Medicine of the Person
64th International Meeting
25th- 28th July 2012
F – SANCEY-LE-LONG

Conference 1

Dr Bernard RÜEDI (CH)
26/07/2012
Translation: Kathy WEBB-PEPLOE

Biotechnology : A challenge for the survival of the people of tomorrow ?

Nowadays, we can only be happy about the remarkable progress of medical technology, particularly in the fields of surgery and medical imaging. Nonetheless, up until now, the purpose of medicine was to prevent and correct as much as possible, the weaknesses of the human body, but today there is also the possibility of bettering the performance of a so called 'normal' person and of building 'improved human beings' with new capabilities. "More intelligent, happier and more beautiful thanks to medicine" was the title of a recent symposium of the Swiss Academy of Science. Is that now the role of medicine? Should we be pleased or worried about it?

We will see that this is not about fantasy or science fiction, but about research and achievements which are already in very advanced state, whose potential is huge and, as with all things, could have positive or negative consequences. What will be the effects on the people of tomorrow, not just our patients, but also our descendants?

As introduction, I would like to quote the provocative proposal of Ray Kurzweil, whose forecasts made over the last twenty years, have proven about 90% correct.

"In the next 25 years, there will be more progress than in the previous 20,000 years. We will succeed in creating beings that are not just intelligent, but also with a higher state of consciousness than human beings : new beings who will possess all the constituents of an individual, not just his knowledge or his wisdom, but also his emotions and spirituality. Is it necessary to be a biological organism to be alive?"

"What in fact, are we? Just data, within a body that is only the supporting hardware. Our biological cells renew themselves every 2 years. That which endures, right from childhood, is the data. And now, finally, we will be able to separate that data from its supporting infrastructure and recreate it in another form. The day will come, when we will be able to regenerate ourselves indefinitely. It will be a bit like changing your computer: you will keep your data and transfer it; we will each be able to keep our personality, our intelligence, our emotions, our spiritual life safe forever."

What a wonderful point of view, to know that, soon, we will be able to be saved onto a hard disk!

We will start with an overview of various developments happening today, following these apparently unrealistic predictions, which seem irrelevant to us.

Prostheses: We are currently already incorporating non-organic material into human beings, in the form of prosthetic joints, vessels, valves, ocular lenses, even artificial arms and legs, creating thus, cyborgs (cybernetic organisms). A frontier has been crossed in the use of cochlear implants, where there is a functioning connection between electronic equipment and the CNS of the patient, allowing a deaf person to hear, sometime to hear better than other healthy people of the same age. Imperceptibly, and without realising the consequences, we have progressed from correcting a deficiency to improving the normal functioning of a person.

It is also possible to interact non-invasively with certain areas of the brain, by recording their electrical activity, similar to the recording of an EEG. By analysing the signals emitted during certain actions or thoughts, it is possible to move a computer mouse or drive a wheelchair, just by thinking about it.

One can also insert intracerebral implants and by stimulating certain zones of the brain, identified by functional cerebral imaging, suppress tremor and rigidity in Parkinson 's disease and treat certain dystonia's, obsessional illness and even depression.

The part of the brain called the amygdala is an important relay in the sensation of fear and it would appear that it is possible to free patients from traumatic memories that are constantly assailing them, or to send back to battle soldiers disabled by fear or the memory of acts that they cannot forget. One could also modify a painful memory, even cause one to remember it as amusing or pleasant, when in fact, this was not the case.

To sum up, it is possible to influence the presentation of certain illnesses by acting on certain areas of the brain, identified by neuro-imaging, just as it is possible to provoke certain emotions or diverse sensations sometimes completely independently from the relational or environmental conditions which would normally generate those feelings.

At Reading University, Kevin Warwick connected his median nerve by 100 tiny electrodes to a computer. Thus he could command at a distance the movement of a robot hand and in turn feel the objects that the robot touched. Connected to his wife via an analogue device, he can exchange with her certain sensory inputs which while rudimentary are nonetheless real.

