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Expertise and Inauthentic Scientific Controversies: What You Need to Know to Judge the Authenticity of Policy-Relevant Scientific Controversies

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ABSTRACT: The paper explores how non-experts can assess whether a policy-relevant technical or scientific issue is subject of a genuine controversy amongst experts or not. A criteria-based approach is suggested. While a number of criteria are introduced, the focus is on the expertise that one needs to employ the criteria appropriately. It is suggested that this expertise, which is called ‘sociological discrimination’ and which refers to an understanding of the nature of science, is an essential prerequisite for making adequate authenticity judgements.

KEYWORDS: AZT, Mbeki, expertise, inauthentic scientific controversy, nature of science, sociological discrimination

1. INTRODUCTION

In October 1999, South African President Thabo Mbeki surprised many when he claimed that an ongoing scientific controversy about the safety of an antiretroviral drug called AZT made it impossible for his government to implement a country-wide program based on AZT to prevent mother-to-child transmission of HIV (MTCT). Scientific research had found that AZT, when given for a short period to pregnant women living with HIV/AIDS as well as their newborns, was capable of reducing the risk of MTCT significantly. While this fact remained undisputed, Mbeki suggested in a speech to the second chamber of Parliament that AZT might just be too toxic to be used in the public health sector for MTCT prevention:

[W]e are confronted with the scourge of HIV-AIDS against which we must leave no stone unturned to save ourselves from the catastrophe which this disease poses. Concerned to respond appropriately to this threat, many in our country have called on the Government to make the drug AZT available in our public health system. [. . .]

There . . . exists a large volume of scientific literature alleging that, among other things, the toxicity of this drug is such that it is in fact a danger to health. These are matters of great concern to the Government as it would be irresponsible for us not to heed the dire warnings which medical researchers have been making. I have therefore asked the Minister of Health, as a matter of urgency, to go into all these matters so that, to the extent that is possible, we ourselves, including our country's medical authorities, are certain of where the truth lies.

To understand this matter better, I would urge the Honourable Members of the National Council to access the huge volume of literature on this matter available on the Internet, so that all of us can approach this issue from the same base of information. (Mbeki, 1999)

This was a remarkable statement as there was no previous indication that the government was concerned about the safety of AZT. Mbeki invoked “medical researchers,” i.e., experts, who warned about the safety of AZT to challenge the seemingly popular belief that using AZT to reduce MTCT was safe. Mbeki also referred to a huge volume of scientific literature that detailed these warnings. These claims proved to be important for the policy-making process as the government stuck to them for several months and blocked any attempts by non-governmental stakeholders such as AIDS activists to force a positive decision on the introduction of AZT-based MTCT prevention programs in South Africa.

The delay in decision making that resulted from Mbeki’s invocation of a scientific controversy about the safety of AZT had serious consequences in the South African context. In 1999, South Africa hosted the reportedly biggest and fastest growing HIV/AIDS epidemic in the world. Official figures suggested that about 4.5 million South Africans were living with HIV/AIDS by the time Mbeki gave his speech and that almost 500,000 new infections per annum were fueling the epidemic (Grimwood, Crewe, & Betteridge, 2000; Marais, 2000; UNAIDS, 2008). Given that in South Africa women between 15 and 40 years constitute the social group most heavily affected by HIV/AIDS, MTCT and its prevention was a huge issue. Scientific research suggests that without any intervention there is roughly a 30% chance that women living with HIV/AIDS will transmit the HI virus to their children shortly before, during or after giving birth. Scientific research had established that AZT-based MTCT prevention programs had the potential to reduce the risk of MTCT by about 50% (Newell, 1998; Bulterys, 2001). Given that official estimates suggested that in 1998, when no such programs were in place, about 60,000 children were infected with HIV through MTCT, the potential consequences of the policy decision about the use or non-use of AZT for thousands of children in South Africa become visible (Marseille et al., 1999; Wilkinson, Floyd, & Gilks, 2000; Chigwedere, Seage, Gruskin, Lee, & Essex, 2008; Nattrass, 2008).

