

**CONSTRUCTING PUBLIC IMAGES OF NEW GENETICS AND
GENE TECHNOLOGY: THE MEDIA DISCOURSE ON THE
ESTONIAN HUMAN GENOME PROJECT**

Piia Tammpuu

University of Tartu

Abstract. This paper examines the construction of public images of new genetics and gene technology in the media by focusing on the example of the Estonian Genome Project. Being one of the few countries where such a large-scale population based genome bank is being established, Estonia serves as a particular case for investigating public representation and reception of gene technology. Of special interest are the discursive strategies of framing and argumentation applied by different social groups for justifying and legitimating, as well as criticising and challenging the implementation of the genome bank. As the study suggests, the domestic public discourse on the genome project has to a great extent been influenced by modernist ethos, regarding scientific and technological development inevitable and progressive. Yet it will be argued that the significance attributed to the genome bank in public extends beyond medical and scientific domain, being introduced by its initiators and proponents as a joint national venture contributing to the country's further development and its worldwide reputation as an innovative and high-technological small state. However, while focusing primarily on the advantages arising from the project, the domestic media coverage has provided little critical reflection about the broader social and ethical implications of gene technology and human gene databases.

Keywords: images of new genetics, gene technology, media discourse, communication of science, human genome banks, Estonian Human Genome

1. Introduction

The perceptions and attitudes people hold towards science and technologies at large are often characterised by a certain ambivalence in which optimism about prospective outcomes of scientific research and technological advances is mingled with scepticism and anxieties about misuse of scientific knowledge and long-term implications of technological progress (Felt 2000). Recent developments in

genetics and biotechnology, the most outstanding and far-reaching of which has been perhaps the sequencing of the structure of the human genome, have likewise evoked great expectations with respect to the application of genetics and gene technology in medical domain, as well as critical reflection and ethical concerns about impacts that new genetics may have on individuals and society on the whole.

Provided that most people are neither directly involved in scientific research nor hold particular scientific knowledge, information about science and its applications is seen to reach the broader public mainly in a mediated form. Here one of the key agents is the mass media that provide people with various kind of information about scientific advances and new technologies. However, far from being a channel that merely mediates scientific and technological news to the public, the media perform rather as a public arena where various versions of social reality, including those of science and technology, are constructed by different social groups and institutions, all competing for legitimacy, authority and public trust. As such, the contemporary media appears as a crucial site for exploring the range of various images and meanings of genetics and biotechnology, as well as the mechanisms by which these images and meanings are produced, sustained and transformed (Petersen 2001:1256). Although the influence that the media have on people's views and attitudes cannot be seen as one-directional or uniform, different interpretations, representations and arguments proposed by the media inevitably come to frame and shape public reception on a particular issue or phenomenon. Hence, the analysis of public discourse is supposed to form an inseparable aspect of the broader research into public opinions and perceptions held about genetics and biotechnology (Gutteling et al. 2002, Condit 2001, Petersen 2001).

The current paper examines the construction of public images and meanings of new genetics and gene technology by using the example of the Estonian Genome Project (EGP). Being one of the few countries where such a large-scale population based genome bank is being planned, Estonia serves as an interesting case for investigating public representation and reception on gene technology and its application in human genetic research. Since the EGP is founded on the principle of voluntary participation, where individuals are left with the choice as to whether they are willing to donate their blood sample to the national gene bank or not, public images of genetics and gene technology become of particular relevance, evoking questions about the credibility and authority of science and scientists, particularly of those working in the field of biotechnology. Furthermore, the possibility to decode the codified genetic samples and link them to particular individuals, like the right granted to gene donors to know their personal genetic data, make individual choices and questions of personal risks and benefits, including those of privacy and responsibility, especially sensitive in the Estonian context. As a recent survey from 2002 reveals, while the Estonian public conceives the genome project on the whole in a positive frame, associating it with various advantages in medical, scientific and national terms, people tend to be much more sceptical and hesitant when asked about their personal participation in the project

(Korts 2004). Considering that the media, particularly printed press, appear as the primary source of information about the EGP, the ways issues of genetics and gene technology have been treated in the domestic press, including the risks and benefits that have been constructed in public, have apparently a certain impact on how the public comes to perceive and evaluate the potentials of genetics and gene technology.¹

Within the present study, a systematic analysis of major Estonian dailies and weeklies was carried out to identify main topics and issues raised in the domestic 'gene debate', as well as the alleged risks and benefits arising from the EGP that were constructed in the press. Here of particular interest are the discursive strategies of framing and representation applied by different groups and institutions for justifying and legitimating, as well as challenging and questioning the foundation of the national genome bank in public. Throughout the article, the role of different groups, including that of journalists, is critically assessed with respect to the construction of public images of genetics and gene technology. Encompassing the four-year period from 1999 to 2002, the study seeks to follow how the media discourse has evolved since the idea of the EGP was initially introduced to the public until its first phase of implementation in the end of 2002. The article also draws comparisons with studies conducted about public discourse on genetics and biotechnology elsewhere, particularly in Iceland where a similar population-based genetic database has been planned.

As the study reveals, the domestic media coverage of the EGP has to a great extent been influenced by a modernist ethos, regarding scientific and technological development unavoidable and progressive, while providing only limited reflection about the broader social and ethical implications of biotechnology. On the other hand, public representation of the EGP appears to be strongly affected by broader discourses of Estonia's post-Soviet transition and politics of identity, making the project highly relevant not only in the scientific and medical domain, but also in national terms.

2. Public images of genetics, acceptance of new technologies, and the media

2.1. Social and cultural implications of new genetics and biotechnology

As it is increasingly argued, current developments in genetics and biotechnology do not signify merely scientific and technological advances, but involve broader social and cultural implications emerging both on individual and societal level (see, e.g., Beck 1999, Condit 1999, Rose 2000, Delanty 2002, Habermas 2003). Research into the workings of human genes, as Delanty claims, has brought about a full 'cognitive revolution' in how people perceive and think of social

¹ According to the nationally representative survey on people's perceptions of science and gene technology carried out in 2002 by AS Turu-Uuringud, 45% of respondents considered the printed press to be their main source of information about the EGP. For more detail on the survey, see Korts (2004) in the current issue.

reality itself – including of what is human, and what involves nature and life (Delanty 2002; see also Habermas 2003, Conrad and Gabe 1999). According to Bauer, genetic engineering stands as one of the four major developments of the post-war era that have evoked popular imaginations of a transition to a new type of society, that is from atomic to space to information, and finally to bio-society or gene-society (Bauer 2000).

One of the major impacts associated with the expansion of biotechnology into the sphere of human genetics has been the emergence of a new genetic determinism where individual fates are increasingly seen to be ruled by biology and genetic heredity (see, e.g., Petersen 1998, Conrad and Gabe 1999, Condit 1999). Alongside with this, the concepts of health and medicine have likewise become the subject of re-conceptualisation where one's health has come to be defined primarily by freedom from risk of genetic disease (Beck-Gernsheim 2000, Petersen 1998). Consequently, individuals are claimed to have right not only to healthy genes, but also to information that will enable them to minimise their risks to disease (Petersen 1998). Assessing various implications of genetics, Rothman insists that genetics appears not just as science, but also as a "way of thinking, as an ideology in which people are coming to see life through the prism of hereditary and genetic frame" (Rothman 1998:15). Regarded from this perspective, bio-genetic projects such as human genetic databases happen to be not just innovative technical, scientific, and economic enterprises, but rather as 'biopolitical experiments' accompanied by various social implications for individuals, families, communities and society at large (Palsson and Hardardottir 2002:285; see also Hoyer 2003).

