Interpreting gene myths in a globalized world

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Introduction

Debate & public opinion in a globalized world

An empirical field that I have been interested in for some time is public debate and public opinion relating to genetic science and gene technology. In a previous paper I have analyzed the British and US radical scientists' critique of genetic science, and the way they intervene in debates with references to religious heritage and World War II. In the same paper I also investigate how public opinion and popular ideas of science and technology, in particular the myths and folk narratives of Faust and Frankenstein, have become key explanatory analytical tools, putting emphasis on public opinion as a reflection of "folk beliefs" and cultural images of science (see Svalastog 2012). In the present paper I will focus on the parallelization of religious stories and religious institutions with genetic science and engineering in the genetic science debate. I am interested in how this parallelization seems to generate one of two outcomes: a) the topic under discussion is transformed, it becomes mythic, or b) the author explicitly states that the topic of discussion is not mythic, that it is not of cosmological significance, not a drama but something this worldly and with limited significance.

Genetic science and gene technology represent research and industries that are part of global networks and institutions. Genetic science is based on international collaborations at research units at universities and beyond. Gene technology products are manufactured by companies with a global range, including multinational and powerful companies in the field of pharmaceutics and plant science. Genetic science and gene technology are regulated by international agreements and laws, and their products are globally distributed through trade. Examples often used to demonstrate the success and promise of such products are the GMO product golden rice, where vitamin A is added to prevent disease; the recombinant DNA used in the production of insulin; and the present work on GMO manipulated energy wood for the production of ethanol as a replacement for oil products. Food, drugs and energy are the main areas of interest in modern genetic science and technology,

representing essential human needs. At the same time, these areas of research and industry (medicine, agriculture, fuel) are commercial enterprises. They have more on their agenda than the common good and people's heath (Svalastog 2004; Svalastog, Jansson, Gustafsson 2006). Criticism has been levelled at new GMO products where organisms have been genetically modified to withstand the heavy use of pesticides. This illuminates how the commercial craving for profit can be in conflict with risks, including implications for human health, the life of insects, and the products' effect on the balance in local ecosystems. There has also been criticism of the economic consequences of sterile GMO (which is the norm for GMO seed) because farmers cannot themselves keep aside seed for the next year but have to rely on the GMO industry. And criticism has been made of the way past colonial relationships are reinforced through the pharmaceutical industry when most research, industry and patents are localized in rich countries while important material resources and potential markets are located in former colonies.[1] Other critical voices warn that gene technology creates new risks because deconstruction of former barriers between plants and/or animals opens up pathways for the spread of infections and diseases (Ho 1998). Benefits and risks related to genetic science and gene technology have become central themes of public and institutional talk and discourses in globalized society.

In today's globalized world, the ownership and governance of genetic science and gene technology are complex issues. Some actors and activities are public, and some are private. People, material and knowledge are continuously moving between public sectors with state governance and private sectors with private, local or international, governance.[2] These shifts and interactions make issues regarding accountability, benefit sharing, ownership etc. harder to deal with (Offe 2009). Regulation of genetic science and gene technology is divided into separate sectors for research, industrial production and trade, and the interplay between these sectors has been challenging.[3]

[1] This critique is parallel to the critique of mining and the oil and gas industries, for example in relation to rare metals from Kongo (used in digital devices), and the oil industry in former colonies or on Indigenous peoples' land (e.g. Nigeria and Canada).

[2] In response to new ethical challenges generated by the digital society, the EU has developed the EU data protection directive. This directive regulates research on registers (health records, biobanks, demographic databases etc.), and ensures individuals' privacy and integrity. https://gdpr-info.eu In addition to research on registers, research on artificial intelligence (AI) represents a new area of ethical and legal challenges. Three new H2020 projects in this field are being financed at EU level, the SIENNA project, the SHERPA project and the PANELFIT project: https://www.bundeskanzleramt.gv.at/documents/131008/981155/NEC+Forum/e506a5d3-151b-4eae-a9ff-c368276c25c3

[3] For analysis of the controversies concerning the commercialisation of biobank research, see Hoeyer and Tutton 2005; H. Rose 2003.

While international networks, trade and movements between sectors have a long history, today's society, based on science and technology, is still understood as representing something historically new. Ulrich Beck describes modern society as a "risk society" (Beck 1992), where science and technology generate both prosperity and disaster. Genetic science and gene technology fit into Beck's "risk society", representing both high expectations and concerns regarding its consequences for humankind.[4] Global society is conventionally defined in terms of new information technology and the borderless communication made possible by the internet. In the present paper, globalized society is understood as a global web of economic relations, digital communication, and high-risk activities.[5]

In the introductory article of this special issue of the *Marburg Journal of Religion* (*MJR*), Peter Beyers' theory on religion and globalization is presented as this issue's common point of departure. The choice is motivated by the influence of Beyer's work, and by a need for an updated and critical review of his thinking. Peter Beyer understands globalization as a consequence of modernity, as a new state where activities are organized in functionally specialized social systems - world capitalist economy, the political system of sovereign states, the worldwide science and technology, health, education and media systems. He states that these systems "represent differentiated means of specialized, instrumental communication which have a strong tendency to coopt, undermine, and otherwise challenge previously existing group-cultural and personal boundaries, including those of the initial, European carriers" (Beyer 1994:99).

[4] The understanding of the risk agent as rational, someone that only needed to be informed to choose the better choice, has been heavily criticised in resent years. Still, Beck's description of risk society is still relevant. See Brown 2014:391-397.

[5] http://www.unesco.org/new/en/social-and-human-sciences/themes/international-migration/glossary/globalisation Immanuel Wallenstein emphasise economics as the key feature of globalization. Beyer presents Wallerstein as one former theorist. Beyer emphasises globalization as a 'common social environment shared by all people on earth and that this globally conditions a great deal of what happens here', Beyer 1994:7. In more resent theories, information technology and the world wide web (WWW) is presented as an inseparable part of the global society, see for example Deborah Lupton's "Chapter 2 Theorising digital society", in D. Lupton 2015 *Digital Sociology*, London: Routledge. In the global social environment there are several communication systems, what he calls globally functional systems; "Functional social systems in particular are much closer to specialized techniques or perspectives. They are ways of communicating; hence the references to them as instrumental systems'. These systems consists of subsystems (including religious systems), and "these are not residual or merely analytic categories like 'cultural' or 'social' systems. They are rather more, relatively autonomous systems of communication with their own rationalities, norms and values", Beyer 1994:55-56.