2. INAUTHENTIC SCIENTIFIC CONTROVERSIES

An inauthentic scientific controversy can be understood as a degree of publicly visible disagreement about some scientific fact or issue which does not represent uncertainty in the community of relevant experts. According to this understanding, the briefly described episode of a larger policy-making process about using AZT to reduce the risk of MTCT in South Africa is a clear example of an inauthentic scientific controversy. There never has been any disagreement about the safety about AZT when used for MTCT prevention within the relevant expert communities.¹

Over recent years the issue of inauthentic scientific controversies has been given some prominence within the sociological literature (e.g., Latour, 2004; Oreskes, 2004; Ceccarelli, 2008, 2011; Weinel, 2008, 2009; Michaels, 2008; Collins, Weinel, & Evans, 2010; Oreskes & Conway, 2010). It has been recognized that some actors in the policy arena clearly invoke

¹ An extensive analysis can be found in Weinel (2008, 2010). Similar views about the authenticity of this alleged scientific controversy can be found in Nattrass (2007, 2012), Gevisser (2007), Cullinan and Thom (2008), Geffen (2010), and Ceccarelli (2008, 2010).

inauthentic scientific controversies for political purposes. Quoted in an editorial of the *New York Times*, Frank Luntz, a Republican pollster, for example, has been very frank about the usefulness of manufacturing scientific controversies for policy purposes in the debate about global warming: “‘Should the public come to believe that the scientific issues are settled,’ he [Luntz] writes, ‘their views about global warming will change accordingly. Therefore, you need to continue to make the lack of scientific certainty a primary issue’” (“Environmental,” 2003).

Michaels (2008), who has analyzed in detail the strategies of tobacco manufacturers in their bid to delay the introduction of anti-smoking legislation, quotes an executive of a cigarette manufacturer, who is clearly aware of the political advantages of being able to point to a scientific controversy: “*Doubt is our product* since it is the best means of competing with the ‘body of fact’ that exists in the mind of the general public. It is also the means of establishing a controversy” (Michaels, 2008, p. x, emphasis in original).

Michaels, who concentrates mainly on the controversy-creating activities of big industrial players, points out that such actors have learned “that debating the *science* is much easier and more effective than debating the *policy*” (2008, p. xi, emphasis in original). Given the inherently probabilistic nature of scientific knowledge, there is always room to create doubts and to declare uncertainty.

While the recognition and description of inauthentic scientific controversies as an important issue in technological decision making is to be welcomed, a hitherto neglected aspect is how to distinguish systematically between genuine and inauthentic scientific controversies. Recognizing inauthentic scientific controversies is important since it can be argued that they should not have an impact on technological decision making. One reason for keeping inauthentic scientific controversies out of decision-making processes is that they can have real consequences. Manufactured scientific controversies are usually used to delay decision making, thereby delaying potentially life-saving legislation as the South African example, introduced above, suggests. Another reason is that it denies publics proper political debates by hiding political agendas behind invented scientific concerns. In the South African example, a proper debate about the pros and cons of using a drug-based intervention to reduce the risk of MTCT was denied by Mbeki’s suggestion that there would have to be an agreement about the facts first within the scientific community before policy makers could act.²

To make these authenticity judgements as transparent and as independent of the personality of judges as possible, an approach based on criteria that can be applied by anyone to judge the authenticity of scientific controversies seems to be most promising route. Elsewhere, four criteria have been suggested that might help outsiders to make judgements about the authenticity of scientific controversies (Weinel, 2008, 2009, 2010). These criteria are: (1) explicit argument, (2) expertise of claim makers, (3) constitutive work and (4) conceptual continuity with science.

The first criterion refers to the existence of an ongoing and meaningful disagreement about a scientific fact or issue, which is a constitutive feature of any scientific controversy. While the presence of a disagreement is necessary, not every discernible disagreement can be

² Fred Kauffeld (personal communication, 2 June 2012) has suggested two more reasons for why it is important to keep inauthentic scientific controversies out of policy making. First, the “misrepresentation” of science in the context of inauthentic scientific controversies might discredit and undermine public support for science. Second, inauthentic scientific controversies might also result in tighter regulations due to attempts to stamp them out. This might then limit the freedom of scientific research.

