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In The Wrong Movie

The reputable ETH* plant biologist Ingo Potrykus on Greenpeace and the witch hunt against genetic engineering

* ETH = Swiss Federal Institute of Technology, Zurich

Interview: Roger Köppel and Finn Canonica

Pictures: Isabel Truniger

Opposition against plant genetic engineering is getting fiercer. Environmental organisations, ethics groups, consumer protectionists and other organisations bet on primordial fears of Dr Mabuse clad in white and conducting murderous experiments in his lab. Travelling lecturers like the US critic Jeremy Rifkin have been considerably gaining ground in the struggle for the attention of an ever more insecure audience. Since nobody has so far succeeded in furnishing scientifically tenable evidence of any negative impacts of genetic engineering - i.e. to date neither animals nor humans have demonstrably suffered injury from genetically modified plants or foods - opponents are mainly working with bleak forecasts for the future and risk projections, leading to a situation where science has to prove its innocence under increasingly difficult conditions. In Switzerland there is the Kafkaesque scenario that experiments that might help exonerate genetic engineering are rarely realised, because the laws that make them possible in the first place are interpreted with growing severity under the pressure of genetic engineering opponents. ETH researchers are shrugging their shoulders, voice indignation or resign themselves to the situation. Rumour has it that thinking is no longer permitted either.

One of the most vigorous critics of genetic engineering critics is Ingo Potrykus, plant biologist and professor emeritus of the ETH, who has developed the so-called vitamin A rice in a greenhouse outside Zurich that would resist a hand grenade attack. This genetically engineered crop is to solve one of the biggest nutrition problems in developing countries, namely iron and vitamin A deficiency which causes every year the death of one to two million children and blindness in hundreds of thousands of cases. Together with his partner Peter Beyer (University of Freiburg), Potrykus engineered a rice crop with substances that the body synthesises to vitamin A. Experts believe the 'Golden Rice' to be a wonder cure able to fight more diseases and sufferings than any other drug in the history of mankind, so Charles Arntzen of Cornell University. For this reason Potrykus developed the new rice applying strictly non-commercial criteria for free use by small farmers in Third World countries. The scientist's relations with industry are limited to agreements granting companies, in exchange for the free release of the Golden Rice in developing countries, the commercial rights of use in the industrial world (there is very little in it for Potrykus). It took over two years to fully settle the patent rights but in mid-January the rice was handed over to the public as a gift in a symbolic ceremony in Manila. Currently over 20 research institutes worldwide are testing how to cross the rice with local varieties. Regardless of the potentially beneficial effects of the Golden Rice genetic engineering opponents are preparing to make a stand against it, headed by the 'protest multi' Greenpeace. With no proof whatsoever being supplied, it is claimed that the rice is either worthless, harmful or superfluous, demanding the global food problem to be solved by a redistribution of all foodstuffs available.

Obviously there cannot be what must not be - which is that companies and scientists for once make a more sustainable contribution to development in the Third World than the protest lobby which sits on its high horse of morality and criticises and judges while now as in the past millions of children die from vitamin A deficiency.

Potrykus received hate mail and was threatened in case the rice would be released. He implied to the 'New York Times' that he was sometimes worried about his safety. In a long essay published in the 'Frankfurter Allgemeine', the former ETH professor criticised the 'hidden motives' of his opponents who spread the absurd rumour that this genetically engineered rice causes hair loss and impotence: 'These critics do anything to prevent the distribution of the Golden Rice to farmers striving for self-sufficiency. Such a thing might be acceptable in rich countries where people can have a carefree life also without genetic engineering. But it is intolerable in countries where it is a matter of life or death (...)' In the United States Potrykus, who appears in public with a modesty close to shyness, is fêted as a visionary and the great hope of an unjustly maligned technology. The 'Time Magazine' put him on the cover of its US edition but did not do so in Europe for fear of the militant opposition genetic engineering encounters in our latitudes. The 'New Yorker', the 'New York Times' and the 'Financial Times' praised Potrykus's rice as an invention that points the way to the future. Meanwhile also US TV stations have contacted the German scientist who has received numerous offers to continue his career at an elite university stateside. In Zurich the plant biologist's merits, who himself suffered from malnutrition in Germany after the war, are underrated with a restraint that is typical of the city of Zwingli. Since his retirement Potrykus has no longer his own office at the ETH. At least he was allowed to keep the front doorkey, and his successor enables him to continue his work at a small scale for some time.

