

In God's kitchen all sciences were mixed

Current trends in nanobioethics

Interview with Dr Mira Marcus Kalish, Tel Aviv University, Israel

Ineke Malsch, date interview 04-03-2010, publication date 19-03-2010

Abstract

Dr Mira Marcus-Kalish has participated in several EU projects on bionanotechnology. She is an interdisciplinary researcher combining engineering, mathematics and biology. Her aim is to stimulate truly multidisciplinary cooperation in nanobiotechnology including natural as well as social sciences and humanities. Relating to the whole human body as one system including the "mind" effects in healthcare and avoiding abuse of nanobiotechnology are her main concerns.

Under the header of Nanobioethics, ObservatoryNano aims to highlight technological and economic trends in nanotechnology for health, medical, biotechnological and agrifood applications with potential ethical and social implications. Simultaneously, current debates on relevant issues in nanobioethics among ethicists and social scientists, policy making circles and stakeholders are analysed and confronted with the issues emerging from the technical and economic trends. This way, emerging issues not discussed sufficiently can be identified and brought to the attention of policy makers in the second annual report on nanobio ethics to be published online in the spring of 2010. The series of interviews with opinion leaders is intended to be a compilation of different views on the relevant issues currently in debate from the perspective of a social scientist, an entrepreneur, an ethicist and now finally a natural scientist.

Ineke Malsch: What are the main issues in nanobioethics currently in debate?

Mira Marcus-Kalish: I see two big issues. The first is the "Mind" Effect, as broad as we define it. Until today, even in systems biology we usually relate to the whole body without always taking into account the brain and especially excluding parts of its activity- the "mind". We currently don't do it in drug delivery nor in other medical treatments. If you administer medication to the liver, to knockout an enzyme, for example, there might be a big influence on the rest of the body including the mind, followed by various reaction, but nobody understands it. We understand something about endorphins and about auto-immune systems, but we don't analyse effects on the whole body, such as bypass, mind effects like mode of beliefs, etc. What is the mind beyond chemicals and electronics? If we know more about the whole body reaction, we can develop better fitted medication, focused with higher efficacy.

Ineke Malsch: Do you mean neurological effects on the mind or cultural or psychological aspects?

Mira Marcus-Kalish: Both. We don't combine the insights and know how from different disciplines enough. The neurological and physiological knowledge, and the medical and brain research experience are still separated in many cases and not integrated enough in others. If pharmaceutical companies develop a new medication, they don't, or can't afford to evaluate in clinical trials environmental or cultural issues, depressions, or other issues that may affect immune reactions. We invest so much in all the preclinical and clinical tests and trials to get FDA approval and then when it's out there in the market, it is still only effective in 30% of patients. Why is that? We talk so much about personalised medicine, but it is not out there yet.

Ineke Malsch: Should we go for personalised medicine?

Mira Marcus-Kalish: It is part of it. We should go even further out to cultural factors, like people who believe more or less in medication, guided affective imagery or tribes who believe in a specific person who could heal them with or without medication. There are also many environmental influences. It is not only genetics. All these factors have an integrative effect in my opinion. We are investing a lot of efforts and have understood and learned so much, but we are still not very far in understanding regenerative medicine for restoring body tissues and organs.

Diagnostics and sensors could be abused?

There are several issues in nanobioethics that could be abused. One main issue, for example, is related to diagnostics and sensors. We use a lot of MRI and similar imaging and other equipment for identifying local health problems like plaques. But these things could be abused for other purposes than diagnostics. If I enable such imaging on my head, others can see that a specific area of the brain is lightening up when I am reacting to something or imagining it. This could be used so that others can know what I am thinking even if I am trying to hide it.

Ineke Malsch: Is the current legislation adequate to deal with that?

Mira Marcus-Kalish: No. We have some real big problems in control and prevention of abuse on the one hand and better healthcare services on the other hand. All these big tools like MRI and fMRI to help people and provide better diagnosis could so easily be abused. In the psychology and

medicine research departments we are investigating the localisation in the brain which reacts to doing rather than not doing something. Even if you are developing it for very good reasons it could be abused. It could be utilized to know what I am thinking. The current legislation is not dealing with that at all. All what was done to affect ones motivation or behaviour without advanced equipment could be done today even further down and more effective.

Ineke Malsch: Which issues are caused by a lack of scientific insight into ethical, legal or social aspects? What can ethicists, philosophers and social scientists contribute to the discussion on these issues?

Mira Marcus-Kalish: The lack of shared scientific insight among disciplines works both ways. First, because ethicists are not involved in basic science we lack their possible contribution. We underestimate the cultural effects, the role of beliefs and alike as well as the possible control. If we fully understand the hearing system for example, why don't we create people who can hear even better than we used to? That is called going beyond nature. This shouldn't be done according to my personal opinion. But unless we involve ethicists, we will go there. Or why shouldn't I be able to see at night? I think this development should be stopped for common human usage. I don't mean military night vision lenses. That is fine as far as it is not integrated into the human body.