regarded as being ongoing and/or meaningful as will be explained below. The task for the analyst is thus to check whether a contemporary meaningful disagreement exists. The second criteria suggests, however, that only disagreements between “scientific experts” can constitute a scientific controversy. The analyst has therefore to check whether those who disagree are genuine experts in the field under consideration. The third criterion states that a controversial claim, even if it has been made by a genuine expert, is not enough if it is not backed up by some sort of scientific work as otherwise any speculative utterance by an expert would constitute a scientific controversy. The analyst has to check whether claims are supported by scientific work such as theorizing or experimentation.³ The fourth criterion, conceptual continuity with science, suggests that to constitute a scientific controversy, allegedly controversial claims have to fall into the realm of science.⁴

3. EXPERTISE AND THE OPERATIONALIZATION AND APPLICATION OF DEMARCATION CRITERIA

The focus in the present paper is not on discussing or testing the suggested demarcation criteria—this has been done elsewhere (Weinel, 2010)—but on a different aspect, namely on what sort of expertise is required to use the criteria “appropriately.” Returning to the South African case study, it is interesting to note that Mbeki has implicitly used the first two of the four criteria to justify his verdict that the safety of AZT was the subject of a genuine scientific controversy. With regard to the first criterion, Mbeki appeared to interpret the existence of a “huge volume of scientific literature” which challenged the view that the benefits of using AZT for the prevention of MTCT outweighed its risks, as a serious disagreement about the “scientific facts.” With regard to the second criterion, Mbeki claimed that those claims were made by “medical researchers,” i.e., experts, and had therefore to be taken seriously.⁵

This contravenes the judgement reached by the present author (Weinel, 2008, 2010), who found that there was virtually no disagreement whatsoever in the relevant scientific communities that dealt with the issue of safety of AZT in the context of MTCT prevention. The discrepancy between the judgement reached by Mbeki and the author might shed some doubt upon the suitability of criteria to determine the authenticity of scientific controversies. After all, it is not promising when two parties use the same criteria and derive mutually exclusive judgements about the authenticity of the controversy about the toxicity of AZT.

Far from being a cause for worry, the discrepancy between Mbeki’s and the author’s assessments is instructive and productive as it directs attention to the way the criteria are

³ The term “constitutive work” draws on the idea of a “constitutive forum,” a concept developed by Collins and Pinch (1979). They define a *constitutive forum* as an abstract “space” which comprises “scientific theorising, and experiment . . . [with or without] corresponding publication and criticism in the learned journals and, perhaps, in the formal conference setting” (Collins & Pinch, 1979, pp. 239–240).

⁴ For the sake of avoiding misunderstandings it has to be repeatedly emphasised that establishing the authenticity of scientific controversies is a problem relevant to the policy arena. The criteria are not useful to “play” science police, i.e., to try and dictate who can do research on what and when.

⁵ The perspective taken in this paper requires taking Mbeki’s comments on face value. As Clark Wolf pointed out during the discussion at the GPSSA “Between Scientists & Citizens” conference in Ames on June 1 and 2, 2012, another interpretation of the episode is to assume that Mbeki only used scientific arguments to disguise a political agenda. This requires, however, inside knowledge of Mbeki’s motives, which my research was unable to generate.

operationalized and applied as well as to the type of expertise that underpins their operationalization and application. The argument put forward is that Mbeki did not adequately operationalize and apply the criteria because he did not have an adequate understanding of the nature of sciences and how they work in practice. In turn, it is argued that an adequate operationalization and application involves a type of expertise which might be called “sociological discrimination” (Weinel, 2010; Collins & Weinel, 2011). To explore the meaning of “sociological discrimination” in more detail, a comparison is undertaken between Mbeki’s and the author’s operationalization and application of one of the criteria, namely the “explicit argument” criterion.