Interview with Ingo Potrykus,

Professor Potrykus, after 10 years of research you are holding the solution to one of the most pressing medical problems of humankind in your hands. All the same, in the eyes of many you are the prototype of the evil genetic engineer.

Opposition to genetic engineering is nothing new in Switzerland, it goes back to the early 80ies. Probably some members of the successful anti-Kaiseraugust movement* have found a worthwhile field of activity here. In any case, I was faced right from the start with organised protest structures.

*Note: this refers to anti-nuclear power plant activities

Was there ever a matter-of-fact approach in the discussion on genetic engineering?

In my experience the discussion was highly emotional from the beginning. There was opposition also at the ETH, for example from a group that would have liked to have a chair of bio-agriculture. The conflict was bound to break out when we wanted new laboratories to start a modern research institute and needed the room occupied by the herbariums in the agronomy building. In response the ETH and Zurich university decided to merge their herbariums in order to save space. Unsurprisingly my genetic engineering research did not find much sympathy after that. On the other hand, from the first moment I was strongly supported by the university's management and my colleagues.

Were you ever physically attacked?

No. Most problems arose when I tried to initiate a discussion with the students of the department of environmental natural sciences. There was a group of students who vehemently opposed my research activities without having any knowledge of the facts. I was shouted down more than once, and the general atmosphere was almost comparable with that in the time of the inquisition.

What were the reactions in the general public? Your discovery is not only a scientific sensation, it is also an important contribution to the fight against hunger and malnutrition.

Well - I received much hate mail over the internet, especially after it became quite clear that the Golden Rice was to come. I was warned not to distribute rice seeds in developing countries or I would have to suffer dire consequences.

Did you need special protection for your laboratories?

Due to the large number of threats I sometimes needed to involve the ETH's security service who advised us how to protect our research work from attacks by opponents. This problem also goes back a long way; the university's management decided as early as in 1988 to construct our new greenhouse as a high security building - not only in terms of biological safety but also to resist attack. I should think that there is no comparable greenhouse anywhere in the world.

Are the Swiss genetic engineering opponents more militant than others?

The genetic engineering opponents in Switzerland are militant but I am happy to say that they restrain themselves in the use of violence. The extreme opposition to genetic engineering

seemed to me over many years mainly a phenomenon of the German-speaking countries, linked with a romantic concept of nature. Surprisingly this mental attitude has been spreading over the past few years also in other nations. Despite this experience I was amazed that my rice research met with so much hostility, because I am convinced that the Golden Rice is a perfect example of how genetic engineering can be applied to improve farming in the Third World and to fight hunger and malnutrition.

Probably this is what you also told your opponents at Greenpeace.

Here in Zurich I spoke for over six hours with the head of the Greenpeace campaign, Benedikt Haerlin. At the end of our meeting I was under the impression that this important representative of the anti-genetic engineering lobby was taking a more factual attitude. However finally Haerlin said that all my statements sounded very well but Greenpeace opposed genetic engineering as a matter of principle.

Why?

I think genetic engineering is an ideal issue for Greenpeace to instrumentalise latent fears. It seems likely that Greenpeace cannot afford to compromise in this issue, because then the organisation would lose clout. If Haerlin strayed only one inch from the official line, he would most probably have to find himself a new job. I know of one concrete case where the spokesperson of an environmental organisation had to resign after this person realised that radical opposition to genetic engineering rather harmed than benefited the cause of the organisation.

According to Greenpeace and other NGOs, hunger and malnutrition are a redistribution problem.

If we were able to equally distribute all foodstuffs available worldwide, nobody would have to starve. But this is utopic. If an equal distribution is the objective, the easiest way to implement it is in the form of money. Then everyone could buy what he or she needs. Unfortunately not even the resources and climatic conditions for agricultural production offer such a degree of equality that optimal farming is possible in all countries. The utopia of a redistribution involves the risk of the search for feasible solutions being abandoned.

Why are you against this utopia?

At the moment sufficient quantities of food are produced for the current population. But we witness an incessant population growth. In roughly 30 or 40 years there will be 3 billion people more on our planet. It is imperative to increase food production in the Third World in order to prevent future disastrous famines. As everybody knows we have three food production systems: oceans, pastures and arable lands. Over the last 30 years we have considerably improved the productivity of these systems. That was the basis for the so-called green revolution which has fed 2 billion additional people. But now we have come to a point where the oceans must be managed with great care; their potential is exhausted. This is true also for pastures. Yields cannot go up any further. More food can come only from arable lands. Therefore good use must be made of all available strategies to improve agricultural yields, both in terms of quantity and quality. This is not only about the lack of calories, it is also about the lack of certain vitamins such as vitamin A, and trace elements for example iron and zinc.