On the other hand, with the changing relationship between science, society, and the market, the formerly recognised autonomy of science has largely become contested. Scientists in general appear to be more and more dependent on the public acceptance and evaluation in order to secure funding of their work and continue research (see, e.g., Delanty 2002, Felt 2001, Petersen 2001). This has a certain influence also on the communication of science. As Rose points out, the combined support of the market and the state, characterising for example techno-scientific projects such as the international Human Genome Project, has required 'selling' the new genetics to diverse audiences, including investors, lay people, and government representatives (Rose 2000:67). Consequently, communication of science to the broader public is seen to be increasingly leaning on the tools of public relations in order to maintain the legitimacy and authority of science in public, as well as to attract the interest of business entrepreneurs and investors.²

² In this respect it should be mentioned that the Estonian Genome Project, for example, was awarded the first prize in the annual competition of public relations projects in 2000 organized by Estonian Public Relations Association.

2.2. *Representation of genetics and biotechnology in the media*

Considering the developments in bioscience together with their social and cultural implications, the media is claimed to be of central importance, emerging as a major channel for communicating science to the public, and influencing in this way people's perception and understanding of genetics and biotechnology (Conrad and Gabe 1999). With respect to modern biotechnology in general, the individual dependence on the media has been considered to be especially high, as the possibilities to gain information through a direct personal experience seem to be limited. Hence it has been supposed that the public conceives 'biotechnological reality' largely based on what media conveys about the subject (Gutteling et al. 2002:95, Hampel and Renn 2000, Schenk and Šonj 2002). Yet, it must be noted that with the spread of genetic testing and also with the foundation of humane genome projects like the EGP, people become increasingly involved and personally affected by genetics and biotechnological developments as well. This, however, does not necessarily decrease the significance of the media in the given context.

Instead of merely reflecting the social and scientific reality by providing 'objective' information about scientific research and scientists' workings (also regarded as the 'popularisation of science' via the media), the media itself contributes strongly to the construction of the 'reality of science', including its public images and social meanings (von Wartburg and Liew 1999). Such constructions of reality are routinely produced through selective presentation of themes, facts and claims, as well as through a particular choice of news sources that give preference to certain types of framing and representations. Although such frames – either deliberate or unintended – are often tacit, they can exert an extensive influence on what, and how, is defined and conceived as a public issue (Petersen 2002, Gutteling et al. 2002).

Accordingly, as many systematic studies of science content in the mass media have observed, the public presentation of science is rarely shaped by 'objective' scientific issues, and is strongly influenced by particular cultural and historical contexts (Lewenstein 1995:346). Debates about new technologies, as Hamper and Renn for example suggest, are usually not restricted to a single technological method, but include the social and environmental embedding of particular technology, and can therefore be described as social projects led by certain values and interests (Hampel and Renn 2000). Likewise, as Fletcher argues, humane genome banks, based on scientific techniques and facts, convey a different symbolic and social meaning in each society that establishes one (Fletcher 2002:371). The public acceptance of new technologies on the other hand, is accordingly claimed to be dependent on how these technologies are adjusted into the existing socio-cultural setting and symbolic frameworks (Wagner et al. 2002, Hampel and Renn 2000).

However, apart from a particular social and cultural context, studies about the media coverage of genetics and biotechnology also provide some common observations. According to the findings of a number of empirical studies, human

genetics tends to be represented in the print media largely in a positive context. The news media is often found to apply a frame of 'genetic optimism', focusing primarily on possible benefits and advances arising from genetic research, while playing down its risks and hazards (see e.g., Conrad and Gabe 1999, Anderson 2002, Petersen 2001, Gutteling et al. 2002, Kohring and Görke 2000, Görke et al. 1999). Together with this broadly optimistic approach, there occurs a general tendency to overemphasise the role of genes and ignore the importance of non-genetic factors in diseases. As Rose notes, "while genetics may formally say that genes are not determining, the unambiguous cultural messages that comes through is that they actually are" (Rose 2000:68). Moreover, while genetic associations and causations are complex, much of the public discourse is often based on the assumption 'one gene, one disease' (Conrad and Gabe 1999). Such a simplification leads easily to 'geneticisation' or 'genetic essentialism' on wider social level where an increasing range of human and social problems are seen to be of genetic origin, while other factors are claimed to be only of second importance (Petersen 1998, Conrad and Gabe 1999, Condit 1999). According to van Dijck, "the heavily publicised 'search for genes' may provide an important selling point of the human genome project, but it narrows the public's vision to a highly limited aspect of the relationship between genotypes and phenotypes" (1998:150).

The number of provocative and widely popularised metaphors that the sequencing of the human genome has evoked in the media, such as the 'search for the holy grail', investing 'the essence of human life', 'decoding the book of life', are seen to enforce the idea that genetic research will reveal the ultimate, objective truth about life, and thus to attribute to geneticists a certain mystique and authority (Anderson 2002, Conrad and de Cabe 1999). Since images are not only descriptive, but also interpretative and evaluative, the selection of particular metaphors is therefore often strategic rather than accidental (van Dijck 1998, Wagner et al. 2002). Hence, metaphors are equally used by geneticists in order to promote their work and persuade the public of its importance for health-care for example, as well as by critics to express their concern about ethical and moral implications of gene technology on the other hand (Nelkin 2001). Repeatedly presented and re-occurring metaphors in turn are argued to come to affect perception and understanding of scientific issues and events (ibid.).

2.3. Media content and relevance of news sources

A common aim of critical discourse analysis is to reveal the ways social structures, power relations and ideologies shape discourses, as well as how discourses contribute to the formation and transformation of social identities, relations and beliefs (Fairclough 1992). As such, discursive practices appear to be indispensably related to social practices extending beyond particular texts and language use. Accordingly, one needs to examine the social agencies and practices behind the media content. As Anderson emphasises, media representations are to a large extent the outcome of a competition among a number of news sources, each seeking to provide their own definition of the public representation of an issue

(Anderson 2002:328). The possibilities to affect media agenda largely depend on the level of access to the news media that different social groups happen to have. As various studies regarding the communication of science have revealed, journalists frequently rely upon scientists as their main sources of information, whereas 'establishment scientists' or those 'institutionally powerful' are regarded more trustworthy and credible sources than 'independent' scientists (Anderson 2002, Petersen 2001). Also, as Petersen argues, science writers, despite claiming to be journalistically independent, are often under personal and institutional pressures to conform to certain scientific values, and their reporting tends to reflect the concerns of scientific community rather than those of the 'public' that they claim to represent (Petersen 2001:1257). According to Lewenstein, this results in the production of science stories that hardly challenge the positivist ideology shared by most scientists (Lewenstein 1995:345).

However, it is not only journalists, but also scientists themselves who try to make use of the media in their efforts to maintain a positive image of scientific research and thus secure continuous funding of their work (Lewenstein 1995, Petersen 2001). There have been identified various discursive strategies applied by scientists in order to establish and sustain their authority in public, and repel the criticism by non-scientists, e.g. by constructing symbolic boundaries between science and non-science (see Kerr et al. 1997, Conrad and Gabe 1999). At the same time, the voices of ordinary citizens, occurring less frequently in the press on the whole, offer supposedly mainly a 'symbolic presence' in terms of representing the 'human angle', and to counter-balance the 'expert discourse' of scientists (Anderson 2002:332). Yet as Jallinoja emphasises, these 'silent' actors play an important role in public discourse, as far as arguments about their opinions, expectations, concerns and fears are central in debates about the ethics of genetics (Jallinoja 2002:35).