Beyer's description of globalization is a fusion of four theorists, each of them presented at length in his book. Beyer starts his discussion with reference to Immanuel Wallerstein. Wallerstein's Marxism-inspired theory of globalization explains globalization as the result of a historical process that led to the rise of modern nation-states and capitalism. (Beyer 1994:16-17). As part of this global system, and according to Wallerstein, there is a system of ideas that resolves the contradictions and ambiguities of the global capitalist system, to secure the unequal distribution of surplus value that is a prerequisite to the accumulation of capital. This means an elimination of social barriers on behalf of the market that at the same time assures the unequal distribution essential for the accumulation of capital. Accordingly the values produced are both universalistic-egalitarian ideals and particularistic-inegalitarian ones. This has established various "-isms" – racism, ethnocentrism and sexism – as dependent cultural expressions of the world economy just as much as the ideals of equality and progress (Beyer 1994:18). The second theorist Beyer presents is John Meyer, whose focus is on polity. The nation states are prime legitimate actors in the world polity, Meyer states, and they reflect the global ideals of progress and equality (Beyer 1994:23). Meyer's empirical contribution to the globalization discussion is his inclusion of the national educational systems built after World War II. Meyer shows how nation states are based on individual citizenships and citizens are produced by national education systems (Beyer 1994:25). The third theorist Beyer includes is Roland Robertson and his discussion of Toennies' use of the terms *Gemeinschaft* and *Gesellschaft*, i.e. the differentiation between self and society (Beyer 1994:26). Robertson's understanding of globalization includes religion, and he concludes, "Hence the global system is witness to both the 'politicization' of theology and religion … and the 'theologization' of politics" (Beyer 1994:30). The fourth theorist Beyer presents is Niklas Luhmann and his understanding of society as a social system consisting of meaningful communication (Beyer 1994:33). Beyer constructs an understanding of globalization that draws on all the four theorists he presents, and which emphasizes how global society carries with it a set of global ideals or cultural norms, first and foremost the ideals of progress and equality. This egalitarian world-polity is between nation states, and rests on norms of justice, which legitimize the rise of the peripheral state (Beyer 1994:24). Beyer also describes globalization as a process of relativization of particularistic identities and of religion (Beyer 1994:4). The combination of egalitarian states and relativized identities and religion represents liberal and/or neo-liberal values. Because Beyer understands religion as systemic and not just cultural, it can be the locus of a

differentiated instrumental subsystem of modern global society. "Religion, in other words, like the political system, is a social sphere that manifests both the socio-cultural particular and the global universal" (Beyer 1994:67).

Beyer's understanding of society is system theoretical and based on Luhmann's understanding of society as a social system. It consists of actions in the form of meaningful communication: "Society is the encompassing social system that includes all communication … we only reach the boundary of a society when communication ceases to occur" (Beyer 1994:33). Beyer operates with a specific understanding of how global society came to be, based on Immanuel Wallerstein. In his description of how global society evolved, Wallerstein applies a materialist dialectical understanding of historic development, and draws on the French Annales school of history with its focus on longstanding "mentalities" (Beyer 1994: 15). Within Beyer's paradigm, identification and discussion of global ideas and norms is thus best understood as expressing a global mentality.

The Annales school of history became a key context for two significant theorists of the 20th century, namely Michel Foucault (discourse theory) and Claude Lévi-Strauss (structuralism). Beyer's understanding of religion may be understood in relation to the discourse theories developed by Michel Foucault, and the binary system of meaning in the structural thinking of Lévi-Strauss.

Combining Wallerstein and Luhmann, Beyer's understanding of religion and society, in global society, seems to coincide with Foucault-inspired discourse theories and their webs of communication. Foucault's understanding of discourse implies a dialectical movement where the production of discourses will awaken counter-discourses, which at some point will undermine and replace the discourse and awaken a new counter-discourse that in turn will become the new discourse, and so on (Foucault 1993 (1971)). Beyer sets out his understanding of religion and globalization through his analysis of a series of empirical examples. His empirical material consists of contemporary religious expressions. Beyer's material is well suited to a structuralist analysis that identifies and approaches meaning in the form of binary opposites. In Beyer's analysis, one of the products of globalization is the binary opposition between liberal and conservative religious social movements and identity projects (Beyer 1994:8-10). And in reference to the theorists he is referring to, he discusses and also operates with a set of globalized values, in particular equality

and progress. In addition, as discussed above, justice and (neo-) liberal capitalist ideals.[6]

In contrast to Beyer I approach meaning from a hermeneutical point of view where meaning is understood as inseparable from explicit and implicit references, from intertextual as well as extra-textual contexts. The meaning of a text is understood as multi-potent, reflecting the complexity of contextual relations, and interpretation. Different layers of meaning will be identified and made visible, depending on which contexts and theoretical perspectives the interpreter involves. According to Ricoeur, the central problem of hermeneutics is the attempt to resolve the disastrous opposition between explanation and understanding (Ricoeur 1981:43; See also Ricoeur1993).

Gene myth - Concepts and hermeneutics

Genetic science and gene technology have generated stories about origin, movements and developments of life on earth, as well as stories about the constitution of life and about change. These stories have been used by a variety of stakeholders, focusing on the relation between research, technology, industry and prosperity. The use of these stories as strategies for research, politics, policies and industry, has generated a broad repertoire of new stories about outcome and consequences, including stories about future prosperity and salvation from disease, symptoms, starvation, and lack of energy necessary for infrastructure and life in modern society. One may say that the stories have been productive in shaping and facilitating opportunities and the development of new products. Genetic science and gene technology have thus generated stories aimed at defining identity, relationships and dynamics between actors in the drama of life.[7] In this respect, the narratives and events generated by genetic science and technology have acquired a mythic character.

As a concept in the field of Religious Studies, myth is defined as a narrative, usually about gods and heroes (Dundes ed. 1984). A myth is expected to carry central themes about origin, how reality

[6] "One consequence of the imperial and global extension of the Western-bred systems and their core values is that the diffusion of the core values, especially equality and progress (and their variations like dignity, empowerment, identity), has gradually become a notable symptom of this globalization", Beyer 1994:101. See also footnote 5.

[7] It is interesting to note how traditional genres, such as folk genres, are alive and well in present digital society, see e.g. Svalastog and Allgaier (2016) on modern fairy tales and emerging technologies.

is constituted, who or what populates it and how they are interrelated. Mythic narratives present beginnings and plots, which are foundational to past, present and future existence. A mythic narrative presents dramas where particular strategies of action are tied to particular and known consequences. However, the meaning and relevance of myth is not immediate but the product of interpretative action.[8]

In traditional theological exegetical work in Christian and Jewish traditions, myths and religious narratives are *interpreted*. The meaning of the text (part of a textual corpus) is understood in relation to its textual contexts (inter-textuality), in relation to society, and in relation to particular situations on which the text is intended or expected to shed light. *Myth* is treated as a carrier of content, as a description or memory of past events with relevance for present and future scenarios. The debates and research I investigate in the present paper appear as exegetical objectives, since the various actors combine quotations from myth and religious narratives with textual context as well as social, historical and economic contexts.