Industrial countries could simply distribute vitamin A tablets.

This is exactly what they are already doing. To my knowledge WHO, the World Health Organisation, invests annually 100 million dollars in distributing vitamin A. All the same, every year 500,000 children go blind due to vitamin A deficiency. Handing out tablets free of charge does not solve the problem, because there are no infrastructures for their distribution and helpers cannot reach many needy persons. Therefore Greenpeace thinks that building roads is more useful than giving a chance to the Golden Rice.

One of the main arguments of genetic engineering opponents targets patenting. They say that with patents biotech companies use 'life' belonging to all humans to enrich themselves in an arrogant manner.

I am not happy with the patenting situation either, but there is no point in dreaming of a patent-free utopia. And it is barely understandable why no patents should be granted in biotechnology when all other forms of intellectual property are patentable. If we want to fight hunger effectively we must face reality and strive for - and not against - a fair use of patents. It is a fact that we were only able to develop our rice just because there are patents. Many of the technologies we resorted to were only publicly accessible because inventors had their rights protected by patents and without this form of protection a large number of the technologies we used would have been kept secret. Therefore we should focus on the question how to apply the knowledge we have to the benefit of the poor.

Greenpeace claims that genetically modified plants contain new unknown proteins that might trigger allergies.

Needless to say that all conceivable risks including allergic reactions were studied before we released our rice to farmers and consumers. There are standards and rules for transgenic materials which have successfully prevented anyone from coming to harm. Nevertheless, it is surprising that allergies were never an issue in connection with other foods. For example: With the import of kiwis, which have an immense allergenic potential, thousands of new proteins were 'released' onto the population. Also biologically daring crossbreeds such as nectarines are nothing but a mobilisation of a large number of genes between different organisms. Here it is hard to see the difference to transgenic plants.

And what about the horror scenario of outside genes in plants that transfer to microorganisms in the soil and turn them, for example, into killer bacteria?

Where 'horizontal gene transfer' is concerned, I supervised in the mid-nineties a doctoral thesis which closely looked into this question under optimal conditions. Probably no more informative series of experiments has been conducted to this day. The outcome of the study is that 'horizontal gene transfer' - to the extent that it takes place at all - is so rare that it is not verifiable by way of experimentation. The likelihood of a horizontal transfer is almost null. And if, contrary to all expectation, such a transfer occurred the consequences would depend on what gene is transferred. Since we have not worked on the Golden Rice with pathogenic genes even our opponents have a lot of trouble to come up with a concrete risk.

Greenpeace fears that pollen of new genetically engineered plants, such as the Golden Rice, might be carried away by wind and pollinate other plants which subsequently mutate into hard to control weeds.

Rice pollen flies over a distance of not more than a few centimetres. Theoretically hybridisation with other plants cannot be fully excluded but we should not forget that we have worked with genes that are perfectly safe to humans and the environment. Provitamin A and the genes needed for it have been part of our food since the beginnings of humankind. Every green plant has the genes for this metabolic process so there is not the slightest basis neither for any ecological advantage nor for any risk to the biosphere due to the Golden Rice.

But is it not objectionable that genetic engineers, so-to-speak, join together what was not joined together by nature? For example, the thought of frog genes in strawberries is rather irritating.

I am not aware of anyone who wants to transfer a frog gene to strawberries, whatever his purpose may be. Quite naturally the spontaneous reaction is invariably that such an idea it is absurd and unnecessary. But this does not mean that the use of animal genes in plants should be generally rejected. We would like to have more provitamin A in the Golden Rice, and one of the conceivable strategies to get it is to transform provitamin A into vitamin A. Only animals can do this so that we might have to use an animal gene. Since we as biologists view genes as neutral information, this would be 'biologically' thinkable. I realise that we would encounter acceptance problems.

What is the very worst that could happen in the cultivation of such plants? What could be the worst case scenario in genetic engineering?