3. Methodology and sample

The material analysed within the present study encompasses all material published on the EGP and applications of biotechnology in human genetic research at large in the major Estonian dailies and weeklies between 1999 and 2002.³ The following Estonian language newspapers with national circulation were included in the study: *Eesti Päevaleht (EPL)*, *Postimees (PM)* (major Estonian dailies), *SL Õhtuleht (SLÕ)* (tabloid daily), *Eesti Ekspress (EE)* (major Estonian weekly), *Äripäev (ÄP)* (business weekly), and *Sirp* (culture weekly). All

³ Besides the print media, a number of special radio and TV-programs on issues of genetics and human genome project have been launched where mostly scientists and experts of biomedicine have been invited to comment on the topic. Likewise, the Estonian genome project has attracted attention in the foreign press. For a selection of different media coverage of Estonian Genome Project, see for example <http://www.geenivaramu.ee>

the aforementioned papers are privately owned, except *Sirp* that is publicly financed.

First, a search of relevant articles was carried out via Internet based on a previously compiled list of keywords (e.g. 'Estonian Genome Project', 'gene project', 'gene bank', 'genetic research', 'human genetic research act', 'gene science/scientists' etc.) and by using electronic search engines of each newspaper. As such, the study focuses primarily on the EGP and human genetic research, excluding other publicly debated issues of genetics and biotechnology, such as genetically modified food, cloning, etc. Also, as the online and printed versions of newspapers differ to a certain extent, only the articles published in printed form were included into the final analysis. In total, the sample included 235 items that were also distinguished by genre: news, interviews, opinion pieces, editorials, letters to the editor, analytical articles, and feature-stories. Most of the material analysed within the present study originates from the two major Estonian dailies – 49% from *Postimees* and 30% from *Eesti Päevaleht* respectively. With respect to format, the sample consisted mostly of news stories (41% of all articles) and opinion pieces (32%).

Both content and discourse analysis were applied as methods of research. On the one hand, the themes/issues covered in the press in relation to the gene technology and genome project, as well as the authors and opinion sources commenting on the subject were identified. Likewise, the risks and benefits associated with human genetic research and particularly with the EGP were singled out in texts. Here the content analysis enables to follow certain trends and shifts in the media coverage over a four-year period in response to the proceeding of the project. On the other hand, the study aimed at distinguishing metaphors, various tools of rhetoric, and strategies of framing and contextualisation applied by different groups, as well as assumptions and values underlying different patterns of argumentation.

4. Themes and voices in the Estonian media coverage of the genome project

4.1. History of the EGP and the media coverage

Having long research traditions overall, biotechnology and biomedicine have also appeared as fields of research that have received remarkable attention and recognition both on domestic and international level during the years of Estonia's re-independence. In recent years, investments have been made both in research facilities and equipment, and a number of biotechnological and biomedical enterprises have been founded.⁴

The emergence of the public debate about the establishment of the EGP dates back to 1999 when the idea of the national genome bank was initially introduced

⁴ For a brief overview about recent biotechnological developments in Estonia, see e.g., "Biotechnology research and business in Estonia: a short overview of present situation and future expectations". <http://www.biopark.ee/en/biotehnoloogia/ylevaade.html>

in public. Here the foundation of the Estonian Genome Foundation (*Geenikeskus*) in January 1999 by a number of recognised Estonian geneticists, biologists, and medical scientists, as well as by politicians, officials and also journalists, serves as one of the first landmarks that indicate the beginning of the domestic 'gene debate'. As explained in the press, the aim of the Genome Foundation was to unify Estonian gene technologists working in different laboratories, in order that 'Estonia would stay in the first rank of this rapidly developing field', as well as to 'help the society to understand where geneticists have arrived and where they will arrive' (Tiit Kändler, journalist, EPL 27/01/99). Since the foundation of the Genome Foundation involved professionals from different fields, including that of politics and journalism, it also helped to create favourable conditions for the introduction of the 'gene issue' in the Estonian public. The events related to the launching of the EGP that have received public attention in the press over the four-year period from 1999 to 2002 include the adoption of Estonian Human Genes Research Act (HGRA) in December of 2000; the establishment of the Estonian Genome Project Foundation (*Geenivaramu*) as a non-profit foundation and the public limited company E-Geen and E-Geen International Corporation responsible for the financing and investments of the EGP in the spring of 2001; signing the contracts between the Estonian Genome Project Foundation, E-Geen and E-Geen International at the end of 2001, according to which the latter obtained exclusive rights of access to the database and selling the data for commercial purposes; disclosure of the list of private investors at the beginning of 2002; making public the terms concerning the free usage of databank for scientific purposes, according to which scientists are obliged to relinquish the rights of patents to E-Geen; and finally the implementation of the so-called pilot project of the EGP in three Estonian counties in the autumn of 2002.

Although certain lines of argumentation and instances of rhetoric have persisted throughout the four-year debate, there has occurred a certain variance in particular themes and issues discussed in the press in connection with the EGP, as the focuses have shifted with the proceeding of the project. At the beginning of the debate in 1999, the media coverage appeared to be mostly supportive towards the idea of establishing a national gene bank, focusing primarily on the scientific and medical benefits promised to arise from the project. Geneticists and medical scientists, as well as journalists supporting the arguments of the former, justified the foundation of the national gene bank mainly with the emergence of 'new individualised medicine' that necessitates genetic knowledge and research in society, and will provide people with more effective genetics-based methods of diagnostic and treatment, as well as 'personalised drugs' corresponding to one's personal genetic make-up. As such, the genome project was initially introduced to the public as a scientific-medical project, contributing to personal and public health-care. In response, there appeared only a few critical stances, mainly by medical scientists, who primarily questioned the scientific and medical value of the designed project with respect to the role of genetic and non-genetic factors in health disorders. Also questions concerning the regulation of ethical and legal

aspects of the database, implications accompanying the awareness of one's genetic data, and the financing of the project were raised in the press. However, the joint position of the medical community towards the implementation of the project was hesitating, rather than denying or resisting, expressing doubts mainly with respect to the public financing of the EGP.

The initial enthusiasm of the initiators of the EGP that was generally shared by journalists was followed perhaps by a more balanced debate in 2000 when various risks and benefits were contrasted more explicitly in public discourse. However, the Human Genes Research Act, regulating the establishment of the database and the rights of gene donors in detail, was passed in the parliament in December of 2000 almost with no prior debate in public or any involvement of the scientific community at large. The adoption of the Act, on the contrary, enabled the initiators of the project to 'switch off' from the public agenda or repel criticism concerning a range of potentially controversial and sensitive issues, such as the terms of individual participation in the project, protection of genetic data, rights of gene donors, etc. In principle, the adoption of the HGRA, claimed to provide Estonia with a clear advance in comparison with other countries planning to establish their genome projects, gave a 'green light' to the foundation of the EGP, leaving aside the principal questions as to whether a national gene bank should be established at all and what could be its scientific reasoning.

In 2001, already more practical issues concerning the financing and investments of the project rose to the public agenda and were considered at length in the press. The disclosure of the financing schemes and the regulations of patents in 2002 caused perhaps most public controversy, evoking concerns about the primarily commercial nature of the EGP. In the light of the revealed commercial interests underlying the project, the formerly promised medical and scientific merits became publicly contested.