There are also some economic issues. What are the priorities in research funding? I am not speaking about basic sciences. Are we providing equal opportunities to all diseases and people? Finally, a major issue is genetic therapy. This could be abused. It could help us cure people with a particular genetic background. Genetic modification could get further than we want, e.g. build nice blonde people rather than cure disease. If I know that all people with a particular genetic background are sensitive to a particular substance I could hurt them by targeting their weakness. So in these kinds of applications of nanobiotechnology I want to make sure it is not abused or used in an unethical way. I want to dedicate more money to curing people with specific genetic profiles.

So in my opinion ethicists should be part of basic science: first in order to be part of and contribute to the research and second to learn and be able to distinguish between safe and harmful, good or dangerous.

Ineke Malsch: How can you prevent military from using something that has been developed for medical applications?

Mira Marcus-Kalish: I wouldn't put it like that. As Altmann¹ said in his book, we need homeland security. We need to protect ourselves. It should

¹ Altmann, Jürgen, "Military Nanotechnology; Potential Applications and Preventive Arms Control", in Contemporary Security Studies, Routledge, Oxon, 2006

be well observed, well controlled and not abused. I am more concerned about societal abuse than military.

Ineke Malsch: How could it be abused in society? People improving themselves like in cosmetic surgery?

Mira Marcus-Kalish: That is a low-level abuse. The high level abuse is if people want only a blonde child or a genius or to control something else, e.g. to improve human performance or selection beyond nature. On a basic level, to use resources that are intended to benefit everybody to benefit a particular group in society.

Ineke Malsch: Which other issues are caused by conflicts of interests between groups in society? What is the role of politicians and civil society in addressing these issues?

Mira Marcus-Kalish: Naturalists or people in favour of alternative medicine or holistic therapy have their own agenda and interests. The collaboration between them and medical research and pharmaceutical companies is very important. If I make you think that you can be cured by using this plant or by not eating meat, or by following a specific guru, there is a gap of knowledge and a conflict of interest that we have to bridge. Neither of these groups have God's secret in its hands. Collaboration, integration, knowledge transfer and cross borders could benefit all.

Ineke Malsch: Is that an actual problem related to nanomedicine?

Mira Marcus-Kalish: Yes. If some naturalists say that imaging technology used to check your stomach for cancer is abusing your body, it is nanomedicine. They are against it and make you believe that if you go to a guru or eat something you will be cured. Both sides should talk to each other. Traditional medicine must become more open to the holistic approach and the naturalists must open the window to basic research or traditional medicine.

Another conflict of interest is related to controlling and prevention of basic research and exposing research results to society as a whole. There are many interests involved including big Pharma, government and the people. In Israel, representatives of the government participate in research consortia. We have a lot of discussions about how to avoid benefiting one societal group at the expense of another. Governmental groups help to disseminate information and provide best practices to everybody. For example, all medical insurance and companies that provide most of the medical care in Israel include in their board naturalist representatives. They integrate holistic therapy and alternative therapy in their hospitals. That should be done in basic research as well. Such people from all disciplines will have to be involved from the basic research phase. Once we reach the nano-era sociologists, ethicists and naturalists should be involved and understand all procedures or they will be against any

nanoparticle without really knowing what is toxic or not and what could be absorbed by the body with no harm, and what not, just like what happened in the GMO debate.

The stakeholder dialogue organised by the European Commission is very important, but not enough. Stakeholders sometimes don't reach the deep understanding. We are now building basic courses bridging biology and philosophy, or biology and psychology. That is to provide students with some basic tools for understanding and to encourage them to be involved in multidisciplinary research. To understand what is dangerous or what could modify natural behaviour. To let philosophers and social scientists be involved in basic science as listeners or contributors. I am trying to make it happen in Tel Aviv University a meeting place converging humanities, science and technology. Our philosophers are getting very active. It is a new era and it is very interesting to them as well as to all other parties from life sciences, engineering, medicine, etc.

Ineke Malsch: you mentioned a role for insurance companies and providers. Is there also a role for politicians?

Mira Marcus-Kalish: Politicians have a huge power in setting a prioritized agenda and accordingly providing resources, funds, publicity, etc. Thus they should be involved in responsible knowledge dissemination. Be sure that everything that is developed will be disseminated and translated to everyone who is interested. Politicians should encourage involvement of social scientists and philosophers in basic research projects in their funding policies. The politicians are also those responsible for the control and regulations to prevent abuse.

Ineke Malsch: Are politicians aware enough about nanotechnology?

Mira Marcus-Kalish: No. That is why I am on top of it. I think it is the responsibility of scientists to inform politicians. We have to disseminate and translate what we know and explain to the politicians and public that our future depends on progress in science. There is not enough interest in the media. There are not enough scientists who could be translators or popularizers. The scientific culture is a barrier. There is a gap between the science willing to disseminate to the public and the media ability and interest to spread the scientific facts and achievements. More than that, there are still language barriers in between scientific areas, and it is much harder to make it clear and coherent to the public and politicians. Some may get their information on nano-medicine from the internet, but there is a lot of misleading information.