My hermeneutical approach contrasts with Beyer's understanding of religion as a system that generates two political positions (liberal and conservative). Viewed from the perspective of hermeneutics, myths are open to a multitude of interpretative outcomes, generating agreements and disagreements between individual interpreters that cannot easily be grouped into two opposite positions. When the meaning and function of myth rests on hermeneutical exegetical work, it should not be termed systemic or sub-systemic. In this paper I approach myth and religious tradition from philosophical traditions that embrace the complexity of context and interpretation. This opens up multiple layers of meaning and makes it possible to identify and analyze the relationship between different interpreting actors, and the variety of contexts that can be related to a particular text, performances, debates or opinions. From a hermeneutical point of view, the interpretative possibilities of a mythic corpus are infinite in much the same way as a poem, while the narrative itself represents limits on what or how directly a particular part can be used to elaborate a particular

[8] I have discussed the meaning and relevance of myth in four interrelated texts, Svalastog 1997, Svalastog 1998, Svalastog 2009, Svalastog 2012. The first and third text focus on theoretical elaborations, while the second and forth texts turn the concept into analysis of particular empirical fields, one focusing on gender, sexuality and reproduction, the other focusing on gene myth.

question, problem, challenge, situation.[9] Myths and references to religious heritage are thus both a strategic construct and an act of enhancement.[10]

In the present text I focus on how myth and religious heritage have become part of dynamic political and social strategies that negotiate and combine academic knowledge of science and modern society with knowledge and memory about modern history. I also include references to institutions and practices, which rest on myth for their legitimization and function. My material contains *interpretative practices* where the relation and value of particular facts, themes, relations etc. are established. The interpretative practice grants or denies mythical status or value to the facts, themes, relations etc. that are included in the discussion. To be able to discuss this dual process, I use the concepts of mythologization and demythologization. Mythologization implies stating something as mythic or related to myth. Demythologization implies the denial of mythic character in a statement.[11]

Generating main questions

My area of interest is public opinion, and attitudes about genetic science and gene technology including the "radical science" debate. My source material for this area consists of:

- Analysis of attitudes to genetic science and technology from the Eurobarometer survey in Europe, in particular the analyses conducted by Nielsen (et al. 2002); Nielsen (1996) and Bauer and Bonfadelli (2002); the Nelkin and Lindee (1995) analysis of the image of the gene in US popular culture;
- To cover the longer perspective on science, opinions and attitudes I have included Turney's inquiry (1998) in the field of the history of ideas, focusing on perceptions of biology; de Chaderevian's inquiry (2002) in the field of science history, focusing on post-war science

[9] Svalastog 2009. On interpretation of myths and poems see Douglas 1967. On interpretation of texts, see Ricoeur 1993:53ff.
[10] I have discussed poststructuralist, postmodern and discourse theories elsewhere, see Svalastog 1998:84-95; Svalastog 2006; Svalastog 2009.
[11] The strategies I identify as demythologization are not identical with, but similar to Rudolf Bultmann's theological strategy of historical critical analysis, demythologization, which aimed to identify non-mythic aspects, in Bultmann's case specifically of the New Testament.

history; and the analysis of the relation between modern science and society by Allen and Baker (2001).

- Texts on the gene science debates include key figures from the radical science groups in the USA and the UK, in particular Lewontin (1991), H. Rose (2003), S. Rose (1997; S. Rose ed. 1982), H. Rose & S. Rose (1969) Ho (1998). The radical science groups are scientists who debate genetic science and gene technology in public through the production of popular books on genetic science and technology.[12] I also include Segerstråle's analysis (2000) of the debate between the radical science group and its opponents (foremost Lewontin and Wilkins).

The most consistent finding in my material is that the researchers and research that I have been analyzing argue for a relationship between people's opinion (whether positive or negative) and past events. In those parts of my material that analyze diversity of opinion and controversies regarding the development and use of new technology, cultural narratives and culture-specific norms and values are put forward as a main explanatory factor. Furthermore, cultural narratives, norms and values tend to be understood as being counter to scientific knowledge. When social scientists Torben Hviid Nielsen, Erling Jelsøe and Susanna Öhman analyzed the results of the Eurobarometer surveys of public opinion on genetic science and gene technology, they concluded that resistance to genetic science and gene technology could not be explained by traditional social variables like low or high levels of knowledge (about genetic science and gene technology), but by cultural perceptions (Nielsen et al. 2002). The shift from 'hard' social variables to 'soft' variables and 'symbols' pushes the analysis in a cultural analytical direction. The cultural analytical approach consists of a search for culturally specific narratives working as cultural carriers of the norms and values that are expressed in opinions skeptical of the new technology. The analysts of the Eurobarometer survey identify two narratives, namely the story of Faust and the story of Frankenstein. The argument is that these two narratives could be used to label, or even represent the content and history of what they had identified as two distinct and different groups of skeptics of genetic science and gene technology (Nielsen et al. 2002; Nielsen et al. 2000).

[12] The US and British radical science groups constitute a group in so far as they represent a common critical political and scholarly project, refer to each other, and in various constellations also produce work together, S. Rose 1997:x. See also Segerstråle 2000. I have discussed and analysed this group in Svalastog 2012.

> The underlying concerns of the 'green' and 'blue' arguments are as distinct as the different social groups that tend to express them. The 'blue' argument is supported by moral (or religious) values, the 'green' by notions of uncertainty. In this sense, the 'blue' critique is 'Faustian' … In contrast the 'green' skepticism is more 'Franksensteinian'. The problematic they identify concerns the insufficient knowledge of potential consequences.[13]

The analysis by Nielsen, Jelsøe and Öhman correlates with Ullica Segerstråle's thorough analysis of the gene science debate (Segerstråle 2000). Segerstråle focuses on the controversies between the two evolutionary biologists Richard Charles Lewontin and Edward O. Wilson. Segerstråle finds the similarities of their lives, age, interests, locations and research methods striking given their irreconcilable controversies, and concludes that it is their different metaphysical underpinnings, not scientific disagreement, that is the main reason for the two scientists' different stances in the gene-science debate. The metaphysical differences concern the grand opposition between existentialism and essentialism, and between free will and determinism (Segerstråle 2000:391).

In folklore and religious studies the meaning of a narrative, or part of a narrative, is understood in relation to the further textual context of the tradition, as well as inter-textual contexts, and socio-economic function and contexts. The socio-economic contexts are elaborated in the analysis of the Eurobarometer surveys as well as in Segerstråle's analyses. Nevertheless, it is not an aspect integrated into their conclusions on why individuals approve or disapprove of genetic research and gene technology.[14] From my point of view it is important to include analysis of inter-textual references. For example, in texts produced by the UK and the US radical science groups, references to religious heritage are juxtaposed with references to World War II and "Big Science".[15] Religious heritage and war history are textually linked and therefore need to be investigated more thoroughly as a context that produces meaning in the texts of the radical science groups. Regarding genetic science and gene technology, there exist a variety of issues that touch upon, and agendas that concern, genetic science and gene technology. How these issues and agendas differ cannot be

[13] Nielsen et al 2002:190f.
[14] For an analysis of early twentieth-century scientific critique in the USA, see Gormley 2009.
[15] See for example S. Rose 1997:274f. Big science refers to interdisciplinary scientific projects aiming at solving a particular problem with large-scale outcome or consequences. The Manhattan project was the first and most famous one.

explained with reference to cultural images or personal belief alone. For example, in Europe GMO seem to be more controversial than pharmaceutics while the USA has been more preoccupied with debating genetic information of humans, and countries in Africa have focused on the question of benefit sharing and post-colonial practices. Regulation of gene technology also differs on different continents. The USA regulates actual applications of gene technology, while Europe regulates the technology itself. In addition, politics and history are implied and also important to understand, if one wants to answer the question why and how opinions differ. In short, to understand the relationship between history and present opinions and controversies, it is necessary to grasp its complexity.

The main questions for my material are:

- Are references to religious and folk narratives in genetic science and gene technology debates primarily a matter of religious belief and folk tradition, or do they relate to wider social, economic, and historic concerns?
- Are the references to World War II in these debates only figurative, or do they reflect past and present actions, relations and politics?
- To what extent do attitudes and public opinion of genetic science and gene technology reflect knowledge about science, technology and modern history?