Kevin Warwick maintains that a lot of time is wasted having to transform a thought or emotion into spoken language, and then stimulating the auditory receptors of someone else by speaking, who then in turn has to integrate and interpret in their brain, the received information. Interpersonal communication could be hugely simplified and sped up, and one could even contemplate networking numerous brains, as one does with several computers. This is the ambition of the "Global Brain Group" which within which the "Global Brain Project" aims to build the global brain of a super-being, at a planetary level.

Kevin Warwick also connected his brain to an ultrasound device, similar to that of a bat, and he can sense the presence of objects in the dark. Looking to the future, he envisages making each person sensitive to new inputs, for example, infra-red, ultra-violet or radio wave.

He says *"This type of technology has huge economic potential, but there are also ethical questions that we need to take account of. For example, an individual whose brain is part human and part machine could have capabilities considerably greater than the individual with just a human brain. Would such a being have different moral and ethical values and what would be the consequences of this, for society?"*

Gene therapy: It has proven possible to modify the genetic profile of a mouse and incorporate the human gene for colour vision, allowing the mouse to distinguish red from green. A sow has been created whose tongue becomes luminescent when she is exposed to infrared rays, and she gave birth to piglets that had the same properties. A new race of animals has been created endowed with properties they did not possess before.

The biology of synthesis is the science of creating a new being by using synthetic strands of DNA to make new proteins. Already the American biologist Craig Venter has created an artificial chromosome, the first step towards creating an artificial life-form. He copied the essential pieces of DNA from those of the bacterium *Mycoplasma genitalium* and baptised his new bacterium *Mycoplasma laboratorium*, which led him to say:

"We are passing from the reading of the genetic code to the ability to write it. This gives us the hypothetical possibility of doing things we could never previously have imagined."

At Tokyo University, researchers have succeeded in introducing two new bases S and Y as well as ATGC into the DNA of the bacteria E. coli, and have thus endowed it with a genetic heritage which has nothing to do with that of any other living creature on the planet and have produced a protein unknown in nature. Some talk of a new creation, with new rules that authorise the creation of living creatures which have never seen the light of day before. The consequence of such research is truly impossible to predict.

And finally, very near to us in Rotterdam, the team of Ron Fouchier has just created a mutant version of the flu virus H5N1, which is no longer only transmissible to man by an animal, but could or will be transmitted by aerosol from man to man. Another team in the US seems to have come up with similar results.

Fearing widespread dissemination of the virus or its use by a terrorist organization, the American National Society Advisory Board for Biosecurity(NSABB) has asked the journals 'Science' and 'Nature' not to reveal immediately all the details of the articles which have been submitted to them. People differ in their opinions about this and for the moment the debate remains active.

The analysis of the genetic profile of an individual should allow the development of "predictive genetics", to reveal the factors which lead to an increased risk of developing certain diseases during one's lifetime, and to develop strategies to prevent them or to select out certain individuals. *"I think that in the future, we will sequence the genome of everyone as they are born"* Professor Stylianos Antonarakis declared in an interview. He is the director of the new Institute of Genetics and Genomics at the University of Geneva. *"Analysing one's genome will allow us to know the illnesses we are prone to as well as personality traits such as aggression, megalomania or skill in mathematics but also it will influence the choices we make in life : choice of career, spouse, whether to have children. After that, the decision to know the result or not will remain a very personal one. But, in my opinion, it is a way of having more control over the direction of one's life."*

The risk of trisomy (Down's syndrome) is already looked at systematically during pregnancy and if it is confirmed it is viewed as 'morally acceptable' to abort the foetus, and the same applies to certain neuromuscular diseases which lead to a premature death. But what should we do if we are considering the

risk of developing diabetes, cardiovascular disease, Alzheimer's disease or certain cancers, where the disease may or may not manifest itself depending on a number of possible risk factors? Should we apply generally the principle of prevention or run the risk of developing the disease in the hope that preventative measures or future effective treatments will deal with it if it becomes necessary?