As such, in Medicine, the doctor is still seen as an authority by many patients. But in most cases the doctor has a lack of knowledge about nanotechnology; we should develop tools to translate this information.

It should be much stronger than the recommendations from the recent report of the NanoMed Roundtable.²

Ineke Malsch: What role can the European Commission code of conduct for responsible nanotechnology research play in governing nanobiotechnology?

Mira Marcus-Kalish: The EC code should cover all nanotechnologies area including nanobiotechnology. The EC should encourage interdisciplinary and multidisciplinary cooperation including natural sciences as well as social sciences and philosophy. The EU evaluation and regulation is a very important issue. One important measure could be to stipulate that certain disciplines should be involved in research projects to qualify for funding. There was an article in Nature called "The molecular naked people". Once we reach this level that all is known about our molecular body, we have to be sure that everything is aimed at our well-being, to improve our quality of life and not go beyond that. Not to make better people. The guardians are the ethicist, social sciences as well as economists. How can we avoid risks and target benefits for society?

Ineke Malsch: At which level should new regulatory measures be taken (national, EU, global)?

Mira Marcus-Kalish: It should start at national level and then contracts should be made between countries, continents and especially the EU. It should start with groups, who are organised nationally in a bottom up process, and at the same time a top down process lead by the EU governance.

Ineke Malsch: Do you think there are applications of nanobiotechnologies which should be stimulated more than they are now for ethical reasons?

Mira Marcus-Kalish: Treating the public health, societal and environmental issues. Environmental and societal issues which could benefit equally the society as a whole and not just private people should be stimulated. Dissemination on a broad and multi level should really be encouraged.

Ineke Malsch: How do you see your own role in the developments and discussions?

Mira Marcus-Kalish: I am a middle-man based on my broad background. I have studied computer science, engineering, mathematics and biology. There are still language barriers even between these areas. I can be a kind of concept and language translator between the groups. Looking into the future, the universities will have to change their structure towards

² <http://www.nanomedroundtable.org/node/101>

flexible education and research programs, especially in higher degrees. Universities should encourage multidisciplinary modes of research while transferring of tools and know how between various area, as we see it happening locally today. It may foster scientific research, innovation and reduce redundancy in tools developments.

In God's kitchen, the almighty didn't start with chemistry and than moved to physics and so on. He put it all together. God is in the optimal refinement and synergy of all parties.

We have to reach this point. The special role for ethicists and social scientists is to be part of this perspective. I am willing to participate.

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Role in debate on nanotechnology, ethics and society:	

Relevant recent publication and projects

Marcus-Kalish, Mira, "Converging Technologies for the European Knowledge Society," in Rip, Arie, Wils, Jean-Pierre, Nordmann, Alfred, Malsch, Ineke and Quesada, Maria Angeles (eds.) "Ethics of Nanotechnology and Converging Technologies", Ethicschool e-learning DVD, 2009

Nano2Life, <http://www.nano2life.org/>

EuroNanoBio, <http://www.euronanobio.eu/>

ReNaChip, <http://www.renachip.org/>

About ObservatoryNano

The observatoryNANO project is funded under FP7 for four years from April 1st 2008. Its primary aim is to support European decision-makers with information and analysis on developments in nanoscience and nanotechnology (N&N). It will collate and analyse data regarding scientific and technological (ST) trends (including peer-reviewed publications, patents, roadmaps, and published company data) and economic realities and expectations (including market analysis and economic performance, public and private funding strategies). The ST and economic analysis will be further supported by assessment of ethical and societal aspects,

impacts on environment, health and safety, as well as developments in regulation and standardisation. Although much of this work will be performed within the consortium, the project is working cooperatively with other initiatives to ensure that effort is not duplicated and that resource sharing and output are maximised. To date liaisons have been established with international organisations including the EPO, OECD, and ISO, and will continue to be established with other relevant organisations such as European Technology Platforms (ETPs), ERA NETs, and other EUfunded projects.

The observatoryNANO project is led by the Institute of Nanotechnology (IoN) (UK), and includes: VDI Technologiezentrum (DE), Commissariat à l'énergie atomique (CEA) (FR), Institute of Occupational Medicine (IOM) (UK), Malsch TechnoValuation (MTV) (NL), triple innova (DE), Spinverse (FI), Bax and Willems Consulting Venturing (B&W) (ES), Dutch National Institute for Public Health and the Environment (RIVM) (NL), Technical University of Darmstadt (TUD) (DE), Associazione Italiana per la Ricerca Industriale (AIRI) (IT), Nano and Micro Technology Consulting (NMTC) (DE), Swiss Federal Laboratories for Materials Testing and Research (EMPA) (CH), University of Aarhus (DK), MERIT - Universiteit Maastricht (NL), Technology Centre AS CR (CR).

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www.observatorynano.org

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