4. EXPLICIT ARGUMENT

As pointed out above, the criterion “explicit argument” turns on the fact that any controversy implies the presence of a “contemporary disagreement” about some scientific fact or issue. While identifying arguments can be fairly simple, knowing when one encounters a contemporary meaningful disagreement is not a straightforward task. There are at least two difficulties to consider here. First, historical studies of scientific controversies show that it is rarely the case that those who oppose a view that becomes the scientific mainstream position change their minds. Rather, it is far more common that they hold on to their views but become marginalised to an extent that their views are ignored. For example, Peter Duesberg’s belief that HIV does not play a causal role in the aetiology of AIDS was rejected in the late 1980s and does not play a role in the scientific discourse. Nonetheless, Duesberg has not changed his mind and still argues the same position, but he finds it now very hard to get his views published or get heard at conferences, etc. (e.g., Epstein, 1996; Natrass, 2012). The difficult part for an outsider is to decide whether an argument is still explicit in the sense of contemporary or whether a particular controversial claim has already been debated and rejected within the scientific community.

Second, an issue that has become particularly acute in the age of the Internet is that one can find a myriad of potentially controversial claims with regard to almost any scientific fact or issue. Whether it is the carcinogenicity of coffee consumption, the influence of planetary constellations on the mutation of viruses, the ability to build machines that supposedly ignore the second law of thermodynamics, the health benefits of obscure substances—there always appears to be someone who has published a claim that challenges the scientific mainstream. Taking each and every controversial claim seriously in the context of technological decision making is impossible. First, there are not enough resources to investigate every claim and to establish whether there is something to it or not. Second, even if this would be possible, it wouldn’t resolve the problem since extreme skepticism cannot be refuted, which means that a determined character can always justifiably uphold a position that disagrees with any finding. Third, and most importantly, it would lead to a breakdown of decision-making processes as any such process could be stopped by simply “making up” controversial claims.

Having argued that identifying an explicit argument is difficult, how can a scientific outsider establish whether one exists or not? The most fruitful avenue for outsiders to judge whether an explicit disagreement is affecting a particular policy-relevant scientific domain seems to be to scrutinize the scientific literature of relevant technical domains and look for

disagreements.⁶ STS research indicates that this literature can reflect the state of a scientific discourse, but only when the literature is looked at in a wider context (Collins & Pinch, 1998; Collins, 2004; Shwed & Bearman, 2010). The contextualization itself can take two forms. One way in which a social analyst can contextualize particular pieces of literature is by immersing herself into the oral discourse of an expert community. By doing so, it is possible to scrutinize the standing and acceptance of particular pieces of published scientific work.⁷ This is, however, a highly impractical way for outsiders as immersion into an expert community requires access, resources and time. Other sociological research indicates that there is another way in which literature can be used to assess whether a fact or an issue is regarded as controversial or consensual within scientific communities. This research does not involve immersion into an expert community but relies on the analysis of certain quantities of peer-reviewed scientific literature (Shwed & Bearman, 2010). The detection of consensus or controversy works on the basis of pattern recognition. In a situation of genuine controversy, a steady output of publications respectively supporting two or more sides in a dispute can be expected. Once a controversial matter has been settled, experts tend to devote their energies to work within an established paradigm. The support for the “defeated” positions in form of publications tends to fall away.

The lesson for an operationalization of the criterion “explicit argument” based on sociological discrimination is that it is possible to concentrate on the literature to establish whether a meaningful contemporary disagreement among scientists exists. One can reasonably claim that an explicit disagreement is ongoing if one can show that there is a reasonable amount of contemporary literature that supports diverging positions.

Applying this operationalization, a good starting point is to look through the peer-reviewed scientific literature and to try and find evidence for an explicit argument about the safety of AZT. Accordingly, a search of the PubMed database, limited to the period between January 1, 1994 and December 1, 1999 and searching for the terms “AZT” or “Zidovudine”

⁶ While deep immersion into a technical field in the mould of an ethnographer might yield more reliable judgements, this route is not open to most people. Outsiders have to make do with accessible scientific literature. This literature ought to be published either in peer-reviewed scientific journals or by widely recognized technical institutions such as the World Health Organization, the International Labour Organization, UNAIDS, World Bank, etc. While this is a crude approach, fraught with all sorts of problems, it helps to keep outsiders away from literature that is published without any attempt to engage with a certain domain. On the Internet, a realm where anyone can publish almost anything they like, one can find “literature” that supports almost any imaginable claim such as that HIV was invented by the CIA or that the “bird flu virus” mutated due to particular constellations of planets. If one starts to take such literature into account, one can simply do away with policy making as any technological topic would have to be classified as being “controversial.”