I have often tried to discuss with scientists and Greenpeace people what the worst case scenario in connection with the Golden Rice could realistically look like. So far they still owe me an answer. Is it not remarkable that for 20 years worst case scenarios have been widely described whilst genetic engineering has been used worldwide for 25 years without harming anyone? I think that with this wealth of experience no other technology comes up to such high safety standards. We could count ourselves lucky if all the other technologies we use daily without even thinking about them came close to genetic engineering in terms of safety. The experiences with the Golden Rice suggest that genetic engineering opponents do not so much care about the environment and consumers and hardly about the fight against hunger and malnutrition in the Third World; rather they seem to want a radical war against these new technologies for political reasons.

What do you think are the motives of Greenpeace for this vehement fight against genetic engineering?

I am perfectly aware that many idealists are active for Greenpeace. I am thinking of those who get in rubber dinghies to stop whaling or risk their lives to draw attention to adverse ecological situations. But there is also the other face of Greenpeace. It is a tightly run organisation whose main objective is to motivate with spectacular actions the largest possible number of people to donate money. And those who donate money probably think of the idealists. At present Greenpeace has annually between 120 and 130 million dollars at its disposal.

Is the critic of big business also a big business-style organisation?

Greenpeace has no doubt many characteristics of the so much demonised 'multinationals'. The large political success of Greenpeace is due to the paradox that Greenpeace knows how to live the image of a modern Robin Hood.

Do you see Greenpeace rather as Robin Hood's opponent, the Sheriff of Nottingham?

The Greenpeace activists are so appealing to many, because they assume with near perfection the role of upright people who bravely fight for a good cause. Greenpeace has managed to become established as the outstanding moral authority and to exert political power on this basis.

This is a serious reproach. Do you have any examples?

There was a revealing scene on television where the arrogance with which Greenpeace makes politics became quite obvious. In connection with an action on "genefoods" the spokesman of Greenpeace said, and I quote him word for word: 'All we have to do is say <bo!> and they all do what we want them to do.'

Consequently PR managers of the big food companies should get their training from Greenpeace.

Greenpeace is indeed a PR miracle. I think hardly anybody else has instrumentalised with so much skill subliminal feelings of unease or fear in the general public for own political purposes. When drafting the research plan for the Golden Rice I took into account all points of criticism brought forward by genetic engineering opponents since the mid-eighties, and there is a lot of justified criticism of how genetic engineering is put into practice. But after the Golden Rice had been developed this product was fought at least as vehemently as, for example, insect-resistant maize. Evidently all this is not about finding solutions to concrete problems, the purpose is to generally demonise an entire technology.

Why does nobody dare to start fighting the anti-genetic engineering propaganda of Greenpeace and other NGOs?

I think many have tried but given up, because it is so difficult. Wherever you go, Greenpeace was already there to poison the surroundings with arguments. A little episode from the ETH may suffice: Already 6 years ago we wanted to send rice to the International Rice Research Institute (IRRI) in Manila. One of our students was working for Greenpeace and he managed to gain the confidence of my assistant. At any rate, Greenpeace knew on what date, at what time and by which courier service the rice was to be collected here. Greenpeace stole the rice and put on the usual show on television, with people wearing protective suits and gas masks. Since there was no doubt who had provided Greenpeace with information, we discussed the case with the ETH's management. Finally it was decided not to report the student to the police, and he was allowed to continue his studies. It is not important to me to sue this young man as an individual but the described case highlights Greenpeace's dubious methods and proves that the organisation is rarely called to account for them.

How do you explain that NGOs succeed in demonising and stopping products even before scientific studies are implemented?

One of the most important strategies is certainly to give the impression that genetic engineering is only in the interest of big industry. But this just not true, on the contrary. Genetic engineering could help solve food problems especially in poor countries so that it could give most to those who have almost nothing today. Genetic engineering is mainly in the interest of humans who do not have enough to eat.

Genetic engineering opponents resort to the 'precautionary principle' in research. They demand that all risks be fully excluded.

I do not think that this principle has been observed more strictly in any other technology right from the start. There is not a single biological system where all risks can be fully excluded, and this is true also for bio-farming. It is unfair to demand an absolute freedom from risk for an arbitrarily chosen system. We should evaluate genetic engineering in a balancing consideration of advantages versus possible disadvantages and use established methods - the so-called biosafety assessments - for this purpose. For example, before our rice is released all conceivable risks will be examined. Without anticipating the outcome, I can say already now that there will be hardly any risk worth mentioning. On the other hand we have the possible advantages. The Golden Rice can make a contribution to preventing that every year 500,000 children go blind and millions of mothers die in childbed. Consequently every delay in the practical use of the Golden Rice means that there will be unnecessarily another hundreds of thousands of blind children and dead mothers. What weighs heavier? A possibly still unidentified, indefinable and hypothetical risk or the predictable blindness and deaths of hundreds or thousands of humans in the Third World?