This medicalization of life, with regular check-ups from childhood, the wish to know at an early stage the statistics for multiple risk factors which for the most part will result in no harm now or in the future, make each one of us into someone who could potentially become ill at any time.

But, thankfully, biotechnology is actively engaged in attempting to **delay if not postpone ageing indefinitely.**

In *"The Fantastic Voyage ; Live long enough to live for ever"*, published by *Ray Kurzweil* and *Terry Grossman*, the founder of the *"Frontier Medical Center"* at Denver, a clinic to prolong life and which promotes anti-ageing strategies, the authors explain how to use every available resource to stay alive until anti-ageing and rejuvenating therapies become available in under 20 years : first a healthy life, then several 10's of vitamin and hormone pills etc. per day and genetic analysis to better predict the risk of future disease.

At the moment, anti-ageing therapies are aiming, for example, to incorporate telomerase into the human genome. This is the enzyme which repairs telomeres broken as the cell divides in cancerous cells. The work is advancing and it is already possible to prolong by a factor of 5 the life of a certain worm.

In contrast, and more encouragingly**, research on stem cells** whether embryonic or obtained by the dedifferentiation of cells such as fibroblasts should permit the regeneration of tissue, even an entire organ. We still need to take into account the fact that cultured stem cells develop mutations and the fear is that certain of these could turn out to be oncogenes.

As we survey this panorama of the future, we shouldn't forget **the nanotechnologies**, which deal with building 'objects', atom by atom, to create '*nanobots*', nanoscopic living entities which can circulate in a being like blood cells, sending messages to other nanobots, delivering medication to the area where it is needed, destroying specific cells, as do white cells and even reproducing themselves. Their beneficial potential is huge, but so also is their largely unpredictable side-effects, particularly if their multiplication is not perfectly controlled.

Finally, let us return to the assertion of Ray Kurzweil, convinced that it will soon be possible to download the entire psychological content of the brain onto a hard-drive (Mind Downloading). This would not only include one's entire memories, but also their emotional and spiritual associations, with the ability to feel them and express them. The identity of an individual would therefore reside in their software, which could be copied and saved onto a new hard-drive, a real artificial brain, and so their 'amortality' if not their immortality would be assured by means of repeatedly backing up.

Artificial brains: given that it is possible to interface the human brain with non-organic material, it must also be possible to guide these robots with biological, but artificial brains. This is how K. Warwick equipped little robots with a mini-brain obtained by culturing rat neurones, linked to sensors and the robots rapidly learned to walk around on their own!

In the same vein, cultured animal neurones or artificial neurones can learn to recognise a face they have never seen before in the same way that a biological brain does. For example, a group of 20,000 cultured mouse neurones, learned certain rules which allowed the control of the trim of an aeroplane on a flight simulator.

At Kyoto, the ATR laboratory *(Advanced Telecommunications Research)* has built an artificial brain consisting of millions of neurones. This represents only 1% of the neurones of a brain, but as they work millions of times faster, their capacity for work will be 1000 times better than that of a human brain. The director of the ATR project plans to teach it the human language so that it can read, at an electronic speed, all the writing present on the internet, so that he can develop an automatic capture of knowledge.

Closer to home, the *'Blue Brain Project'* was started in 2002 at EPFL (Ecole Polytechnique Federale de Lausanne) in association with IBM, which made available to them its *'Blue Gene'* supercomputer. The plan was to reconstitute the cortex of a rat brain, a "typical brain unit" made up of 10,000 neurones with all their interconnexions, to simulate and then study both normal and pathological functioning of the brain. In 2008 the cortex was completed and nowadays articles are circulating about it.

The new aim is now the *'Human Brain Project'*, which has united 90 institutions from 22 countries and is hoping to receive European funding to the tune of 1 thousand million Euros over 10 years!