The issues of public awareness and voluntary participation in the project, as well as of the mediating role of family doctors between gene donor and the EGP entered the discussion to a large extent only in 2002 with the implementation of the first phase of the EGP. At the same time, a large share of media coverage of 2002 was devoted already to the introduction of technical details concerning the logistics and storage of gene samples.

On the whole, it appears from the domestic media coverage that the principal decision-making concerning the foundation of the national gene bank was preceded only by a limited debate in public, while criticism expressed in the press has emerged largely in response to the decisions already made.

4.2. Representation of opinion sources

With respect to the social groups and opinion sources involved in the domestic 'gene debate', the public discourse on the EGP can be regarded mainly as an expert discourse, in the sense that besides journalists it is mainly scientists and experts or professionals from different fields who have commented on the topic. Approximately 70% of the material published on the issue originate from

journalists and editors of publications. The rest of the material has been published mainly by scientists and various experts, mostly including geneticists and medical scientists or specialists. Lay people themselves have commented very little on the topic, and likewise their opinions have seldom been asked by journalists.

Among news sources, geneticists and medical scientists as well as various experts involved in the establishment of the EGP, including administrative staff and board members of the EGP, have been asked to comment on the topic, accounting for more than half (52%) of all commentators. The most frequently quoted source (15% of all commentaries) has been Andres Metspalu, Professor of Biotechnology at the University of Tartu, also one of the main founders of the genome project and board member of the EGP, as well as one of the owners of the local biotechnology company Asper. As such, Prof. Metspalu has emerged as one of the main spokespersons and promoters of the EGP since the issue was first introduced in public. At the same time, scientists from other fields or geneticists not directly engaged with the project have been asked to comment on the issue less frequently, thus limiting the potential range of arguments and positions. In general, journalists writing on the subject seem to rely on a limited number of sources, among whom there have been mostly geneticists and specialists related to the EGP who are probably easily accessible to the press and willing to comment on the topic.

On the journalists' side, on the other hand, there appear to be only a few who have specialized on issues of science and/ or genetics, and their reporting tends to a large extent reflect the so-called 'scientific conformism'. As revealed from the media coverage, journalists writing on the subject are not used to question or critically examine the information provided by geneticists and biomedical experts, but take over their assumptions and devices of rhetoric without critical consideration.

Besides the scientists and experts involved in the Genome Foundation and the EGP, there has been almost no other 'institutionalised voice' equally represented in the public debate, neither by the scientific community nor by other social groups. The members of the Ethical Committee founded at the Estonian Genome Project Foundation have made only approving statements towards the regulations concerning the implementation of the genome bank, and thus have mostly shared the positions of the initiators of the EGP. Family doctors who hold the mediating role between gene donors and the EGP have expressed different opinions with respect to the genome project, being both enthusiastic and sceptical about the medical benefits of the project. Overall, there have been only a few figures, mainly from medical community and scientists from social sciences, who have consistently and publicly criticised the implementation and regulations of the project from scientific as well as from an individual's point of view. Given these findings, it is noteworthy that according to the findings of public opinion survey, geneticists and the staff of the Estonian Genome Project Foundation enjoy the highest credibility rating in the eyes of the Estonian public compared to other possible information sources about the EGP (see Korts 2004).

5. Framing the public discourse on the EGP: “It’s one for all, and all for one”

As revealed from the domestic media coverage, the EGP has been introduced to the public through different representations, being portrayed by different groups as a scientific project, as a medical or health-care project, or mainly as a business enterprise. Yet, far from being uniform or internally cohesive, certain strategies of framing and representation can be distinguished that appear to pervade the media coverage throughout the four-year period. Next the particular assumptions, devices of rhetoric, and metaphors characteristic to the domestic media discourse are examined in more detail.

5.1. Technological innovativeness and construction of Estonian Nokia

On the whole, the domestic media coverage of the EGP seems to be largely framed by a modernist rationale regarding scientific and technological development to be both inevitable and advantageous, and seldom contesting the ideas of technological and scientific progress. Invoking notions like ‘entrance into the gene century’, a ‘new era in medicine’, ‘gene revolution’, ‘breakthrough in biotechnology’, geneticists and medical scientists, as well as journalists and politicians endorsing the implementation of the EGP, have argued that Estonia is driven by broader developments in medicine and biotechnology that cannot be either avoided or ignored. In this context, the establishment of a national gene bank appears as something unique, yet on the other hand as something commonplace in the constantly modernising world. As such, the project has been conceived to signify merely another instance of technological advance, as for example suggested in the following examples:

We already have electronic cards and we use them to take out money from cash dispensers, we do shopping and pay in gas stations and for some reason we are not afraid. Perhaps our fear of gene bank comes from our Soviet past. (Arne Urm, businessman, EPL 12/06/00)

The project can be compared with the usage of the first mobile phone that helps us a lot in everyday life. (Andres Metspalu, Professor of Biotechnology, EPL 05/09/02)

Enclosed within the common developments in biotechnology, Estonia has been depicted to participate in an international ‘gene race’, competing with countries planning or completing similar human genome databanks. Here the risk to ‘miss the chance’ and to ‘lose the honourable and desirable first prize’ in the competition has frequently been served as an argument to further the completion of the EGP by its initiators and proponents.

Since the very beginning of the domestic ‘gene debate’, geneticists and biomedical experts engaged with the Genome Foundation and the EGP have claimed Estonia to have a number of advantages to become a ‘leading country’ in the field of gene technology. Strong traditions in molecular biology, on the one hand, and on the other hand, technological innovativeness reflected mainly in the rapid

growth of IT sector and telecommunication, are used as premises or evidences to support this assumption. Also journalists have been emphasising that gene technology may be one of the few fields where such a small country like Estonia can compete with big Western countries on equal footing, or even achieve an advance:

The idea of the genome project is a strategically well-timed project that would give Estonia the possibility to rise among the forerunners at least in Europe. (Kalev Kask, letter to the editor, PM 20/11/99)

It is important for Estonia that we get to the world arena in gene technology as an increasing and developing economic branch, and compete with other countries. (Annika Alasoo, journalist, PM 13/03/00)

Here, the Icelandic Genome Project has often served both as an example and comparison:

Mini-societies like Iceland and Estonia that are genetically homogeneous and have a good health-care system and scientific base can accomplish the leap to the new medicine much faster than big countries that are still standing at the starting line. ... Estonian Nokia may be hidden in our genes and in the Icelandic example. (Alo Lõhmus, journalist, PM 18/09/99)

Even before the detailed plans of the EGP were introduced in public, the initiators and proponents of the project declared it to become the 'Estonian Nokia', drawing a parallel with the Finnish Nokia, a leading telecommunication company in the world:

Estonia's chance is in information and gene technology. ... If these two will cooperate, there may emerge the desired Estonian Nokia. (Andres Metspalu, Professor of Biotechnology, ÄP 27/05/99)

Here Nokia has been regarded primarily as a national symbol of Finland that is known and recognised worldwide. Labelling the EGP as the Estonian Nokia has turned out to be a powerful metaphor, symbolising innovativeness and technological advancement as the key factors determining development and success in the modern world based on high technology. In the context of Estonian post-communist transition and symbolic 'Return to the West', in which the public debate and the particular discursive framing is embedded at large, the completion of the EGP appears therefore as another evidence of Estonia's post-communist 'Success Story' and as a 'Big Chance' for the country. Emphasising Estonia's potentials in genetics and biotechnology, the genome project is assumed to take Estonia to the 'world map' and to shape Estonia's international image and reputation as that of an innovative and competitive small country:

Estonia has a big advantage in the biotechnology and gene technology compared to the other Central and Eastern European countries. Gene technology is probably the big chance of Estonia's future. The only problem is that we haven't yet founded the gene database that would be an ideal base for the development of technology and enterprising. (Agu Rimmelg, Director of Estonian Foreign Investments Agency, ÄP 28.01.00)

The Estonian gene project is our next big national venture after re-independence. It concerns all living Estonians, besides several generations of those who are already dead, and many generations who are not born yet. /.../ The success or failure of the gene project will determine Estonia's reputation as a state adjusting to the global world of science. (Anu Jõesaar, journalist, EPL 18/01/02)

These expectations are likewise implied in several headlines, particularly in 1999: "Gene sale will make Estonia well-known" (PM 24/05/99), "Estonia's chance is in gene technology" (EPL 31/05/99), "EGP – The gas deposit of Estonian state" (EE 04/11/99), "Gene technology and transit are Estonian trumps for the coming years" (PM 01/12/99).