Apart from the hunger problem in the Third World, should not the heretical question be put to our biofarmers whether, in the final analysis, genetic engineering agriculture is an environmentally sounder method than conventional bio-farming?

Objectively nothing speaks against a combination of bio-farming and genetic engineering. The decision against genetic engineering is mainly a marketing decision, because an image that relies on the key word 'natural' is not to be put at stake.

What does the word 'natural' actually mean? In a manner of speaking, is a plant with an outside gene expelled from Paradise?

A biologist's answer to this question is quite easy: There is nothing more natural than genes. Plant breeding and genetic engineering are basically one and the same thing. Radical champions of 'nature' would have to live on grass. None of our cultivated plants, from spelt to cherry and apple trees or potatoes, are indigenous Swiss plants. All of them were brought to Switzerland by our ancestors without the approval of ethics or biosafety commissions. What an incredible ecological risk! In central Europe we have hardly any indigenous plants at all except for forest trees, grass and carrots. Moreover genetic engineering opponents have been successfully painting a picture of farming that ceased to exist a long time ago. But a growing world population cannot be fed with false idylls and noble utopias. Many farmers in developing countries only stick to 'bio-farming' because they are too poor to buy other agricultural inputs. I fail to comprehend why the notion of a child out in the fields all day long and picking weeds but unable to go to school and have a better future is deemed romantic by some.

In this context you were also speaking about neocolonialism.

Just one example: Thailand wants to cultivate the Golden Rice. It is one of the few countries that produces enough rice to export it. Now European rice importers have informed the Thai government they are not willing to buy from Thailand if the country decides to cultivate transgenic rice. In other words, Europeans make the choice if Thailand is allowed to fight

blindness and many other diseases with the help of genetic engineering. This is what I call neocolonialism.

But one could also speak of obscurantism. It is a fact that esoteric approaches have been booming for years in parallel to the hostility toward science.

This is probably a phenomenon of the affluent society. I personally could not care less what others believe in if it was not the Third World that has to suffer the consequences.

Is it not the task of institutions such as the ETH to protect people against this new obscurantism? Why do the important institutions remain silent?

They do not want to find themselves in an exposed position, and I can almost understand them. Pressure from Greenpeace is immense. Even the World Health Organisation treads carefully. I contacted David Clugstone, director of WHO's 'Food and Health' programme, asking him if they would support my rice project. After all, WHO has the official mandate to fight vitamin A and iron deficiency and finances a programme to do so. But the whole thing came to nought. I was under the impression that even WHO was afraid of getting caught up in the machinery of genetic engineering opponents.

Why did the ETH not make a stronger commitment?

Probably the ETH preferred not to seek an eminent role in this discussion.

What consequences will this attitude have? Is this mental climate a risk to Switzerland as a research location?

Yes, unfortunately it is. I can perfectly understand any young scientist who looks for another field of activity. Moreover everyone will ask why one should invest money without being welcome. It is not so much basic research that is in danger but applied research where it is tried to make good use of new findings in solutions to practical problems. A moratorium for the release of transgenic plants is under discussion. There are no sound scientific reasons for such a step but it is hoped to bring a certain bonus for Swiss bio-farmers who could market products from a 'genetic engineering-free zone'. This is understandable, but a moratorium in Switzerland would be the worst possible signal for plans to further develop the Golden Rice as a tool in the fight against blindness and death in developing countries.

Thus a moratorium would mean a step backward in science?

Most certainly at international level. Activities realised here at the ETH rank no doubt among the leading achievements worldwide. Impacts of a moratorium would be devastating and turn Switzerland into the first country in Europe where thinking is no longer permitted as far as genetic engineering is concerned.

A return back to the times before the Enlightenment?

One should wonder whether the Enlightenment has taken place at all.

During the debate, did you never have the feeling of being in the wrong movie?

We are in the wrong movie.

Roger Köppel is editor in chief of the 'Magazin'

(roger.koeppel@dasmagazin.ch)

Finn Canonica is on the editorial staff

(finncanonica@ftnetwork.com)

Isabel Truniger is a freelance photographer in Zurich

(isabeltruniger@hotmail.com)