

Five Easy
Pieces ...Or,
Four Weddings
and a Funeral

Pat Roy Mooney

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A word on the optimism gene: In mid-2001, 277 so-called “disease” genes have been identified as scientists page through the Book of Life made possible earlier in the year with the completion of the first draft map of the human genome. Disease genes are genetically inheritable diseases that with the right circumstances are passed from generation to generation. Once found, some researchers hope that they will either be eradicated through genetic screening and consultation, or wiped away with gene therapy that could forever erase the disputed gene from the human germline. The problem for families and for society is to determine—and to decide who is to determine—when a gene is a “disease” and when it simply makes someone “different”. When a difference is to be celebrated and when it is a problem to be medicated. Were there a gay gene, would we erase it? Were there a black gene, would it be abandoned? Is the solution to our ills genetic cleansing or a better society?

This issue and its answers are the subject of the fifth and final piece of this essay. However, in addressing each of these “five easy pieces”, we come up against the same need. Civil society organizations (CSOs) must retain the optimism gene. When all else fails—when logic says otherwise, we must continue to be optimistic. Though Monsanto or Merck may offer us gene therapy, we must continue to resist. It is possible to look upon history as a series of human and natural disasters that have merely run their course. It is also possible to see within each event the heroic struggles

of the few, and sometimes of the many, who have ameliorated the damage, ended it sooner, and led us into times of peace and opportunity. Dag Hammarskjöld, who was shot down in a plane over the Congo 40 years ago, once said that no one would ever see or acknowledge the wars that did not happen because good people worked effectively and quietly to prevent them. That we are here proves that history is a succession of small victories, not of defeats. What has carried humanity through in the past must carry us onward in the future. Never underestimate the power of the optimism gene.

1. Food Security-The final link in the food chain

Farmers’ rights and the conservation and enhancement of agricultural biodiversity

Background

Civil society organizations launched the political struggle to conserve and utilize plant genetic resources in 1979 when the first efforts were made to have the threat of crop erosion debated at the biennial conference of the Food and Agricultural Organization (FAO) in Rome. At that time, even the most basic political realities were not known. The genetic diversity within the world’s food supply was eroding at about two per cent per annum. By the end of the 1970s, it was estimated that the world had already wiped away three-quarters of its crop breeding options. The culprits were

newly introduced plant varieties through the Green Revolution and industrial agriculture intended to meet the needs of machine harvesting, processor preferences or chemical inputs such as herbicides and fertilizers. It was also not well understood that the North depended heavily on the crop genetic diversity of the South and that the centres of origin and of diversity for the world's most vital crops were all in the Andes, the Horn of Africa, the Fertile Crescent of the Middle East, Southeast Asia and China. Industrial agriculture was wiping out its own base, building the roof with stones from the foundation.

CSOs were concerned about food security, especially the security of the poor in the South. We were also alarmed because the limited scientific efforts underway to collect and preserve the endangered seeds meant a siphoning of the South's botanical heritage into genebanks located in the North or controlled by the North at international agricultural research centres. Compounding this flow, the North was in the process of adopting a form of patent legislation that would allow breeders an exclusive monopoly over their bred varieties. With the market opportunities created by monopoly, CSOs feared that multinational pesticide manufacturers would take over the seed industry to breed varieties that were compatible with their proprietary chemicals.

The struggle against crop genetic erosion and monopoly began with the need to find a global forum for debate. Working closely with Mexico and a handful of other countries such as Nicaragua and Ethiopia, CSOs campaigned for the FAO to establish a high-level permanent commission on genetic resources. We also wanted a treaty to govern the flow of and access to genetic resources between public sector scientists around the world. Thirdly, we wanted a fund to be established that would guarantee the long-term security of the world's genebanks.

In a battle that will be long remembered at the FAO, governments in 1983 did agree to the intergovernmental commission as a political forum for permanent debate. The treaty proposal however, was reduced to a voluntary "undertaking" and the proposed fund was also made voluntary.

Battleground

Nevertheless, the achievements of the early and mid-1980s were a useful building block for other national and international actions. At the urging of governments and industry, CSOs joined in a three-year off-the-record negotiation on the outstanding issues—including intellectual property and corporate concentration issues. If nothing else, the dialogue process stirred additional government interest and support for germplasm conservation. The South especially began to realize the important role it plays with respect to the North's food security. Between 1993 and 1996, the FAO undertook a unique consultative process—proposed and led by CSOs and individuals from CSOs—that culminated in a 150 government conference on and commitment to a global plan of action to conserve and develop crop genetic resources. Governments agreed that their undertaking should be converted into a legally binding treaty and that a funding mechanism should be established that would be mandatory and permanent. In addition, governments accepted CSO demands for Farmers' Rights—a legal concept first proposed in 1985 that was intended to protect farmers from abusive plant "patent" monopolies and guarantee their historic right to save and exchange seeds and to benefit from innovations they wanted.