Mythologization and demythologization

In the book *DNA as cultural icon*, Nelkin and Lindee (1995) analyze a vast collection of examples of how the human genome and genetic science and information are presented in contemporary US society. Their collection covers popular culture, media, and academia. In their analysis they point out how metaphors representing Jewish-Christian religious heritage are employed in presentations of the human genome and in presentations of gene knowledge and gene technology. Their conclusion is that the genome has replaced the Christian concept of the soul in modern society. References to religious myths, the garden of Adam and Eve, the tree of knowledge, the Book of Man (a paraphrase of the Book of Life) etc., are typical in the material Nelkin and Lindee present, and they argue that the human genome in popular culture is best understood as a religious image

related to faith:

> Indeed, DNA has assumed a cultural meaning similar to that of the Biblical soul. It has become a sacred entity, a way to explore fundamental questions about human life, to define the essence of human existence, and to imagine immortality. Like the Christian soul, DNA is an invisible but material entity, an 'extract of the body' that has 'permanence leading to immortality'. And like the Christian soul, DNA seems relevant to concerns about morality, personhood, and social place. (Nelkin & Lindee 1995:40)

Nelkin and Lindee emphasize how scientists themselves have embraced this folk-conception of the genome:

> Geneticists also refer to the genome as the Bible, the Holy Grail, and the Book of Man. Explicit religious metaphors suggest that the genome – when mapped and sequenced – will be a powerful guide to moral order. Other common references to the genome as a dictionary, a library, a recipe, a map, or a blueprint construct DNA as a comprehensive and unbiased resource, an orderly reference work. (Nelkin & Lindee 1995:8)

When Nelkin and Lindee state that the genome is mythic or related to myth, they are pointing towards processes of mythologization of genetic science and gene technology. And when the gene, in the material they analyze, is presented in mythic terms, research and activities that include the genome appear to be actions of religious or sacrilegious character. Nelkin and Lindee argue that representations of the genome in the material they analyze are in contrast to scientific truth and knowledge:

> The powers of the gene in popular culture - expansive, malleable, sometimes fantastic - derive not from evolutionary forces or biological mandates, but rather from social or political expectations. Infused with cultural meanings, the gene has become a resource that is too readily appropriated, too seldom criticized, and too frequently misused in the service of narrow or socially destructive ends. (Nelkin & Lindee 1995:198f)

Nelkin and Lindee identify popular perceptions of the genome as myth, and thus as false belief and misconception. When analyzing the politics that is or can be attached to these popular perceptions their conclusions lead to harsh warnings and critique.

In my terminology one could say that the strategy adopted by Nelkin and Lindee is to demythologize the popular perception of the genome. I have discussed the theoretical limitation of their analysis elsewhere (Svalastog 2012). What I want to point out here is that their analysis and critique rest on phenomenological assumptions about what reality consists of or does not consist of. And when they dismiss references to religious heritage as misconceptions of a phenomenon that does not exist, misconception becomes an analytical endpoint.[16] Thus, Nelkin and Lindee reduce popular images of the gene to belief/religious myth, and then they counter these images with complex and scientific knowledge, underlining a modern secular worldview. Their strategy of mythologization (identifying the gene with myth), does not lead to complex analysis of popular images, but to a counterstrategy of 'demythologization', aimed at undermining what they identify as a false gene myth in present-day society. However, they provide no new information on how, where, and for what purposes the gene myth appears.

A parallel strategy to that of Nelkin and Lindee, also using mythologization and demythologization, can be found in R. C. Lewontin's book *The Doctrine of DNA - Biology as Ideology* (1991). In this book Lewontin discusses images used by scientists rather than popular images. Lewontin's underlying aim is the same as Nelkin's and Linee's: to criticize arguments he finds oversimplified and not in line with scientific knowledge.

Lewontin asks what it is that is required for an institution to explain the world in a way that gives itself legitimacy. He concludes that: a) as a whole the institution must appear to derive from sources outside of ordinary human social struggle, and not seem to be the creation of political, economic, or social forces but descend into society from a supra-human source; b) its explanations and pronouncements must seem to be true in an absolute sense and to derive somehow from an absolute source, and be true for all time and all places; and c) the institution must have a certain mystical

[16] I have discussed Nelkin's and Lindee's phenomenological understanding of myth elsewhere, and pointed out how it entails a loss of context and politics, see Svalastog 2012.

and veiled quality so that its innermost operations are not completely transparent to everyone. This description, he states, "also fits science and has made it possible for science to replace religion as the chief legitimating force in modern society" (Lewontin 2001[1991]:7). Lewontin compares science with the role of the Church in previous times: "Despite its claim to be above society, science, like the Church before it, is a supremely social institution, reflecting and reinforcing the dominant values and views of society at each historical epoch" (Lewontin 2001[1991]:9). In these quotations, science is paralleled with religion, with religious institutions' function as a bearer of views and values, and with the Church as a powerful "chief legitimating force" in modern society. Lewontin's analysis of how science become myth might also be understood as a process of the mythologization of science, a process that makes it possible, and even morally important for him to deconstruct and demythologize it. As in the case of Nelkin and Lindee, it is history and politics, not theology or beliefs that are Lewontin's target.

In the process of defining gene science, Lewontin refers to World War II:

> Except for a brief interruption around the time of the Second World War, when the crimes of Nazism made claims of innate inferiority extremely unpopular, biological determinism has been the main-stream commitment of biologists. Yet these claims are made without a shred of evidence and in contradiction to every principle of biology and genetics. (Lewontin 1991[2001]:26)

In Lewontin's presentation, genes are discredited as a valid starting point for specific and widely distributed visions of the human being, and as something that contains an inner self-disclosing truth, representing an isolated key determining factor, and thus leading to a reductionist understanding of human life. Lewontin deconstructs, trivializes and secularizes genetic science, pointing out that genetic knowledge so far has had limited value from a clinical point of view, and that today's main global medical problems are old problems that most of all need to be given economic priority, in order to distribute already well-known solutions. (Lewontin 1991[2001]:71) Again, Lewontin demythologizes the scientific work and its potential explanatory value by presenting gene-knowledge as partial, uncertain and not determinative.

Another example of a researcher who combines references to genes, myth and World War II is Stephen Rose.

> Speculation about the origin of life of course goes back far beyond present-day biology. It forms part of the creation myths of most cultures. [...] For the three letters of GOD, substitute DNA's four: ACGT. In the Jewish religion within which I was raised, it was sacrilege to speak the hidden name of God except on the sacred occasion of the Day of Atonement, Yom Kippur. Today's molecular biologists, however, with all their Frankensteinian insouciance, have no qualms about not merely speaking but even manipulating the sacred letters. (S. Rose 1997:250, 251)

Steven Rose contrasts the Jewish understanding of "the letters of GOD" with the modern scientists' approach to the four nucleotides that constitute DNA, thus stating that some actions are sacrilege. His description of today's gene technology transforms the religious prohibition into a theological critique of modern genetic science. This is underlined with a reference to Frankenstein, a European story of a man/scientist who has forgotten that God is the only creator, and when crossing the limitations for actions that men are allowed to conduct, he produces a monster. Frankenstein represents a story about how the loss of basic knowledge about human beings' place on earth leads to disastrous consequences. Rose's narrative strategy makes present-day genetic research appear as part of a (cosmological) drama where what is at risk is fatal for mankind. It has consequences for life itself. The risk has evolved as a result of the loss of memory, and the trivialization/secularization of what ought to be holy.