⁷ Collins (2004) has shown that this can work. For example, he recognized that claims in a certain paper by Joe Weber did not lead to a scientific controversy despite contradicting widely held beliefs in gravitational wave physics. Curious about the lack of debate within the domain-specific journals, Collins discovered by talking to practitioners in the field that Weber’s published claims had regularly been rejected during conferences and workshops. Given that Weber was regarded as a maverick and given that his claims had been refuted by leading figures within the field, no one had deemed it to be necessary to respond to his claims in writing. As Collins (2004) points out, a written rebuttal of Weber’s claims was only published in the early 1990s, almost ten years after Weber’s initial claims had been published. The reason for this belated response was that Weber, on the basis of his findings, lobbied politicians to refuse the funding of laser interferometers. Faced with this threat to the funding of new equipment, a refutation of Weber’s claims was published to satisfy outsiders, such as politicians, that Weber was wrong.

and “toxicity” in the title and abstract, finds 318 publications.⁸ Not all of them are relevant as they do not all deal with the use of AZT in the context of MTCT prevention. Looking through the abstracts of those that do, the vast majority either recommend the use of AZT for MTCT prevention explicitly or do not offer an explicit opinion. Only one article, a literature review by Papadopulos-Eleopulos et al. (1999), seems to outright reject the possibility of using AZT as an antiretroviral drug.

The institutional literature is even more in agreement about the safety of AZT. The drug was approved for use in MTCT prevention by all major licensing bodies, among them the very influential U.S. Federal Drug Administration (FDA) and the South African Medicines Control Council (MCC). The MCC, in response to Mbeki’s and Tshabalala-Msimang’s claims in late 1999, immediately reviewed the safety of the drug and an interim report in mid-November 1999 concluded that the benefits of AZT outweighed the risks when used for MTCT prevention (Nattrass, 2007). AZT was also put on the World Health Organization’s (WHO) “Essential Drug List” from 1998 onwards, which meant that its safety and effectiveness had been reviewed by WHO experts (Gray & Smit, 2000). A WHO expert team also published a literature review in January 2000 which concluded that AZT was safe to use for MTCT prevention.

In sum, following the operationalization of the “explicit argument” criterion, one has to conclude that there was no explicit argument about the safety of AZT in the context of MTCT prevention. The bigger picture in late 1999 was that dozens of peer-reviewed scientific articles as well as the institutional literature recommended the use of AZT, while exactly one peer-reviewed scientific article argued against the use of AZT. Using his sociological discrimination, the author can point to several features that shed doubt about the credibility of this singular article. First, the article claims to be a literature review, but nonetheless comes to conclusions that are not supported by the literature. Rather than reviewing the literature, the article uses selected claims from a wide range of literature to arrive at a novel claim, namely that AZT cannot function as an antiretroviral agent. Second, the article only makes indirect and theoretical claims about the toxicity of AZT. It does not actually demonstrate that AZT, when used for MTCT prevention, is too toxic as no experiments are done or reviewed. Instead, the article claims that AZT cannot possibly work and that the drug is toxic; thus, exposing pregnant women to it involves only risks but no benefits. Third, the article does not state a principle that underlies the selection of the literature under review. Published in late 1999, only a small subset of the reviewed literature is recent—the majority of the reviewed literature is pre-1994, i.e., before the time AZT has been used for MTCT prevention. Fourth, the article has been published in a journal on the fringes of the scientific domain—one might expect that an article reporting paradigm-shifting findings would appear in a journal with a higher impact factor than *Current Medical Research and Opinion* (Cherry, 2009; Nattrass, 2007).

It is suggested that if Mbeki or anyone else following the above specified operationalization and using “sociological discrimination” to inform their judgements would have to conclude that there was no explicit argument about the safety of AZT in late 1999. So, why exactly did Thabo Mbeki arrive at a different conclusion? It is argued that Mbeki, instead

⁸ The publication types in this search have been limited to: Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Case Reports, Classical Article, Clinical Trial, Phase I, Clinical Trial, Phase II, Clinical Trial, Phase III, Clinical Trial, Phase IV, Comparative Study, Controlled Clinical Trial, Corrected and Republished Article, Government Publications, Journal Article, Multicenter Study, Technical Report, Twin Study, Validation Studies.

of basing his judgement on “sociological discrimination,” used his common sense, which seemingly did not entail much regard for an understanding of the nature of sciences.