At five o'clock in the morning of July 1, 2001, the member governments of the FAO Commission adopted the legally binding treaty text. Though far from perfect, the text establishes a mandatory funding mechanism that directly taxes the global seed industry. The national and international recognition of Farmers' Rights—though not good enough—is part of the treaty. Adjacent to the treaty, governments and foundations are establishing an endowment fund to guarantee the security of the world's most important *in situ* and *ex situ* genebanks. Most importantly, perhaps, governments have agreed that 50 of the world's most important food crops—accounting for more than 95 per cent of global per capita food consumption—must remain in the public domain. Companies are not allowed to patent the original material. A future meeting of the treaty's governing body will determine whether or not varieties bred from public materials can be patented.

Grounds for optimism

Melaku Worede, the head of Ethiopia's highly acclaimed national genebank during the famines of the 1970s and 1980s once told the FAO Commission that farmers' crop varieties are the part of biodiversity that we eat. In the quarter-century ahead, optimists can lead the world to not only conserve but to continue the diversification of crops and varieties. In the last quarter century, we have moved from seeing farmers as the passive recipients of the genius of scientists to seeing them as innovative plant breeders themselves. Through Farmers' Rights, our appreciation of the essential role farmers play in ecosystem conservation, and the utilization of new communications technologies, it is possible for us to launch a new era of agricultural discovery. We can move from high-tech to wide-tech.

2. Global Governance—Taking the Cigar from CGIAR

The restructuring of international agricultural research as a lesson in global governance

Background

The Consultative Group on International Agricultural Research (CGIAR) is a unique creature in the intergovernmental world. Its origins trace back to World War II and the establishment of a maize and wheat research program outside of Mexico City by the Rockefeller Foundation. Following the war, the Ford Foundation joined with Rockefeller in expanding the crop research initiative and in creating a parallel program for rice in the Philippines. Together, CIMMYT (the International Maize and Wheat Improvement Centre) in Mexico and IRRI (International Rice Research Institute) in the Philippines developed the semi-dwarf cereals that became the Green Revolution. By 1971, the two foundations felt that the potential of their revolution exceeded their capacity to finance it. Robert McNamara, then President of the World Bank and former President of the Ford Foundation was asked to create a donor consortium that could construct a network of international agricultural research centres

around the developing world. During the 1970s and 1980s, the network grew rapidly from two to eight to 18 centres in the early 1990s. In the mid-1990s, however, the CGIAR was forced to pull back and consolidate into 16 research institutes. It now

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functions with about 8,000 personnel and an annual budget of US\$340 million and is the largest agricultural research system in the world dedicated to crop and livestock improvement in the South. By some reckoning, between two-thirds and three-quarters of the South's cereal production is based upon CGIAR-funded research or CGIAR-bred varieties. Perhaps the CGIAR's greatest treasure, however, is the half million samples of farmers' traditional seeds that it holds in its genebanks. These seeds are both the scientific basis for, and insurance policy of, world food security.

Battleground

Civil society organizations have long been concerned that the Green Revolution launched by the CGIAR a half-century ago created monocultures and undermined local plant breeding. The monocultures, in turn, depended upon increased irrigation and herbicides for their yield improvements. Not that increased yields were not needed—nor that science couldn't play a role—but that biodiversity and local innovation systems were uprooted. The struggle to negotiate with the CGIAR over these issues—and to influence its governance—has not been easy.

In essence, the CGIAR does not exist. It has no legal identity. When it meets (twice yearly until now), it has no rules of procedure and voting is unheard of. Each of the 16 centres has its own separate legal status imbedded in its national headquarters agreement with its host country. The unofficial members of the CGIAR are the 50 plus government aid agencies and foundations that fund the system together, with its co-sponsors: the World Bank, the FAO and the United Nations Development Programme (UNDP). The regional development banks are also members. The secretariat is at the World Bank in Washington, DC.

Given there are no rules, CSOs decided to join in the twice-yearly meetings. Beginning in 1991, CSOs documented the system’s decision-making structures showing that—contrary to CGIAR rhetoric—an ever-increasing majority of the trustees of the 16 centres were coming from the North and that the key posts of centre director-generals, centre chairs, and system committee chairs were overwhelmingly controlled by the North. Identifying 74 key posts within the system, CSOs showed that three-quarters were held by the North and that an “agree-culture” of nationals from four countries, Australia, Canada, the UK and the US, accounted for at least one-third of all important posts in any given year. The CGIAR responded immediately, though sluggishly, to redress these imbalances so that by 1999, more than half of all trustee posts were in the South and half of all government donors (though hardly two per cent of the funding) were in the South.