In theories of myths, creation myths have been understood as the starting point for all other myths in a mythic complex (Eliade 1958: Chapter XII). S. Rose treats myths as the origin and universal containers of knowledge about ontology. In Rose's argumentation, the genome is the beginning that cannot be changed without consequences for all other beginnings. To do wrong, to try to transcend ontological and pre-given premises, is hazardous, just as in the story of Frankenstein. His parallelization of the four letters of the divine name in Hebrew with the ACGT of the gene gives the story of scientific action what theories of myths call a "function of myth"; it structures

thoughts and behavior and provides a source for the construction of meaning and reality.[17] He makes this strategy explicit in the preface to his book:

> Here I criticize many of their arguments robustly; but it is the arguments, together with the metaphysical assumptions behind the arguments and their implications for both biology and culture, that concern me, not the individual who put them forward. The stakes are high: how do we, not just as biologists but as denizens of the late twentieth century, culturally understand nature? (S. Rose 1997: xiii)

Rose's preface starts off with reference to Nazi Germany's norms and values, and how the reappearance of reductionism in modern science is the background to his and other radical-science authors' work (S. Rose 1997: ix-x). If hermeneutics strive to find inter-textual relations, the prime concern for Rose does not seem to be religious, but political, and tied to an ambition to continue to analyze relations to and consequences of science in recent history. Rose's text appears as an explicit interpretative action, where the contemporary situation is interpreted and argued for in relation to a variety of contexts and texts. The argumentative strategy employed in his critique implies mythologization. He uses myth as a means to transform the scientific debate by superimposing/revealing (depending on the reader's interpretation) cosmological dimensions and consequences. Rose's references to religious heritage are tied to the history of modern society, not to stories of religious life. It is as a repetition of particular implications and consequences of science during and after World War II that S. Rose wants to avoid. When historical (or ontological, depending on the reader) and political (or cosmological) concerns are put into a mythic language, it is past events, and human beings, that constitute the horror, not God or mythic agents. The outcome of this mythologization is that contemporary history and human activity become actors in a drama. S. Rose's reference to science or research related activities and atrocities during World War II overlap with well-known critics of modern genetics (Segerstråle 2000).

[17] Eliade1958: Chapter XIII; Pals 1996; Paden 1988:69ff.

Another example of mythologization in this "war of interpretations" is found in the work of Mae Wan Ho. Ho employs references to religious heritage by adopting the language of Jewish-Christian prophetic and apocalyptic literature. In her influential book *Genetic Engineering. Dream or Nightmare?* she writes:

> The Brave New World. As the twentieth century draws to a close, people are wakening up to the realisation that genetic-engineering biotechnology is threatening to take over every aspect of their lives [...] many have asked, isn't it a bit too late in the day to tell us that? Yes and no. Yes, because I, who should perhaps have known better, was caught unprepared like the rest. And no, because there are so many people who have been warning us of this, eventually, people who have campaigned tirelessly on our behalf, some of them from the earliest days of genetic engineering in the nineteen-seventies, though we may have paid them little heed. And no, it is not too late, if only because that was precisely what we were being encouraged to believe."[18]

Like the prophets of the New Testament and the Old Testament in Christian tradition, Ho refers to earlier warnings, presents her vision, appeals to people's life, and proclaims that although there is not much time left, faith and conversion are still possible options – indeed, the only options.[19] Ho's use of a well-known religious genre the apocalypse where the god speaks through his/her prophet underlines the urgency of the matter she discusses. But, once again, it is the link between a this-worldly past and future, not religious worlds or truths as such, that is important to her.

Researchers who celebrate genetic science also use metaphors drawn from the Jewish-Christian heritage. The Nobel Prize winner Walter Gilbert wrote an article named "A Vision of the Grail". The article starts as follows: "The information carried on the DNA, that genetic information passed down from our parents, is the most fundamental property of the body" (Gilbert 1992:83). Gilbert is careful to include both the biological and social complexity of gene knowledge, though he puts forward the human genome as a main key to understand the human organism: "The molecular

[18] Ho 1998:1,5. Compare with Nowotny (1979:10) and her references in footnote 18.
[19] Ho's references to earlier debates are problematic since critical analysis of science came from within science, for example the Paul Berg letter, and debates on genetic science and gene knowledge have concerned social and economic consequences.

biologist's view is that this organism is defined by its DNA. That DNA molecule can be sequenced to reveal the essential information that defines that type of organism and hence the species" (Gilbert 1992:84f). When taken together with his presentation of genes as essential information, it seems fair to characterize the title of his article, "A Vision of the Grail", as mythologization. The title captures the possibilities of genetic science and points towards knowledge of fundamental value.

The critiques' skeptic inquiries of genetic science and gene technology are directed towards simplifications and misconceptions made by scientists and society regarding the complex social and political implications related to genetic science:

> The scientists writing about the Genome Project explicitly reject an absolute genetic determinism, but they seem to be writing more to acknowledge theoretical possibilities than out of conviction [...]. It is only the social scientists and social critics, such as Kevles, who comes to the Genome Project from his important study of the continuity of eugenics with modern medical genetics; Dorothy Nelkin, both in her book with Laurence Tancredi and in her chapter in Kevles and Hood; and most strikingly, Evelyn Fox Keller in her contribution to The Code of Codes, for whom the problem of the development of the organism is central. Nelkin, Tancredi, and Keller suggest that the importance of the Human Genome Project lies less in what it may, in fact, reveal about biology, and whether it may in the end lead to a successful therapeutic program for one or another illness, than in its validation and reinforcement of biological determinism as an explanation of all social and individual variation. (Lewontin 1991:64f)

The hermeneutical process of mythologization and demythologization appear to be part of a fight for the future and humankind, like battles in a war. Which interpretation will win? At stake are not the norms and values of global society that Peter Beyer presents: equality, progress, justice, and capitalism, which I perceive in the sense of (neo-)liberal values. It is the relation between past, present and future life that is discussed in this interpretative struggle. Questions asked by participants in the debate are about implementation of politics, which norms and values a particular interpretation will establish, and which social, economic and further consequences its outcome will be. The backdrop is not religion but World War II, and the experience that science, when

implemented in society, generates consequences. As stated by Hilary Rose and Steven Rose: "Not really until the Second World War was the scientific underpinning of our society recognized" (H. Rose & S. Rose 1969:131). The globalized values Beyer discusses represent an understanding where the present and the future are in contrast to, or even cut off from, the past. In contrast, the gene science debate focuses on the interrelatedness between past and future. How the present is tied to our past continues, and how the past, depending on how conscious and critical we are, will strengthen, transform, limit or undermine our lives and future. And to have a future, we need to fight for it. The issues at stake are not individual freedom, but the sustainability of society and nature, of which society and life is an integral part. Equality is an issue, but more than that, the critique is directed towards reductionism, the risk of modern science to reduce what it means to be human, for all of us. In contrast to the values identified by Peter Beyer, those of the globalized world are not uniform or dichotomous, but multiple.