Such a framing and contextualisation, applied by different social groups involved in the public debate, including geneticists, medical scientists, journalists and politicians, has attributed to the genome project a meaning of a national venture that calls for joint efforts and provides a common point of reference for identification. In this respect, the idea of the national genome bank has effectively been switched to the broader identity narrative of the country by its initiators and proponents. Hence, as Fletcher argues, the EGP "works not only as an instrumental policy choice, but also as a way to link Estonia's future economic, scientific, and cultural identity to its historical strengths in molecular biology" (Fletcher 2002:374). The portrayal of the EGP as the Estonian Nokia has definitely brought along a broader resonance in society, adding certain attractiveness to the project.

5.2. Challenging the prevailing rhetoric

However, the rhetoric appealing to national identity and shared national benefits, as well as calling the project the Estonian Nokia has been contested in public. In response to such rhetorical formation, there are instances of a certain meta-discourse in which the initial elements of rhetoric and assumptions are reversed or challenged:

What is the real direction of development of our tiny nation? What is our new identity? To be a progressive cheap horde of guinea pigs for progressive enterprises? [Referring to the Estonian Genome Project] (Joel Volkov, Head of Advertising Agency "TANK", PM 30/11/01)

This spring the Estonian Genome Project will be initiated and in a couple of years we will possess something that the big and rich western nations don't have and will never have. /.../Our genetic database will be a golden egg that is ten times more important than Kuwaiti oil or Turkmenistan gas, a thousand times more interesting than the Polish 'federative experience'. (Andrei Hvostov, journalist, EPL 30/01/01)

On the whole, the prevailing rhetoric of the geneticists and biomedical experts related to the EGP has nevertheless been confronted primarily from the ethical and commercial perspective, rather than from the viewpoint of scientific or technological progress. Recognising the commercial interests underlying the construction

of the national databank, the project has been associated with an image of business enterprise led by the drive for corporate profits:

I will call it stock company called Vampire. What else it is? A business with blood and health records. (Endel Lippmaa, academician, EE 10/01/02)

The image initially created of the genome project for the public that here one has to do with a unique mega-project of Estonian state and nation with which we will arise to the world map, as well as to the heights of top science has gradually transformed into a primarily business project. (Editorial, PM 12/02/02)

Such instances of meta-discourse and reversed rhetoric have appeared in the press mainly from 2001 onwards when the issues of financing and investments moved up in the public agenda.

6. Discourses of risks and benefits

Depending on whether the genome project is treated primarily as a scientific venture, a medical or health-care project, or a business enterprise, different risks and benefits related to biotechnology and particularly to the EGP have been constructed in the press. Among them in turn, advantages and disadvantages associated directly with an individual, and those regarded to be more of common nature can be distinguished.

6.1. Distribution and dynamics of risks and benefits

Similarly to a number of studies on the media reporting of genetics and biotechnology, the findings of the present survey indicate that in the Estonian media coverage the benefits associated with the genome project outnumber risks and disadvantages raised in public. From 1999–2002, approximately half of the articles discussing possible advantages and/ or disadvantages of the genome project and gene technology focus only on benefits, while about one third discuss both concerns and benefits, and one fifth consider only risks or disadvantages. As several headlines and subheadings explicitly state, the project involves only few or no threats that are definitely outweighed by possible benefits: “The Gene Bank will offer new opportunities, but does not oblige or threaten anyone” (PM 10/06/00), “The benefits of the Gene Bank weigh out possible threats” (EPL 12/06/00), “The Gene Bank is open and safe” (PM 27/02/01).

However, over the four-year period, a certain dynamics in the public construction of possible harms and benefits can be noticed. With the proceeding of the EGP, when further details of the project, including financing scheme and regulation of patents, have become public, more sceptical and critical statements have appeared in the scientific community as well as among journalists. Whereas in the beginning of the debate, the media discourse was overwhelmingly positive, focusing primarily on the medical and scientific aspects of the gene bank, in the

following years the share of articles discussing both risks and benefits, as well as those expressing only concerns, have risen. For example, in 1999 67% of the articles emphasised only benefits, but in 2000 the share of such articles decreased, while the number of those contrasting both risks and benefits increased (Figure 1).

The weighing of risks and benefits is reflected also in various headlines, such as “The Gene Bank: A generous or rapacious idea?” (SL 10/03/00), “Dangerous and useful Gene Bank” (SL 13/06/00), “Human Genome Project – hope or concern?” (PM 20/06/00). However, the dominant positive frame of stories has often been maintained in journalistic reporting despite drawing attention to certain risks. For instance, while various benefits allegedly arising from the project are commonly treated as certainties, various disadvantages are generally discussed rather as probabilities or possibilities, thus mitigating their significance. The relevance of risks has also been played down in journalists’ reporting, for example, by admitting there is (only) ‘some’ risk, and that particular fears are pertinent in the other contexts (in West), but not in the case of the EGP.

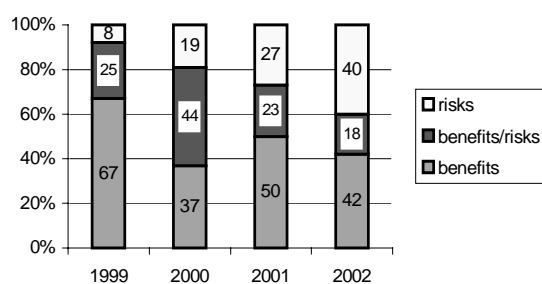


Fig. 1. The distribution of risks and benefits in the media coverage of 1999–2002.

Yet, as the data suggest, there appears a certain tendency towards the polarisation of opinions with the development of the debate, where the share of ‘resisting’ articles has been increasing, while the ‘balanced’ or ‘ambivalent’ articles have been decreasing. Thus, the groups commenting on the subject seem to take more explicit sides in the domestic debate.

6. 2. Benefits constructed in the press

The benefits associated with the applications of biotechnology and the EGP are suggested to be of common nature rather than strictly limited with the gene donor. However, from a personal perspective, the main benefit is seen in the opportunity granted to gene donors to receive personal feedback about their genetic dispositions from the genome project – the very aspect that distinguishes the Estonian genome project from similar genetic databases elsewhere (Table 1).