Nonetheless, all these developments raise several questions: can an artificial brain be conscious of self? Apparently it could be. 'Consciousness is the ability to have a subjective experience of a sensation and the ability to be aware of self', a logical process which replies and reacts to itself. In principle, we are told, it would be sufficient to create a programme which contained a version of itself, reacting and replying to its own method of working, for it to be conscious of self. Having acquired the ability to reflect about itself, it should also have the capacity to evolve.

But consciousness is not simply a logical process. We usually call *"conscience"* a mentally constructed and interpreted awareness of that reality, of which we in fact only perceive some aspects which in no way represent a true image of its real nature. One can certainly imagine that this mental process corresponds to the expression of a logical computerised process, but at the same time as this perceptive conscience there is also "complete consciousness", on which it is based and which doesn't elaborate any mental construct of reality, but simply experiences our relationship to it in the here and now. This subjective experience of complete consciousness seems very difficult, if not impossible to computerise.

To complete the picture let us consider the **artificial uterus** which, they tell us, will completely liberate women from the inconvenience of pregnancy and will put her on an equal footing (as far as availability is concerned) with man: a sperm and an egg, in vitro fertilisation, selection of an embryo and the development of the foetus in an artificial uterus. When will it happen? In animal studies, it has already proven possible to develop a goat until term, and she lived for a month. But already, the plan is to study this in man: trials with defective embryos have already been undertaken in the US, but they were interrupted by numerous demonstrations and objections.

Through these few examples, we can see that considerable efforts have been made throughout the world to develop biotechnology, and large sums of money have been invested in this. Is it sensible? Are we taking into account the importance of the potential risks as well as the evident benefits?

Let us move on to some more questions that this raises:

Is there any justification for improving a human faculty that, at present, is considered to be "normal"?

This question in fact leads us to consider whether evolution has produced the best model in the man of today? Or should man, as his duty or his mission, be seeking to further this process by means of biotechnology thanks to the intelligence and the liberty available, a conviction which many scientists share already?

Let us be provocative: If one admits that evolution is the outcome of a divine process, having culminated in man, gifted with intelligence and the freedom which allow him to work on his genome and extend his intelligence, is it not man's duty to make the most of it? Would God not thus have designed him to collaborate in the pursuit of His project?

Until now, evolution has happened based on natural selection, so should it now progress on a basis of rational selection? Yet again, it is difficult to establish a limit. Natural selection favoured the survival of the fittest, but, these days, medicine has sidestepped this rule by allowing individuals with chronic diseases that used to be fatal to survive and have children, and no-one is sorry that this is happening. Would it be any 'worse (?)' to make people who are well or who have survived a little bit better?

Yes, people aver that no-one will be obliged to avail themselves of the technology, if the application of predictive medicine makes it possible to improve mankind, but the risk remains that the man who is normal today will end up being handicapped in the world of tomorrow; less economically competitive, considered to have been responsible for his choice. His freedom to choose will be but a pseudo-liberty.

As for eugenics, it will appear again, wearing a different guise compared to events in our not so distant history, under the name of "rational selection", chosen by the individual for his descendants or encouraged by certain institutions such as insurance companies, for example.

What attitude should we have to "anti-ageing medicine"?

The ultimate aim of all this biotechnology is to push the limits of what is possible, humanly speaking, with the attempt, whether openly admitted or not, to attain immortality. It has certainly always existed in myths and in science fiction, but these days it is also proclaimed by scientists, who are proposing eternal life.

Put another way by J-P Dupuy "*For life to make sense, we need to accept it is finite and also that it is shaped by chance."* Without random chance, there is no why! If life is not finite, we have no need to reproduce; life becomes static and stops altogether.