World War II and 'The scientific underpinning of our society'

In this section I focus on contexts that can help identify more layers of meaning in the gene science debate and regarding public opinions about genetic science and gene technology. The radical science debate goes back to the 1950s, which is before the information technology's underpinning of global society, gene science and gene technology. The relationship between present-day science and technology, and science during World War II relates not to information technology but to methodology. The first large-scale project that combined science, industry and governments/politics was the Manhattan project and the production of the atomic bomb. For the very first time a multidisciplinary research team, with researchers who represented a spectrum of competences, were gathered together in order to solve a specific problem. Due to the productivity of the group (the bomb was developed), it showed how science could be a productive strategy for society. And after the war, the scientists who had participated in war projects had become part of new productive networks of academics, industry and politics. These scientists were rewarded with new positions, influence and productive contacts, and an entirely new situation for scientific work had appeared (de Chaderevian 2002). Science had become a problem-solving activity with huge potential, and both destructive and life-giving results became self-evident as plausible outcomes. This is in contrast to the pre-war conception of science where success was perceived as a possible

but not certain outcome that might be achieved after long periods of uncertainty, non-productivity and failure. After WWII, productivity became an argument for a future based on science, at the same time as productivity continued to be a double-edged sword. References to the development of penicillin became important, and biophysics and penicillin came to represent life science, in sharp contrast to the Manhattan project (i.e., physics) and its results that came to represent death science (de Chaderevian 2002:75). Examples of success (penicillin) implied industrial success, and the vision of science as the key to a healthy future, bringing fortune to both individuals and society, was established. The US and UK radical science groups started to publish their critique in the 1950s, and the post-war changes in how research was organized, industrialized and politicized were well known by them. They knew very well how wartime and post-war research politics had shaped and changed science, how it was organized and governed, in a close relationship between governments and industry, with an explicit intention of producing knowledge and products that could be implemented in society and industry.

After the thriving economy of the seventies came the downward trend of the 1980s and 1990s in Europe. Science became viewed less as a "medical solution" for social problems and more as a provider of solutions to industries and national economies.[20] In the 1980s, the understanding of gene technology as an area with great potential became important in politics, resulting in increased funding for research in this field. Belief in the importance and the profound changes that genetic knowledge would bring, as written above, turned gene technology into a cultural vision. This was illustrated by iconography and metaphors in the discussions of gene science and gene technology, and connected gene science and technology with religious creation myths or miracle stories. Books about gene technology had covers depicting Adam and Eve holding the apple of knowledge, and references to the Holy Grail, visually or literally, picturing genetic science as the first step in the revelation of the secrets of the human being who was now permitted to look into the "Book of Life" (in addition to Nielsen et al. 2002, see Nelkin & Lindee 1995, Turney 1998, and Keller 2002, 2000, 1995). It is fair to say that the level of fear in the academic and political-polemic discussions is

[20] "Starting in the USA in the early 1980 s, public attention also shifted to the industrial potential of the technology [...] Accordingly, it was believed that those who missed the chance to be at the forefront of technological innovation would put the welfare of their nation at peril: biotechnology had to be made to happen", Torgersen et al. 2002:36. This vision of economic profit had been integrated into government politics long before the economic repression of the 1990s. This economic argument was a rationale for governmental politics already in the late 19500s and early 1960s, see H. Rose and S. Rose 1969:131.

proportional to the high expectations surrounding genetic science and gene technology, the standards set up for governing (on the national and transnational levels), the importance and prestige attributed to it, the distribution of money, and the expected outcome.

There was an incident that made scientists fear that gene technology could lead to horrific epidemic consequences. In 1973, Professor Paul Berg and his colleagues at Stanford University planned to insert DNA from a virus, SV40, into the E. coli bacterium. *Nature* published an anonymous article that criticized the attempt for not handling the obvious risk related to the known possibility of the virus causing cancer in human cells. The obvious risk referred to was an epidemic spread of cancer. Professor Berg was appointed head of a committee of pioneer American biologists. The committee's work resulted in the Berg letter in *Nature* and *Science* under the title *Potential Biohazards of Recombinant DNA Molecules.* This letter had a strong impact on the scientific community, and was understood in relation to Albert Einstein's famous open letter to the UN General Assembly in 1947.[21] The focus on potential epidemic consequences, and the associations with Einstein's earlier letter, became the main frame for risk discussions in the field of genetic science and gene technology. It confirmed that genetic science and gene technology were a so-called Big Science, in parallel to physics and the atomic bomb. The letter constructs an apocalyptic vision. The result of the Berg letter and subsequent discussion was a one-year moratorium on these particular scientific experiments. In addition, the *National Institutes of Health* (NIH) established a counseling committee to develop guidelines for scientists. At a meeting in Asilomar in 1975, 150 scientists accepted the first guideline proposal, which led to the lifting of the moratorium (Nielsen et al. 2000:257f.; Torgersen et al. 2002:29ff).

This scenario, from the anonymous article in *Nature* to the first proposal in 1975, was the first broad discussion of biotechnology and risk handling, and the first debate where biotechnology appears as a Big Science. The scientific question asked in the moratorium was whether the use of a virus could transform cancer into an epidemic disease. Questions about the transfer of genetic material and risk due to transgression of borders between different forms of life reappear in the later discussions of gene technology. Because gene technology appeared as a Big Science, gene technology appeared as dangerous. The danger was not primarily a matter of implied norms and

[21] The Paul Berg letter: https://www.mcdb.ucla.edu/Research/Goldberg/HC70A_W10/pdf/BergLetter.pdf

values, but a matter of the productivity of science and technology.

Both the critical voices, the discussion and moratorium, came from within the scientific community itself. This represents a new situation for post-war science. After the revelations at the 1945 Nuremberg trials of medical experiments in Nazi Germany, biologists were confronted with their own version of the moral dilemma posed to physics after Hiroshima and Nagasaki (Allen & Baker 2001:149,158). In particular, the questions of informed consent and of the scientists' responsibility for human health and possible dual uses of their research results became important. The 1964 Declaration of Helsinki became a collective answer to the need for research guidelines and ethics. Before the Declaration of Helsinki, UNESCO issued a statement in 1952 that made it impossible to legitimately refer to race as an explanatory factor for human behavior. The fact that UNESCO, part of the UN organization, took such a stance is an indication of the political and ethical importance of the question and helps explain the level of the controversies that later became attached to the gene science debates and gene technology (See also Gormley 2009).

The scientific underpinnings of society, with special reference to genetic science and gene technology, are both extensive and deep. The complexity and depth underlines relations between past and present, and how past and present defines future situations, relations and conditions. The relation between medical ethics and World War II is not as straight forward as often presented in retrospect (Hoeyer 2009:271; Svalastog, Gustafsson and Jansson 2006:473). But the post-war situation where researchers took on the role of becoming watch dogs is new and a direct consequence of World War II. The US and UK radical science group represents this practice, and moral obligation, of scientists, to be involved in public debate and risk analysis of research and the politics, norms and values it represents and/or produces.