Mbeki was first and foremost a politician and had very little exposure to sciences in practice throughout his life (e.g., Gevisser, 2007). Mbeki himself was aware of this and publicly acknowledged that he was not well-positioned to read and understand scientific literature. Accordingly, he also publicly acknowledged that he never made direct claims about AZT. Rather, he suggested that all he did was to draw attention to the alleged ongoing dispute among scientists about the safety of AZT.

For Mbeki, recognising such an ongoing scientific dispute appeared to be a very simple task which did not really require any specialist knowledge. Indeed, at the end of his speech in October 1999 he suggested that any Parliamentarian (and presumably anyone for that matter) could come to the same conclusion as the president:

To understand this matter better, I would urge the Honourable Members of the National Council to access the huge volume of literature on this matter available on the Internet, so that all of us can approach this issue from the same base of information. (Mbeki, 1999)

The question is what “huge volume of literature” was he actually referring to given that the above analysis was unable to uncover any significant disagreement in the institutional and peer-reviewed scientific literature.

Unfortunately, Mbeki never properly elaborated what literature he had actually read nor did he specify where found it. Mbeki himself only ever mentioned one article directly and this was the aforementioned literature review by Papadopoulos-Eleopoulos et al. (1999), published in *Current Medical Research and Opinion* (Robertson, Hartley, & Paton, 2000; Myburgh, 2007, 2009; Cherry, 2009). In contrast to the above assessment by the author, Mbeki attributed great significance to the article. While he did not assess the content of the article, Mbeki claimed that it was an important piece because it was “very lengthy with millions of references” and had been published in a “very senior scientific journal” (Robertson et al., 2000). It seems odd that Mbeki uses the lengths and the (vastly exaggerated) number of references to assess the importance of a scientific article. It is also unclear which standard Mbeki used to refer to *Current Medical Research and Opinion* as a “very senior” scientific journal. The most commonly used and widely accepted marker of importance or “seniority” of a journal is usually the impact factor and the impact factor of this journal, as shown above, did not suggest great importance (Cherry, 2009; Natrass, 2007).

An indirect way of getting to the supposedly critical literature that is likely to have informed the government’s view is to scrutinize a “book” called *Debating AZT*, which was written by Anthony Brink (2001), a South African lawyer and self-proclaimed expert on AZT. Brink repeatedly claimed that it was his “research” into AZT that alerted Mbeki to the dangers of the drug (Brink, 2001; Myburgh, 2007, 2009; Cherry, 2009; Natrass, 2007, 2012; Geffen, 2010). *Debating AZT* claims to be an extensive review of the critical scientific literature on AZT and at some stage Brink deals with the toxicity of AZT in the context of the drug’s use for MTCT prevention. Brink repeatedly stresses the importance of four papers—Olivero et al. (1997a, 1997b), Blanche et al. (1999), and The Italian Register for HIV Infection in Children (1999)—that apparently support his claim that AZT is unacceptably toxic in the context of MTCT prevention. In the context of the whole body of literature, these four papers, if truly represented by Brink, would still represent a minority view on AZT. A closer look at the original publications, however, reveals that Brink’s representation of the content of the articles

is problematic. Specifically, Brink quotes selectively from this set of papers and fails to mention that the respective authors actually endorse the use of AZT for PMTCT.

For example, with regard to a paper by Olivero et al. (1997a), Brink gives the impression that these researchers recommend not to use AZT for PMTC by quoting selectively from the paper:

Since “AZT is unequivocally a transplacental genotoxin and carcinogen [and] given transplacentally to mice, benzopyrene produced lung and liver tumour multiplicities similar to those observed [with AZT],” the researchers recorded their concern that “the current practice of treating HIV-positive women and their infants with high doses of AZT could increase cancer risk in the drug-exposed children when they reach young adulthood or middle age.” (Brink, 2001, p. 43)

Readers, who might not have access to the full text of the publication, are not made aware that the researchers state in the next sentence: “The remarkable effectiveness of AZT in preventing fetal HIV infection indicates that the immediate need for treatment of a potentially fatal disease should outweigh the potential cancer risk” (Olivero et al., 1997a, p. 1607).