Table 1. Alleged benefits arising from biotechnology and the EGP in particular

Personal benefits	Common benefits
<ul style="list-style-type: none"> • Awareness of one's genetic dispositions and risks will allow individuals to take various measures to prevent or avoid illnesses, e.g. by changing one's lifestyle and habits, regular medical check-ups, etc. • Individuals will have better methods of diagnostics and treatment that will also enable increasing one's average life expectancy. • Individuals will have more effective medicines that correspond to their particular genetic make-up. 	<ul style="list-style-type: none"> • The genetic data gathered within the EGP will allow scientists to discover new genes and genetic correlations that help to detect causes of various diseases, as well as to elaborate better methods of diagnostics and treatment. • The completion of the EGP will contribute to the improvement of public health by providing more effective methods of diagnostics and treatment that reduce the cost of the health-care system. • Thanks to the EGP, medical records of the population will be better organised and stored in databases. • EGP will allow small Estonia to become one of the leading countries in the field of genetics and high technology. • EGP will contribute to Estonia's economic growth, competitiveness and living standard by attracting new (foreign) investments and creating jobs for scientists/specialists. • Thanks to the EGP, the public will become more educated in genetics.

With respect to the possibility of becoming aware of one's genetic data, the frequent assumption has been that in the situation where individuals are facing a choice as to whether or not to know their personal genetic risks, they would rather prefer knowledge. As geneticists and medical scientists have asserted, awareness of one's genetic risks enables an individual to minimize personal risks, for example, by choosing an appropriate lifestyle and profession, change one's habits, take various preventive measures, etc.:

Perhaps the message hidden in one's genes is too sad for one to cope with? A person always has the right not to know. /.../ But there are much more people who would like to know – they should also be given an opportunity to decide about their life themselves. It's always possible to react to bad news with a preventive treatment and change of lifestyle. (Andres Metspalu, Professor of Biotechnology, EPL 05/11/99)

Thus it has been tacitly expected that people behave in a highly rational manner when becoming aware of their genetic risks. Furthermore, the argumentation represented by geneticists involves an interesting controversy. Enforcing on the one hand the ideas of genetic determinism according to which it is genes that largely determine one's life-course and health, while environment and behavioural factors appear to be only of secondary importance, awareness of one's genetic risks on the other hand is claimed to allow people to overcome this 'biological destiny' by re-arranging their personal environment and behaviour. In the words of a leading geneticist, knowledge about genes gives humankind thus a chance to become 'masters of their genes and not to allow themselves to be led by chance.' (Andres Metspalu, Professor of Biotechnology, PM 12/02/00)

On the whole, the advantages arising from the genome project are frequently associated with the medical domain. The completion of such a large-scale genetic database is argued to allow the tracing and identifying of the 'real' causes of illnesses, and to start curing the 'causes', not just treating 'consequences' of diseases. Here the underlying assumption explicitly and repeatedly expressed by geneticists in public has been that *all* diseases are of genetic origin and thus genetically determined (e.g. Andres Metspalu, Professor of Biotechnology, PM 24/05/99, EE 04/11/99). The analysis of genetic data gathered within the EGP are assumed to provide pharmaceutical companies with valuable information for launching new genetically designed medicines that correspond to one's specific genetic make-up, and also to enable geneticists and medical scientists to elaborate more precise methods of diagnostics and more effective treatment.

Here appeals have been made to health as a common value, suggesting that it is people themselves who are interested in better diagnostics and treatment – because 'until a man lives, he wants to do it as long and as healthily as possible'. From the medical perspective, the project has therefore been characterised as a 'project of hope' for thousands of people who have incurable diseases. However, the crucial questions when individuals can come to enjoy the benefits of the promised individualised medicines, as well as whether these will be equally available to everyone have remained largely unaddressed by geneticists and representatives of the EGP. Instead, there have been given simplistic promises like 'whenever new medicines are launched, Estonians will be the first ones to use them.'

Besides individual benefits, the proponents of the genome project have laid even stronger emphasis on common values and profits arising from the EGP. Thus, with one's personal participation individuals are argued to give a 'contribution to the future' and for the benefit of offspring:

Our generation won't get direct personal benefit of the Genome Project. What we get, is the knowledge that we help our children and grandchildren. (Jaanus Pikani, Head of the Clinics of University of Tartu, (EPL 14/10/99)

The Genome Project is an opportunity for anyone to participate in the creation of future, to give one's contribution to the development of Estonia as well as to reaching to revolutionary discoveries in the international world of science. (Rain Eensaar, Project Manager of the Genome Project Foundation, PM 27/02/01)

In addition to scientific and medical benefits, the project is seen to produce economic profits and raise the general living standard by contributing to the development of high technology, attracting foreign investments and creating new jobs, especially for domestic biomedical specialists. Similar economic arguments, for example, have also been used to support the establishment of Icelandic database (Palsson and Hardardottir 2002).

The modernist ethos is also reflected in the depiction of the EGP as a certain 'project of enlightenment', providing people with knowledge of genetics and human nature. According to the more or less implicitly shared assumption, scepticism or resistance to the genome project and geneticists' efforts can be explained primarily

by ignorance or lack of ('sufficient') knowledge. Thus it is supposed that 'informing' people about genetics and the principles of the project will help them to 'understand' the 'true' purposes of the venture. As such, this rationale reflects a traditional understanding underlying the communication of science that a more educated and informed public will be more positive about scientific research and technological developments (Hamstra 2000, Glasner 2002).

6.3. Risks constructed in the press

While the EGP has been largely promoted in public by appeals to common benefits, the project has been contested and criticised largely from an individual's point of view, drawing attention to the possible risks and moral choices accompanying with the personal participation in the project and knowledge of one's genetic data.

In the Estonian context, issues of privacy and confidentiality have evoked perhaps most anxiety in relation to the genome project. One of the most frequently perceived risks concerns the security of the database and the protection of personal genetic data. Here the caution can be also explained by a broader concern for the storage of personal data caused by various publicly known instances of the misuse or leakage of personal data.

Table 2. Alleged risks arising from biotechnology and EGP in particular

Personal risks	Common risks
<ul style="list-style-type: none"> • Personal health and genetic data collected within EGP are not sufficiently protected in the database and may be misused for various aims. • In society new forms of discrimination based on one's genetic data, e.g. by insurance companies and employers may appear. • Awareness of one's genetic risks may cause an individual psychological stress and worsen his/ her quality of life. • The provisions concerning personal genetic counselling within EGP are not sufficient. • A genetic risk diagnosed in a person may not actually develop into disease. • A person diagnosed with a particular genetic risk may not actually receive necessary treatment. • Parents whose unborn child is diagnosed a risk for hereditary disease may experience social pressure towards abortion. 	<ul style="list-style-type: none"> • EGP is financed at the expense of general public health care and other scientific research. • The scientific reasoning underlying the establishment of EGP and the promised scientific and medical value of the project are questionable. • The ethical aspects concerning human genetic research and genetic databases have not been considered sufficiently within EGP. • The task of collecting gene donors' phenotype information and blood samples will put an additional burden on family doctors whose everyday duties may thus be neglected. • Extra payment for collecting gene donors' phenotype information and blood samples may tempt family doctors to exert pressure on people to participate in the genome project. • The genetic data gathered within EGP can be misused for various aims, including genetic manipulation.

Table 2 continued

Personal risks	Common risks
<ul style="list-style-type: none"> • Gene donors do not have the chance to quit the project should they so wish and let their data to be removed from the data bank (unless a misuse of their genetic data is identified). • The new medicines corresponding to one's personal genetic pattern may not be available for everyone and may therefore lead to new forms of social injustice and inequality. 	<ul style="list-style-type: none"> • The genetic data gathered within EGP will be used primarily for commercial rather than for scientific purposes. • With the EGP, tendencies to explain human nature and behaviour primarily through biology and genes may appear. • The knowledge of genetic causes of various diseases does not necessarily imply knowledge about how to cure these diseases.