At stake – some remarks on Beyer and globalization

The gene science debate and European public opinion on genetic science and gene technology are concerned with the implementation of scientific knowledge in agriculture, medicine and pharmaceutics. Progress in genetic research depends on technological development and the

capacity of existing, or the development of new equipment,[22] global cooperation, and regulation and law. Globalization and governance are two processes and contexts that add complexity of meaning to genetic science and gene technology. All these aspects are of importance in public debate and public opinion. In contrast to Beyer's understanding of religious sub-systems, genetic science and gene technology do not represent a post-modern sub-system aimed at producing (group) identities and/or discursive power. The proponents and critics of genetic science and gene technology alike claim that genetic science and gene technology are productive, that they produce empirically grounded knowledge (not mere discourses) and products (not mere social or discursive positions). The disagreement between critics and proponents raises questions about how relevant, accurate, comprehensive and valuable the new information, knowledge and products are, and whether or not they challenge the norms and values that can hinder modern war history from repeating itself.

Globalization is more than economy and (neo-)liberal norms and values, just as genetic science and gene technology are something other than systems of communication. It is politics and industries that create or aim to create consequences and changes that cannot easily be reversed, or analyzed as a mere moment in a dialectical process of discourses and counter-discourse. When large amounts of sterile GMO affect insect lives, or when GM crops are modified to resist pesticides and we get unwanted chemicals in vegetables and fruits, or when a fetus is selected or aborted due to gender or genetic features, when genetic screening affects job opportunities or insurance policies, then conditions, society and nature, change for all of us. We need to find ways to discuss global society that are not limited to explaining its genealogy but make us able to transcend the limitations of what Beyer identifies as global modes of communication and of identities.

Public opinion – Faust and Frankenstein

Does the analysis of genetic scientists' debates have any bearing on the analysis of public opinion? Above I have presented contexts, and argued that these contexts can contribute to our analysis of

[22] One example is new information technology with the capacity to combine and process vast amounts of information, technology crucial to present epidemiological research on common complex diseases. Another example is electro magnetic microscopes that can photograph and send pictures of cellular level to computers for enlargement and further processing of information, important in present research on amyloid-diseases.

underpinnings in the gene science debate. The fact that it is scientists who are agents in the debate makes it difficult to argue that disagreement can be explained by different levels of scientific knowledge. In addition, I have shown how their references to historical and political contexts are intertwined, and how this makes their references to religious heritage reflect this-worldly concerns and not religious beliefs or attitudes.

In Europe, a large EU-funded research group, coordinated by Martin W. Bauer and George Gaskell, worked for eight years on questions related to public opinion, analyzing differences and common patterns in the public debate and public opinion about gene science and gene technology.[23] The main material for the different national research groups was a combination of the Eurobarometer surveys from the 1990s up to the most recent survey in 2002, together with analysis of texts on gene science and gene technology in leading national newspapers over the last thirty years. The survey questionnaire focused on knowledge of genetic science, gene technology, and attitude. The answers to the surveys showed that knowledge and attitude did not correspond. This was in contrast to the communication theory the analysts used, a theory that stated that there is a correspondence between knowledge and a positive attitude to new technologies. They also assumed that public debate, rather than public information, contributes to the spread of knowledge about a new technology to a broader group in society: "[P]ublic attention and awareness are a precondition for the formation of clear images, opinions and attitudes about an emergent technology."[24] This is because debate initiates private discussions, and makes the topic a theme of conversation that leads to a general rise in the level of knowledge, and lack of public debate results in a lack of public knowledge, and conflicts with democratic values.

Regarding genetic research and gene technology, the debate has been loud and far-reaching. Still, the survey answers from the Eurobarometer survey could not be explained by science

[23] The International Research Group on Biotechnology and the Public, initially fifty researchers, later eighty researchers, coordinated by Durant and Gaskell, supported by the European Commission through the European Community Concerted Action "Biotechnology and the European Public", starting with Contract Nr. B104-CT95-0043. Three volumes have been published: Durant et al. ed. 1998; Gaskell & Bauer 2001; Bauer & Gaskell 2002. In addition, project results and doctoral theses within the group have been published separately, e.g. Olofsson 2002; Öhman 2002.

[24] Bauer and Bonfadelli 2002:149f.. "Controversies involving new technologies, such as biotechnology, complement the normal educational channels for the diffusion of knowledge [...] and mobilize an ever-wider range of people to participate in the representation of the issue in the public sphere" … "In a democracy, public familiarity with an issue is a precondition for realistic and sustainable decision-taking pertaining to it", Bauer and Bonfadelli 2002:153.

communication theories. The resistance to genetic science and gene technology did not correspond to traditional sociological variables like class, education and gender either, nor was the resistance uniform (Nielsen et al. 2002:179). The findings led the social scientists into a search for cultural explanations. The first analytical answer to the heterogeneity of the material led to a distinction between different "segmentations" of the resistance through new analytical categories: politically "blue" and politically "green" resistance. In a second step, they searched for perspectives to explain the two different types of resistance. In the comparison of material from seventeen countries in Europe, data strongly suggests that two categories of skeptics, "traditional" and "modern", are well defined and distinct, and constitute a "striking commonality" in the nature of skepticism across Europe (Nielsen et al. 2002:187). This led to a new cluster analysis, in line with a growing interest in the relation between people's opinion and cultural images of modern biotechnology. To add explanatory depth to the analysis of the two segments in the material, the researchers decided to identify what they understood as implied cultural images structuring the resistance:

> [T]he "blue" critique is "Faustian" - the whole enterprise of biotechnology may be conceived as a modern covenant with Mephistopheles. Even though biotechnology represents technological success, insight into, and the manipulation of Nature, it is considered problematic. In contrast, the "green" skepticism is more "Frankensteinian". The problem they identify concerns the insufficient knowledge of potential consequences ... The danger is perceived as the possible creation of a "monster" capable of developing in unforeseen and uncontrollable ways, and conceivably coming to usurp its creators. (Nielsen et al. 2002:191; Nielsen et al 2000:250)

The cultural images of Faust and of Frankenstein that Nielsen et al. have identified as having (cultural-) analytical relevance, is not explained theoretically or conceptually. They merely state that new tools are needed, and that these images fit. This is a pragmatic analytical solution motivated by analytical needs. The strategy overlaps with Turney's analysis. Turney is an historian of ideas who has focused on the story of Frankenstein in his "history of public imagination of biology" (Turney 1998:2). Like Nelkin and Lindee, he approaches the story of Frankenstein through the concept of myth. His conclusion is that the Frankenstein myth is alive and well, just like what he calls its sociological cousin, the Brave New World. He explains that myth maintains

significance if it is continually retold, and that the feature of a myth is that the particulars change but the plot remains the same (Turney 1998:207). Seen together, Nielsen et al., Turney, and Nelkin and Lindee, they all point out how specific stories, like the stories of Frankenstein, continue to be represented and retold in relation to gene technology, and represent cultural significance. The focus is primarily on cultural narratives as carriers of norms and values. None of them investigates more thoroughly how cultural narratives are a resource in dynamic processes of interpreting the present, as carriers of histories of past experiences, as a means that make it possible to discuss the relation between past and future, and how myth and folk stories are part of an exegetical tradition with interpretative patterns that continuously relate mythic narratives with memory and experience.