Brink repeats the trick of selectively quoting from scientific papers with regard to the other papers and creates the impression that medical researchers argue against the use of AZT in peer-reviewed scientific journals.⁹

If those scientific papers do not argue against the use of AZT for MTCT prevention, what other literature is there that might constitute a “huge volume”? By his own admission, Mbeki got most of his literature from the Internet (Mbeki, 1999). Indeed, a day after Mbeki’s speech in October, a media liaison officer working for the presidency confirmed that the president had indeed accessed a lot of literature on AZT on the Internet: “The president [has] got a thick set of documents. He went into many sites, including the World Health Organisation’s one. The president goes into the Net all the time,’ she said” (Sulcas & Randall, 1999)

According to one South African scientist, the “thick set of documents” comprised at least 1,500 pages (Cohen, 2000). While one can access peer-reviewed scientific literature via the Internet, this is apparently not what Mbeki has done. Instead he appears to have accessed a variety of “critical” websites, among them websites such as virusmyth.com which contain a number of popular, non-peer-reviewed or otherwise unpublished texts disputing, among other things, the safety of antiretroviral drugs (Cherry, 2009). The only peer-reviewed scientific article on virusmyth.com with limited relevance for the use of AZT for MTCT prevention is the aforementioned Papadopulos-Eleopulos et al. (1999) review.

In sum, Mbeki seemed to operationalize the explicit argument criterion in an oversimplified way. While rightly looking for disagreement, Mbeki seemingly did not pay too much attention to where exactly the claims about the excessive toxicity of AZT were made. The vast majority of his “huge volume” of literature comprised texts downloaded from various Internet portals associated with people denying that HIV caused AIDS. As shown further above, only one peer-reviewed article supported the claim Mbeki was making, but this article made only indirect claims about the toxicity of AZT and represented an opinion on the very fringes of the scientific discourse. Interestingly, Mbeki, by stating that this article appeared in a “very senior scientific journal,” appeared to be aware that the quality of a journal reflects on

⁹ A longer discussion can be found in Weinel (2010).

the articles published in it, but he then failed entirely to recognise that *Current Medical Research and Opinion* was a rather undistinguished and unimportant journal.

Mbeki's claims about the literature that supported the view that AZT was too toxic suggest that he did not understand how sciences work. He appeared to be unaware that identifying an ongoing scientific controversy is actually harder than just finding some disagreement. He also failed to realize that "scientific literature" is predominantly published in scientific journals. He also appeared unable to adequately assess the quality of journals and individual texts, the latter being demonstrated by his assessment of the Papadopulos-Eleopulos et al. article.

5. CONCLUSION

The case study of decision making about the use of AZT to reduce the risk of MTCT in South Africa aims to illustrate the importance of establishing the authenticity of scientific controversies. Recognizing inauthentic scientific controversies and ensuring that they do not affect technological decision making has significant practical value. The South African case study indicates that there was at least some chance that PMTCT might have been introduced earlier if President Mbeki had been unable to influence the technological decision-making process by claiming that the safety of AZT was the subject of a scientific controversy. As well as the potential saving of lives and reduction of suffering (Chigwedere et al., 2008; Natrass, 2007, 2008, 2012) there is also a political imperative that makes the recognition of inauthentic scientific controversies important. Actors who try to use inauthentic scientific controversies effectively camouflage political arguments as scientific arguments. De-politicizing matters that are political, as happens when certain issues are declared to be matters for expert inquiry and therefore beyond the lay public's grasp, denies citizens a proper political debate.

While four criteria to determine the authenticity of a policy-relevant scientific controversy have been cursorily introduced, the main point of this paper is to draw attention to the claim that operationalizing and applying these criteria requires a particular type of expertise. This type of expertise has been referred to as sociological discrimination (SD). It has been claimed that in contrast to Mbeki the author was able to draw on an additional understanding of the nature of sciences which he acquired partly due to his immersion into the field of science studies and partly due to his fieldwork on the topic which included talking to experts.