In 1994, civil society groups expressed alarm that the system’s priceless genebanks were being seen by the World Bank as a bargaining chip with which public science could negotiate patent licenses with private biotech companies. Faced with intense public pressure, the system hurriedly accepted a “trust agreement” with the FAO that placed responsibility for the genebanks under the auspices of the FAO Commission (discussed above). In 2000, when the 16 centres attempted to adopt a policy that would have allowed them to claim intellectual property rights over germplasm bred from material held in-trust with the FAO, CSOs were effective in forcing the policy to be withdrawn and in winning CGIAR adoption of a text written by CSOs that surrendered intellectual property and other germplasm policies directly to the FAO Commission.

While these initiatives have effectively constrained the CGIAR in important areas, an intense debate is now underway regarding the full restructuring of the system. CSOs are collectively proposing that the CGIAR create regional boards in Africa, Asia, Latin America and the Near East. The boards would be composed half from the region and half from other regions. Members would have to include civil society and farmers’ organizations

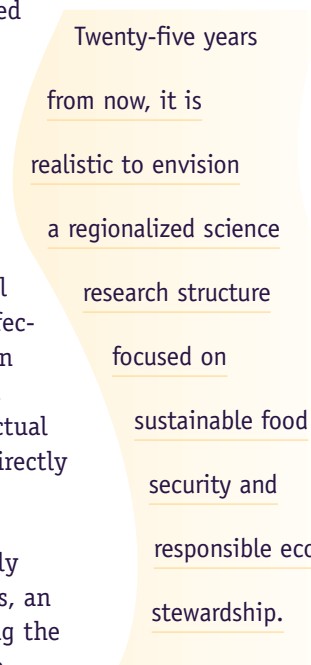
as well as national governments. The funding currently available for each region would remain but the money could be made available to any group or consortium chosen to undertake research deemed important in the region. The 16 centres would—over a ten-year period—cease to exist and become small teams of science-animateurs whose task would be to provide a multi-disciplinary and catalytic approach to regional programs. The research agenda would swing sharply from single crop foci to agro-ecological and natural resource management programs.

Grounds for optimism

Ten years ago, CSOs began their challenge of the CGIAR, confident that the system had to be placed under the flag of the United Nations. Many CSOs also believed that science had little place in food security. Today, few CSOs familiar with the system would want to see it locked inside a UN bureaucracy. Most would agree that science could and should play a support role in improving food security. There is also today an appreciation of the commitment and concern of the scientists engaged in the CGIAR System. The adversarial relationship has somewhat eased on both sides.

Twenty-five years from now, it is realistic to envision a regionalized science research structure focused on sustainable food security and responsible ecosystem stewardship. It is also realistic to work toward the merging of customary community innovation strategies with those of lab scientists. In essence, community innovators produce wide-tech solutions for specific environments while lab science produces narrow-tech options for wider environments.

But a decade of engagement with the CGIAR also points to the role civil society could play in the restructuring of governance within the UN system itself. As much as the CGIAR was an enigma to most just a few short years ago, the omnipotent governance of a UN agency is also misleading. Concerted CSO efforts to monitor decision-making, document governance practices and democratize



election processes could have a profound impact on UN management and leadership with very little effort. Some elements of the CGIAR could and should be applied to the UN system it has tried for 30 years to avoid. Twenty-five years from now, there will be a New Roman Forum of UN agencies, industry, civil society and farmers working collaboratively to debate and develop a global approach to agricultural and rural development—including the toll of scientific research.

3. The right to development?

New enclosures of the mind

The changing role of intellectual property and other monopolies on the development process

Background

The French wanted to patent their roses in the 1920s and the Americans were keen on fruits and flowers in 1930, but it took Adolph Hitler in 1933 to impose the world's first formal patent regime for food crops. The war years saw similar legislation adopted in Austria and the Netherlands. Once accepted, patent monopolies are not easily repealed. Forty years ago in 1961 the first International Convention for Plant Breeders' Rights was adopted in Paris. Four revisions later, Plant Breeders' Rights (the euphemism for plant patenting) has spread from Chile to Canada and from South Africa to Finland.