The public science debate, together with national politics and economies, represent historical and specific conditions that entail contextual realities and geographic locations for people's opinions. If the hermeneutical aspect of the relation between myth and history had been more thoroughly investigated, it could open up analyses of how different locations (Europa and USA) represent different attitudes, and why knowledge (as a parameter in the analysis of public opinion) needs to include knowledge about contemporary history.

Within the field of folklore, it is well known how public and scholarly images and understandings overlap,[25] just as popular and scholarly use of images do in the material that is presented by Nelkin and Lindee in their *DNA Mystique*. My assumption is that the important contexts for public opinion are just as complex and substantial as contexts are in the gene science debate. In analysis of the public science debate, for example in Segerstråle's analysis, the individual scientists are analyzed as bearers of political agendas motivated by past incidents. In the analysis of public opinion, people's agenda is treated as less significant than the scientists' agenda and reduced to issues of specific knowledge about genetic science, and to religion, norms and values. A broader agenda that includes history and politics, assuming that people in general and scientists have shared interests and fears, has not yet been proposed as a main theme in the analysis of the Eurobarometer surveys.

[25] Folk beliefs and understandings are not a strict opposite or contrast to science or learned understandings. On the contrary, the two overlap in individuals' lives, for people in general as well as for scholars. See for example on folk belief: Eriksen 1991; Bugge Amundsen 1989; Bø 1986; Alver & Selberg 1992.

Conclusion

The historic dimension of myth and genetics

References to myth and religious heritage, in the material I have presented, have a specific function. The references do not represent religious belief or theological exegesis, but appear as a particular interpretative strategy that enables the inclusion of specific themes. The genre of myth represents the fundamentals of reality, its building blocks and premises, its inhabitants and agents, it gives knowledge about the relation between them, which dramas they are part of, potential or expected outcomes. Myth, or references to myth, in the texts I have referred to relate to genetic science and gene technology as a strategy. This strategy explicitly pushes for, or denies, mythic characteristics in genetic science and gene technology. The strategy turns genetic science and gene technology into a contemporary drama, even a cosmological drama, at least when the fight between good and evil, preservation and destruction is included.

The use of references to myth and religious heritage is a dual interpretative process where some aspects are defined as mythic while other aspects are defined as non-mythic. These strategies of mythologization and demythologization represent a quest to understand how events and activities are connected with agents and relations, with a particular time (past, present or future) and space, and how it affects premises for present and future life, in a this-worldly story. It is not religious belief or a particular religion as such that is of importance, it is the relation between knowledge, politics and consequences. References to myth and religious heritage is a way of presenting history, and it is the relevance of memory and knowledge about reality, what reality consists of, how its parts are interrelated, which dramas it contains that we need to be aware of, and how to act when or if a particular drama is taking place.

With reference to Robertson, Peter Beyer refers to the dual process of "politicization of theology and religion … and the 'theologization' of politics" (Beyer 1994:30). In the material I have presented, references to myth and religious heritage are juxtaposed with references to World War II. The post-war history of genetic science and gene technology, of how scientific practice changed during WWII, and new relations between academics, politics and industry were established, new

policies and political strategies were developed etc., is a history that is well known to the partakers in the gene-science debate, though it is not elaborated in the debate.

The post-war history of genetic science and gene technology matches the mythic character of the gene-science debate. It involves national governments and national and international research groups and companies with political and economic visions, aiming to radically change or improve agriculture, medicine and pharmacy, and energy production. As a key context for the gene science debate, and the radical science groups in particular, the post-war history seems to confirm that genetic science and gene technology are activities that fit the narrative genre of myth.

The way I understand the gene science debate, "mythologization" is not a strategy to turn politics religious, and "demythologization" is not a strategy to desanctify a phenomenon. They are both strategies taken to either dispute or state the relevance of mythic knowledge in concrete situations. It is knowledge, and not (liberal or fundamentalist) belief that is at stake.

The interpretation of myths generates norms and values, though the ones Peter Beyer identifies as characteristic of globalized world are secondary in my material, or ambiguous. It is not (neo-) liberal values that are of importance, but sustainability regarding food supply, health, production of energy, and the risk of large scale and even irreversible horrors. At stake is equality and progress, but not as a conflict between (neo-)liberal versus particularistic fundamentalist understandings. Instead equality is at risk in terms of justice and risks. And progress is not a common ideal but the very thing the dispute is all about. As an alternative to the concept of progress, critics of genetic science and gene technology elaborate on what sustainability (not progress) may imply when one discusses the relation between science and society, or knowledge and power. And they include priorities, production, availability, ownership, distribution of health and wealth, and the relation between private, national, and international economies in the discussion. For the proponents it is about economics and competition, and for the critics it is about the consequences and predictable or unforeseen risks for society and nature.

The globalized values Peter Beyer refers to seem to imply a chasm between the past and the future. In my material, debates and public opinion related to genetic science and gene technology work

quite differently by pointing out the inseparable relation between past, present and future life. The debates about gene technology, and public opinion on gene technology, are preoccupied with knowledge, consequences, and how the past represents resources and relations between humans and the society and environment we are located in. Resources and relations are understood as limited and represent challenges one needs to understand and be aware of. Knowledge about the past and present becomes fundamental for the future. Visions of the future are not unlimited, and they cannot be captured in ideas of the progress of human civilization, but are based on a critical examination of the same. Both public debate and academic analysis appear as hermeneutical exercises focused on interpreting and investigating the relation between past and future. Debates and opinions strive to investigate the space between limitation and possibilities. It is the investigation that is of importance. Beyer's approach to religion as a sub-system in globalized society presents religion as a political project directed in one of two directions, liberal or conservative. Debates and public opinion in my material, that use myth and religious heritage as a resource, cannot be reduced to a particularistic/right vs left/liberal political agenda. Resistance or critique comes from both political left and right. And in the field of science, conflicts are not reducible to different fields of research. Scientists representing the same philosophical, epistemological and methodological traditions might disagree, just as other scientists agree despite representing quite different traditions and methodologies.

Several scholars have chosen to use myth as an analytical key concept or perspective when they analyze public opinion and attitudes to genetic science and gene technology. Their understanding tends to see attitudes and opinions as religious beliefs, or folk beliefs rooted in religious myths and folk narratives. In parallel, science history has shown how science today is returning to the kind of practice that developed during World War II, when science was turned into a team-based problem-solving activity aiming to create products with a comprehensive impact. Society has been deeply involved in science, and science has not been an isolated activity outside of society in the post World War II era. On the contrary, after World War II, science moved into the center of political, industrial and governmental strategic decision-making. Science and technology in the field of genetic science and gene technology became an arena for huge societal and industrial expectations. It was given economic priority and started to involve people from new areas of society, media, decision makers and policy makers. It is this new societal and political situation, where science is

expected to generate social, economic and in some cases biological consequences, that the British and US radical scientists operate. I believe that public opinion also needs to be understood in relation to this societal and economic context they have been involved in or affected by.

Finally, myth, religious heritage and folk narratives can be understood as a resource within a strategy to take the potency and potential failure of science seriously. The relation between myth and history appears as both dynamic and contextual in character. To be made relevant, myth has to be related to a specific time and space. And for myth to be more than a rhetorical trope, history seems to be a prerequisite.

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