According to Palsson and Hardardottir, protection of personal information has appeared to be a highly sensitive issue also in Icelandic public discourse (Palsson and Hardardottir 2002). In relation to the concerns for privacy, fears have been expressed in Estonia about the emergence of new forms of discrimination based on one's genetic risks, e.g. by insurance companies and employers. The representatives of the EGP have usually repelled these fears by simply referring to the legal regulation of the genome bank that forbids the misuse of genetic data, as well as discrimination of individuals either for participation or non-participation in the genome bank.

Given the specifics of the EGP where gene donors are granted the possibility of receiving feedback in the form of a personal 'gene card' including one's genetic information, critics have expressed strong anxieties about individual capability to cope with the knowledge about the genetic risks of one's own or their offspring. Instead of expecting people to behave in a strictly rational manner, philosophers and medical scientists have pointed at the risks arising from a person's awareness, such as psychological stress or social pressure exerted to parents whose (unborn) child has been identified as having a risk to a genetic disorder. In this respect, the provisions concerning genetic counselling within the EGP are claimed to be insufficient. Although concerns about the various implications accompanying the personal feedback provided to gene donors have been raised since the beginning of the debate, they have largely escaped notice or received ambiguous responses by the representatives of the EGP.

Here, a common response has been, again, a mere reference to the law, according to which a gene donor is also entitled to *the right not to know* his or her genetic data, shifting in this way the responsibility for knowledge largely to the individuals themselves. Thus, when it comes to the establishment of the genome bank, the geneticists furthering the implementation of the project strongly assert *the right to know* one's genetic data in order to gain control over one's life-course and genetic risks, while with respect to the possible distress caused by the genetic self-awareness, the decision to know is seen to be rather a matter of individual choice and responsibility, as there always remains the possibility *not to know*.

Likewise, the tacit link established between more precise and effective methods of genetic diagnostic on the one hand, and better treatment on the other has been

questioned by critics, since from an individual's perspective the former do not necessarily lead to the latter as new genetically designed medicines may not be equally available to everyone and thus lead to new forms of social injustice.

The 'independent' geneticists and medical scientists have also contested the scientific and medical reasoning of the project, including the enforcement of genetic determinism.⁵ Tiina Tasmuth, Professor of Medical Sciences at the Pedagogical University, has for example been consistently questioning the scientific and medical value of such a large-scale genetic testing and research envisioned within the EGP. Most of the criticism has, nevertheless, addressed the commercial aspects of the project, rather than the assumptions underlying the formulated objectives of the EGP.

6. Discussion

As the study reveals, the Estonian media coverage provides rather contrasting images of the national genome bank. Whereas the Estonian Genome Project has been represented by its initiators and proponents primarily as a medical and scientific project, leading to better methods of diagnostics and treatment, and consequently contributing to public and personal health-care, critics have regarded the project rather as a business enterprise, serving the commercial interests of geneticists involved in the EGP and biomedical experts related to the local biotechnological enterprises.

With respect to the various benefits promised from the national genome bank, it remains to be asked to what extent the advantages and personal benefits asserted by the creators of the EGP in public can be seen to be reliable and consistent. For example, the promise to provide gene donors with a personal 'gene card', which turns out to be one of the main incentives for individuals to participate in the project (see Korts 2004), has remained highly ambiguous with respect to details concerning form and content of the genetic information included in the card, as well as how and to which extent the information can be interpreted either by gene donors or genetic counsellors. As Petersen argues, the fact that genetic information is highly complex and difficult to interpret, appearing to be perhaps more confusing rather than helping, has not been sufficiently recognised in the scientific and health promotion literature (Petersen 1998:65). In the Estonian public debate, the capacity of gene technology to provide explanations about the causes of various diseases has similarly been seldom contested. Furthermore, the initial promises to provide gene donors with personal feedback have been 'temporarily' left aside at the stage of the pilot project, as it is not finally clear when the genetic data gathered within the genome project will be analysed.

However, besides arguments about its medical and scientific advantages, or commercial nature of the gene bank, in public the EGP has acquired an image of a

⁵ With respect to scientific argumentation of the genome project, see for more detail Tiia Hallap (2004) in the current issue.

national project. In order to attract the public interest, the creators of the EGP have related the public representation of the genome bank effectively with the broader discourses of Estonia's post-communist transition and construction of new identities. Here the former positive reception and experience in the fields of information and telecommunication technologies, as well as the strong support towards the development of new technologies in society by the Estonian government have definitely provided in a certain sense a favourable context for the introduction of biotechnology. For instance, according to the program "Estonian Strategy for Research and Development 2002–2006" launched by the Estonian Government, information technologies, biomedicine and material technologies are defined as the key areas of research and public financing. Labelling the national gene bank as the Estonian Nokia has made it possible to make the project commonly meaningful and socially relevant. The public discourse of the EGP thus epitomises how a national identity is being envisioned and constituted through a techno-scientific project, and how the latter is represented and largely legitimated by appeals to a national self-image.

Similar observations have also been made in the Icelandic context, where domestic discourse on the genome bank has called upon nationally meaningful phenomena and sense of commonness, e.g. by establishing parallels between the databank and national fisheries, or evoking the significance of genetically bounded citizenship of the country based on the continuity with the Viking past. As Pálsson and Hardardóttir argue, both supporters and opponents of the Icelandic database have appeared to be informed by 'deeper' cultural and political considerations; and the public support of the project cannot be separated from a specific local history and the nationalistic discourse of Icelanders, emphasising the uniqueness of the Icelandic biological and cultural heritage (Pálsson and Hardardóttir 2002:281; 282).

On the whole, the Estonian media coverage, however, provides a contrast to the Icelandic debate over the foundation of the national gene bank, in which negative or critical opinions, especially by physicians, professional writers and scholars, have dominated in the public discourse (see Pálsson and Hardardóttir 2002). Both the range of the argumentation, groups involved in the public debate as well as the amount of the material published in the Estonian press allow one to conclude that the foundation of the EGP has drawn relatively less attention and consideration in public than in the case of Iceland where establishment of a similar population-based genetic databank has been accompanied by vivid and extensive debates in public (*ibid.*).

In the Estonian context, the journalistic reporting has to a great extent followed the rhetoric and assumptions introduced by the proponents of the EGP, contributing in this way to the reproduction of the 'optimistic' images of genetics and gene technology suggested by geneticists, rather than examining critically the assumptions underlying the argumentation of different social groups involved in the public debate over the risks and benefits of the genome project.

Critical issues regarding the role the media in the communication of science and introduction of new technologies in society that remain open to debate involve thus the questions to what extent journalists are acknowledging the changing role and interests of science and scientists in society, including the commercialisation of science and the influence of public relations on science communication; whether biotechnology and -sciences are conceived and treated as fields exclusively limited to 'expert opinions', or as spheres that concern closely and personally various social groups; and how a particular socio-cultural context affects the introduction and acceptance of new technologies in society. As the current study revealed, these issues turn out to be highly relevant and problematic also with respect to the biotechnology and expanding biomedical research.

Acknowledgements

This study has been completed within ELSAGEN (Ethical, Legal and Social Aspects of Human Genetic Databases) research project financed within the 5th Framework Program of European Commission. The author is very grateful to the colleagues participating in ELSAGEN and NORFA (Nordic Academy for Advanced Studies) networks for commenting the earlier versions of the manuscript.

