zellen* –Rögner, 2005). Whilst such ascription of miraculous creative POTENCY to ES cells –as well as to the scientists– is by no means alien to British discourse (see Frith, 2005; McKie & Asthana, 2005. Further data in Hellsten, 2002), its specific link with, and seeming derivation from, scientific terminology (as in “multi-”, “pluri-”, “toti-”, “omni-potency”) appears to be typical of the German debate.

5. Conclusions

Due to the limitations of the small corpus that has been assembled so far, it is not possible to draw statistically significant conclusions about differences between British and German uses of specific metaphors in ES cell debates. Whilst the overall range of source domains seems to be similar in both national discourses, the German discussion appears to give special prominence to distinctions of the degrees of cell growth “potential” that are derived from scientific terminology. The data show that these terminological distinctions change their rhetorical function when they are used in the public debate. A concept such as “absolute totipotency” may be discussed by scientists as a theoretical and technical problem, but in the public debate, due to its ramifications for the contentious issue of defining the “origin of human life”, it is linked to familiar metaphors of popular science where scientists are routinely depicted as “playing God” and stem cells are attributed quasi-miraculous, creative POTENCY.

The special focus on the researchers’ or ES cells’ “creative potential” seems to favour certain types of discourse over others. On the one hand, one can think and talk of genetics and biology in terms of “scientifically controlled processes”. This is the realm of technological, instrumentalist metaphors that are typical of success-oriented popular science accounts. In such texts, researchers are the “agents”; the respective biological entities are the “objects” or “tools” of scientific inquiry and manipulation. This discourse is metaphysically agnostic or ostentatiously non-religious. The opposite position is usually framed by religious discourse, which insists on the

omnipotent creator-God. The scientists' instrumentalist approach and supposed usurpation of God's role ("playing God") is seen as a blasphemous, unacceptable violation of the order of the universe. Today, this discourse seems no longer to command a majority appeal in Britain or even in Germany. Instead, we have also found a third, alternative position in public discourse, i.e. the ascription of POTENCY and even AGENCY to cells and other biological entities/processes themselves.

Significantly, none of these three discourses ascribes an active/agentive role to the female donors of eggs and patients of genetic "harvesting" procedures and experiments or to the alleged beneficiaries of the scientific "breakthroughs", i.e., the actual patients or subjects of the hoped-for therapies. These groups have at best "object" status in most public debates on stem cell research.

Leaving aside religious discourse, the currently dominant conceptualisations of researchers or ES cells as the main or only "omnipotent/totipotent agents" carry an analogically, i.e. not descriptively, underwritten presupposition of either a God-like "designer/engineer" role of human scientists or of a miraculous "dynamism" that is somehow inherent in life, evolution and/or stem cells. Someone or something has to "do" all the "evolving", "growing", and "realisation of potential". Such implicit metaphoric assumptions are liable to be ideologically exploited for the purposes of a bio- or eco-mysticism that imputes metaphysical principles to nature in order to obscure political interests. Such tendencies rely no longer on arcane magic formula; instead, they lay claim to scientific authority by borrowing from the specialised, technical register of particular scientific debates. But whereas scientists may argue over the theoretical and practical implications of the distinction between mere "pluri-" and full "totipotency" (example 7), the popular uses of recycled special terminology suggest clear-cut contrasts that justify specific courses of action in legislation and research. As we can see from the history of misinterpretations of the TREE OF LIFE, PROGRESS and STRUGGLE metaphors for evolution, transferring metaphors from scientific to public discourse without reflecting their potential ideological bias is not without risk. A combination of conceptual and discursive metaphor analysis seems to be well suited to unearth the implications of such transfer and subject them to critical discussion.

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