SD, in its broadest sense, refers to an understanding of the nature of sciences or to "social intelligence about science" as Kutrovátz (2009) has put it. The knowledge that might be associated is not "well-defined" or "canonical," at least not at the present state of thinking about it. While the idea of SD appears to be plausible to the author at least, the extent of it or what exactly falls into it remains largely unclear and fuzzy. To get a better understanding of the idea of SD, it is worth taking a closer look at the specifics of the SD that played a role in analyzing the South African case (Table 1).

Table 1: Sociological Discrimination

Criteria	Operationalization	Relevant SD
Explicit argument	Analyze seemingly “controversial claims” in larger context of published and /or oral discourse of a domain	<ul style="list-style-type: none"> • Awareness that identification is not ‘easy’ (i.e., involves more than simple identification of two or more opposing points of views) • Awareness that if judgement is made on the basis of literature alone, it needs to involve “scientific literature” which is sufficiently contextualized (i.e., individual pieces are not looked at in isolation) • Ability to perform competent literature search (i.e., knowledge of where and how to look for relevant literature) • Awareness of limitations and “power” of different types of scientific literature • Ability to recognize the limitations of individual pieces of literature • Awareness of quality differences of scientific journals (i.e., “impact factor” as rough guide) • Awareness of differences in relevance and quality of individual pieces of literature • Ability to recognize differences in relevance and quality (requires knowledge about standards, i.e., a “good” literature review sets out criteria that guide literature choice and includes up-to-date literature)

What appears to be the case is that it is highly unlikely that one person can gain “complete” SD as this requires an understanding of all sciences and their respective *modi operandi*. As such, SD is necessarily collective knowledge distributed among a multitude of actors. It might, however, be the case that one person has the relevant SD to make adequate judgements about specific cases. For example, the author does not claim to fully know how a particular science works, let alone how all sciences work. Rather, he happens to know useful and relevant bits that set him apart from Mbeki’s understanding of sciences when it comes to judging the specifics of the alleged controversy about the safety of AZT.

This raises the question of how SD can be acquired and be made widely accessible within societies. The author has had the chance to acquire SD in the course of his (fairly shallow) immersion into the field of science studies. This, to be clear, should not be taken to mean that a formal degree in science studies is sufficient or even necessary for the acquisition of SD. The formal aspect of the studies only contributed to part of the author’s understanding of the nature of sciences. More useful and relevant appears to have been his fieldwork related to the case study of technological decision making around the use of antiretroviral drugs, which involved reading about AZT and talking to scientists, doctors, activists and other observers of the policy process.

While direct immersion into a scientific field or into a range of scientific fields is a good way of acquiring an understanding of the nature of sciences, there are aspects of SD that can be made explicit and formal. There is thus the potential for wide distribution within societies and there is nothing in principle that prevents anyone from gaining knowledge that falls into the SD category. This can and possibly ought to start at school level. At the moment, it seems that children are predominantly taught specific content of science, e.g., they learn domain-specific knowledge in biology, chemistry, physics and so on.¹⁰ While this, to a certain degree, is important, education on the nature of science should be taught in a way that reflects contemporary understanding. The output of science studies in general and post-positivist science studies in particular is relevant here and it ought to be incorporated into contemporary school curricula. This would, of course, require a considerable effort as teachers would have to be trained, courses would have to be designed and accessible text books would have to be written, but that such an effort can be undertaken is demonstrated in Brazil, where sociology has been a mandatory part of the curriculum of secondary schools since 2007. Interestingly, some pilot projects specifically teach some of the key findings of the sociology of scientific knowledge in schools.¹¹

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¹⁰ In contrast to earlier and largely ill-fated attempts to educate the wider public about the *content of science* under the banner of “public understanding of science,” an educational effort ought to concentrate on relaying insights about the *nature of science*. The short-comings of the Public Understanding of Science and its association with the deficit model are well-established (e.g., Irwin & Wynne, 1996; Miller, 2001; Burns, O’Connor, & Stocklmayer, 2003; Sturgis & Allum, 2004). Given the societal usefulness of sociological discrimination, a case can be made for a new programme that leads to the “public understanding of the nature of science” (PUNS).

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