Opposition to "life patenting" first arose among CSOs in Canada in the late 1970s propelled by a speech by then Agriculture Minister Eugene Whelan who proposed Canadian legislation on the grounds that it would both make Canada more beautiful and feed the hungry. Among the major concerns: once monopoly is granted it is always expanded; once any life form is patented, all life forms are vulnerable; once exclusive rights are given to some, traditional rights are denied to others.

Battleground

Any dispassionate review (or taped replay) of the debates of the late 1970s or early 1980s would conclude that CSOs were deadly accurate in their assessment. From the patenting of flowers and ornamentals in the 1930s, the United States moved to food crops in the 1970s and to microorganisms in 1980 and animals in 1987. Human cell lines of foreign nationals were permitted in the 1990s along with the patenting of specific genes and DNA fragments. There is now no part or particle of living material that is not eligible for patent protection in the US. Rules in Europe and Japan are bending gradually to US interpretations.

Likewise, the monopoly right has also been stretched in terms of years of exclusivity and the "rules of the game" requiring inventiveness, non-obviousness and utility have been brushed aside. Patents have been granted on discovered gene sequences in the human brain found by computer search techniques where the utility has been identified as being proven by the fact that the genes relate to the brain. This has inspired drift net patenting of both rainforests and animal genomes.

Patent regimes have also preyed upon the poor. Farmers' traditional crop varieties and the medicinal plants of indigenous healers have been routinely patented in several countries. Since patents are a matter of national civil law, the poor must defend their rights in American courts where the average cost per litigant is now US\$1.5 million. Although laws are national, the World Trade Organization's (WTO) TRIPS (Trade Related Intellectual Property Rights) chapter and the US trade representative are being used to coerce compliance in countries where the corporation has not even applied for a patent or where national rules would make such a patent unacceptable.

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Tragically, public sector researchers in agriculture and health have often acted as Trojan trade representatives for multinational enterprises by accepting US patents and rules when they work in countries where the patents are non-applicable.

Since the adoption of the TRIPS chapter at the WTO, CSOs have renewed their fight against life patenting with some success. African governments have joined together to publicly condemn the patent system. France, the Netherlands, Denmark and Italy have challenged the European Commission directive widening the scope of life patenting in the European Union (EU). In Sweden, the Ministers of Trade, Justice and Environment have jointly challenged the appropriateness of life patenting. Last year, the FAO Panel of Eminent Ethicists accused the patent system of being out of control and biased against the poor and in favour of biopiracy. The CGIAR called for the intervention of the International Court of Justice and the UN Human Rights Commission to clear the chaos. The Human Rights Commission itself has three times in the past two years attacked life patenting as a threat to the Right to Develop and to food security. Mounting public debate is forcing some rethinking of the patent system, even within the United States. By campaigning against specific patents such as *neem* in India or quinoa in the Andes—and winning—CSOs have repeatedly exposed the usurious nature of the system and caused enormous embarrassment in countries such as the US and Australia.

Grounds for optimism

In mid-2001, a civil society initiative led by the US-based Foundation for Economic Trends won immediate CSO support in over 70 countries with a proposal for a Treaty to Share the Genetic Commons. The one-page treaty effectively bans life patenting and requires that governments and peoples accept that all forms of genetic material must be safeguarded but freely exchanged for the benefit of humanity. The sweeping initiative—which could easily have been dismissed as Pollyannaish—has gained remarkable support in the South among both

governments and indigenous peoples. The treaty is being inserted into the Rio+10 process and is likely to be a major topic in South Africa in September 2002.

The treaty initiative rides upon a growing feeling among many CSOs and some governments that intellectual property regimes are the soft underbelly of global capitalism. The system is so far out of control that even major corporations are losing confidence in its long-term utility. If the changes that have taken place in patent law in the past 25 years are shocking to those who have fought through them, the potential for change in the coming 25 years—for good or ill—cannot be underestimated.

This optimistic note, however, comes with a strong cautionary warning. Patents have been described as “enclosures of the mind”. As surely as the enclosure system in Europe usurped the common lands of the peasants on the eve of the industrial revolution, patents have enclosed the intellectual commons of today. New enclosures are also on the horizon that

could update and replace patents. As the recent debate over the biosafety protocol shows, some new technologies are advancing that pose unprecedented risks for the environment and for human well-being. From this perspective, government safety regulations could be used to enforce technological monopolies at public expense and under criminal law. In addition, a combination of contract law and new satellite and biosensor technologies are already making it possible to minutely monitor farm fields in Spain, Argentina and Australia from satellites.

Inexpensive handheld devices have been patented recently that allow DNA identification within minutes from field to fridge or from parent to offspring. In a world of thousands of commercial competitors, patents play a role as a barrier to entry. In a world of five gene giants, for example, patents are less and less relevant and other tools of monopoly are cheaper and more far-reaching. CSOs must be vigilant to ensure that new enclosures do not replace the old enclosures of the mind.