We must not confuse this "*a-mortality" which* the suppression of ageing promises us, with 'immortality' and eternal life, which is not an interminable existence which would carry on or would only start after death. Instead it is a love relationship, alive and personal, with the Divine first, and then as a natural consequence with others, starting already now and in every moment, in other words outside time, in eternity. "*Eternal life is to know You, the one True God"*, in other words, You, Love Itself, already here and now!

In addition, while it is certainly the duty of medicine to combat the suffering that can be linked to ageing, so that mankind can remain as well as possible right up to the point of his death, this does not imply the suppression of all the functional losses linked to age, which can offer the opportunity to discover other fulfilling activities and can also prepare the person for that which is often presented as the "great loss". We need to remember the words of St Paul, it "is a gain for me" for in freeing me from the constraints of time, it gives me access to the full knowledge of what is real and true.

And we can ask ourselves other questions:

- Is it ethical to cultivate human neurons in order to build artificial biological brains to incorporate them into robots, or is it just a pseudo-scientific game without any future?
- Is it ethical to work towards a universal brain, as in the "Global Brain Project"?

- Is it reasonable to imagine pregnancies in an artificial uterus, celebrating the fact that it can result in a real equality between men and women? What about the very important relationship between a mother and her foetus? Are we going to replace it by recordings of songs sung by the mother?

In the future **should we be limiting the scope of study of the research scientists?**

We have already seen this question raised with the production in Holland of the variant of the flu virus H5N1, capable of being transmitted by aerosol. This limitation is illusory, for the same research could happen elsewhere and in this example, has already happened in the US.

We can't put a brake on scientific advances or censor some of them, but we could and should take up the responsibility of providing limits for the scientists to make them aware of their responsibilities, of the possible consequences of their research and how it is being developed.

Scientific research aims to find solutions to particular problems. Viewed in this light, while one could predict that a particular solution would be associated with minimal risk but have dramatic consequences if put into practice, would it not be sensible to look for another solution so there is no danger of being responsible for a risky product? In other words, should one not offer evidence of an "enlightened catastrophism", as proposed by J-P Dupuy? Not satisfied with one solution, but analysing all possible solutions and continuing one's research aiming for the solution which seems the least risky. And during this process, mankind also needs to remember with humility that his knowledge will always remain limited and that, sometimes, even though he thinks he is doing the right thing and finding the best solution, he will overlook certain regrettable consequences of his actions. His guiding principle could be: Stay vigilant without losing sight of the spiritual aspects of the situation.

What would be the identity of the better man? Stuffed with prostheses and microchips, more intelligent and crafty, stronger, more handsome; would he know how to take advantage of these qualities to also improve his relationship with others? With others who risk appearing to him more a 'thing' than a 'you'! if, as fears Guillebaud *"A concept of conscience being purely a data set will take the place of man with his interior life, and the individual will be reduced to a simple "difference in data set". A man without an interior life is a man who is disarmed, prey to all sorts of manipulation."* What can we do to make sure that the 'better man' remains a person?

He needs to renounce everything which aims to achieve a-mortality, accept his limits, stop wanting to define and control everything rationally, rejoice in the strokes of luck which can bring the unexpected and make sense of his life, and he will discover that chance can sometimes have hidden within it a purpose, since, as said A. Einstein ; "*Chance is God walking around incognito."*

And what then of "La Medecine de la Personne" in this context of biotechnology? Paul Tournier himself, more than 40 years ago, brought to our attention the associated risks; "*We are immersed in this world of "one". We are all the sheep of our technical and rational civilisation. Our school, university, professional and social training all condition us to be objective. If our two world views are complementary, that of the heart lags well behind that of the intelligence."*

The future is very much "our affair", as we determine today the outcome for future generations. If man manages to stay human, to keep and deepen his relationship and his link to the divine, he will, one hopes, guide the advances in biotechnology in the spirit of his Creator, advances which will therefore not only improve the well-being of mankind, but also that of all sensing beings. Let us not lose hope; let us have faith in the power of Love, the only power able to arrive at harmony in the world.