Address:

Piia Tammpuu
Centre for Ethics
University of Tartu
Ülikooli 18
50090 Tartu
Estonia

Tel.: +372 7375 427

E-mail: tammpuu@hotmail.ee

References

- Adam, Barbara and Joost van Loon (2000) "Introduction: Repositioning Risk; the Challenge for Social Theory". In *The Risk Society and Beyond*. B. Adam, U. Beck and J. van Loon, eds. 1–31, Sage Publications.
- Anderson, Alison (2002) "In search of the Holy Grail: Media Discourse and the New Human Genetics". *New Genetics and Society* 21, 3, 327–337.
- Bauer, Martin (2000) "'Science in the media' as a Cultural Indicator: Contextualising Surveys with Media Analysis". In *Between Understanding and Trust. The Public, Science and Technology*. Meinolf Dierkes and Claudia von Grote, eds. 157–178, Harwood Academic Publishers.
- Beck, Ulrich (1999) *World Risk Society*. Polity Press.
- Beck-Gernsheim, Elizabeth (2000) "Health and Responsibility: From Social Change to Technological Change and Vice Versa". In *The Risk Society and Beyond*. B. Adam, U. Beck and J. van Loon, eds. 122–135, Sage Publications.

- Condit, Celeste (2001) "What Is 'Public Opinion' about Genetics?" *Nature Reviews* 2, October, 811–815.
- Condit, Celeste M (1999) *The Meanings of the Gene: Public Debates about Human Hereditary*. The University of Wisconsin Press.
- Conrad, Peter and Jonathan Gabe (1999) "Introduction: Sociological Perspectives on the New Genetics: an Overview". *Sociology of Health and Illness* 21, 5, 505–516.
- Cunningham-Burley, Sarah and Anne Kerr (1999) "The New Genetics: Risks and Boundaries". *Health, Risk and Society* 1, 3, 249–252.
- Delanty, Gerard (2002) "Constructivism, Sociology and the New Genetics". *New Genetics and Society* 21, 3, 279–289.
- Fairclough, Norman (1992) *Discourse and Social Change*. Polity Press.
- Felt, Ulrike (2000) "Why Should the Public 'Understand' Science? A Historical Perspectives on Aspects of the Public Understanding of Science". In *Between Understanding and Trust. The Public, Science and Technology*. Meinolf Dierkes and Claudia von Grote, eds. 7–37, Harwood Academic Publishers.
- Fletcher, Amy L (2002) "Mapping Its Future: The Estonian Genome Project and the Politics of Identity". In *Beyond Boundaries: Challenges of Leadership, Innovation, Integration, and Technology. International Conference on June 25-29, 2002 Rome, Italy. Readings Book*. Nejdjet Delener and Chiang-nan Chao, eds. 371–377, Global Business and Technology Association.
- Glasner, Peter (2002) "Beyond the Genome: Reconstituting the New Genetics". *New Genetics and Society* 21, 3, 267–337.
- Gutteling, Jan M., Anna Olofsson, Björn Fjaestad, Matthias Kohring, Alexander Görke, Martin Bauer and Timo Rusanen (2002) "Media Coverage 1973-1996: Trends and Dynamics". In *Biotechnology – The Making of Global Controversy*. Martin W. Bauer and George Gaskell, eds. 95–128, Cambridge University Press.
- Görke, Aleksander, Matthias Kohring and Georg Ruhmann (2000) "Gentechnologie in der Presse". *Publizistik* 45, 1, 20–37.
- Habermas, Jürgen (2003) *The Future of Human Nature*. Polity Press.
- Hallap, Tiiu (2004) "Science Communication and Science Policy: Estonian Media Discourse on the Genetic Database Project". See in the current issue.
- Hampel, Jürgen and Ortwin Renn (2000) "Introduction: Public Understanding of Genetic Engineering". *New Genetics and Society* 19, 3, 221–231.
- Hoyer, Klaus (2003) "Conflicting Notions of Personhood in Genetic Research". *Anthropology Today* 18, 5, 9–13.
- Jallinoja, Piia (2002) *Genetics, Negotiated Ethics and the Ambiguities of Moral Choices*. Academic Dissertation, National Public Health Institute & University of Helsinki, Publications of the National Public Health Institute.
- Jäger, Siegfried (2001) "Discourse and Knowledge: Theoretical and Methodological Aspects of a Critical Discourse and Dispositive Analysis". In *Methods of Critical Discourse Analysis*. R. Wodak and M. Meyer, eds. Sage Publications.
- Kerr, Anne, Sarah Cunningham-Burley and Amanda Amos (1997) "The New Genetics: Professionals' Discursive Boundaries". *The Sociological Review* 35, 2, 279–303.
- Kohring, Matthias and Aleksander Görke (2000) "Genetic Engineering in the International Media: An Analysis of Opinion-Leading Magazines". *New Genetics and Society* 19, 3, 234–363.
- Korts, Külliki (2004) "Public Acceptance of Estonian Genome Project". See in the current issue.
- Lewenstein, Bruce V. (1995) "Science and the Media". In *Handbook of Science and Technology Studies*. S. Jasanoff, G. E. Markle, J. C. Petersen and T. Pinch, eds. 343–360, Sage Publications.
- Nelkin, Dorothy (2001) "Molecular Metaphors: the Gene in Popular Discourse." *Nature Reviews* 2, July, 555–559.
- Pallson, Gisli and Kristin E. Hardardottir (2002) "For Whom the Cell Tolls: Debates about Biomedicine". *Current Anthropology* 43, 2, 271–301.

- Pallson, Gisli and Paul Rabinow (2001) "The Icelandic Genome Debate". *TRENDS in Biotechnology* 19, 5, 166–171.
- Petersen, Alan. (2001) "Biofantasies: Genetics and Medicine in the Print News Media". *Social Science and Medicine* 1, 52, 1255–1268.
- Petersen, Alan (1998) "The New Genetics and the Politics of Public Health". *Critical Public Health* 8, 1, 59–71.
- Rose, Hilary (2000) "Risk, Trust and Scepticism in the Age of the New Genetics". In *The Risk Society and Beyond*. B. Adam, U. Beck and J. van Loon, eds. 63–77, Sage Publications.
- Rothman, Barbara K. (1998) *Genetic Maps and Human Imaginations. The Limits of Science in Understanding Who We Are*. W.W. Norton & Company.
- Schenk, Michael and Deziderio Šonj (2000) "Journalists and Genetic Engineering". *New Genetics and Society* 19, 3, 331–343.
- Van Dijck, José (1998) *Imagination: Popular Images of Genetics*. The New York University Press.
- Von Wartburg, Walter P. and Julien Liew (1999) *Gene Technology and Social Acceptance*. University Press of America.
- Wynne, Brian (1995) "Public Understanding of Science". In *Handbook of Science and Technology Studies*. S. Jasanhoff, G.E. Markle, J.C. Petersen and T. Pinch, eds. 361–388, Sage Publications.
- Wagner, Wolfgang, Nicole Kronberg, Nick Allum, Suzanne de Cheveigné, Carmen Diego, George Gaskell, Marcus Heinben, Cees Midden, Marianne Odgaard, Susanna Öhman, Bianca Rizzo, Timo Rusanen and Angeliki Stathopoulou (2002) "Pandora's Genes – Images of Genes and Nature". In *Biotechnology – The Making of Global Controversy*. Martin W. Bauer and George Gaskell, eds. 95–128, Cambridge University Press.