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4. Underlying causes—from the whole, to parts to particles

The prospects for the poor in the next industrial revolution (nanotechnologies)

Background

The quest for the Philosopher's Stone—or the alchemy that can turn common metals into gold—is common to many cultures. The search for *Eldorado* devastated Latin America and led to the hemorrhaging of wealth and blood from the mines of Potosi to the banks of London. The new alchemy is now at hand and how we handle it over the next 25 years will set the course of the world ever afterward. In 1900, science remembered the laws of genetic inheritance and, with them, revolutionized agriculture. A half-century later, science discovered the properties of DNA and learned that all life forms could be genetically manipulated. In 2000, the mappers of the human genome told us that humans share half their DNA with a roundworm and half with a banana—that the Book of Life has many common chapters regardless of the species involved. In 2001, science may have uncovered the distinction between living and non-living matter.

In a sense, the massive drive toward nanotechnology (material manufacture at the atomic scale of one-billionth of a metre) is just a logical step “down” from gene manipulation to the manipulation of the carbon, hydrogen, oxygen and other atoms that build genes. As strange as it seemed a quarter century ago to contemplate the mixing and matching of genes of different species, 25 years from now it will be commonplace to extract atomic elements from garbage heaps or thin air to build a Big Mac or a Mac computer. As surely as Canadians ate genetically modified foods for dinner last night, nanotechnology (nanotech) will surpass biotechnology in manipulating the material world within ten to 25 years. No aspect of economic life will be left untouched anywhere on the planet as raw materials become universally accessible and energy and production costs become inconsequential.

Battleground

There are four indicators that a new technology is marching remorselessly on the horizon. The first is the

number of scientific citations that appear in the literature. In the case of nanotech, from virtually none in the late 1980s, there are thousands today and the trend line is starting to curve straight up. Second, consider the number of patents. Unlike biotech, nanotech had no patent rules to cross. From the first patent around 1989, a half-dozen or more are now being granted every single day. Third, look at public sector investment in nanotech research. Since 1998, US government investment in the technology has risen from barely US\$100 million to US\$500 million per annum this year. Japanese investment in the public arena is matching US investment dollar for dollar. European Union investment is at about half US and Japanese levels but is now expected to leap forward. Vastly more money is going into nanotech research today than into biotech research in the early 1980s or into the Human Genome Project in the 1990s. The fourth criteria, scope of activities, is perhaps the most remarkable. Twelve different US government departments and agencies have active nanotech research programs underway. Corporate involvement includes both the “nano-nichers” (start-up companies with one foot in academia and the other in venture capital) and “nano-nabobs” (giant multinationals). But the scope of industrial R&D is staggering (Boeing, Exxon, BASF, Toyota, Toshiba, Xerox, IBM), covering every segment of the industrial landscape; nanotech will change everything.

Nanotech's promise of course, is the elimination of want and the eradication of waste. Everyone will be able to afford to have everything and everything we have will be phenomenally strong and durable. Nano-scale construction massively increases the strength of materials. Since it builds from the atom up, there is no waste material. Since it can restructure atoms from garbage, it will help to remove waste. The core (and still elusive) technology, molecular self-assembly, could mean the use of solar energy to manufacture complex materials. All that will be needed is a trash can and a template.

The downside of nanotechnology is equally obvious. Self-replicating matter conjures the legend of the sorcerer's apprentice where an uncontrollable succession of mops and buckets washed away the cottage. The potential for a profound technological error on the level of atoms is truly alarming. Alarming, too, is the

potential for bionic materials where the carbon atoms of living material are fused into the carbon steel of a machine. Beyond the environmental concerns, the sudden development of a manufacturing process that requires almost no raw materials for either agriculture or household goods spells the end of employment as we understand it. Because of the risks involved with nanotech (the peaceful use of the atom once more with feeling?) and—more—because of the need to control the benefits it could create—new forms of government regulation will be necessary (see the previous section). Nano-scale production is already developing grapefruit-size satellites and spider-size robots and aircraft that are incredibly inexpensive to operate. Nanotechnology poses worrisome challenges to the right to dissent and the future of democracy.

To date, the “battle” over the use and abuse of this technology has not been joined. The first ever global meeting of CSOs on nanotechnology was held in Sweden at the end of June 2001. Three regional meetings on nanotech and related developments will be held in Africa, Asia, and Latin America within the year.

Grounds for optimism

It took international civil society organizations almost 15 years—from the late 1970s to the early 1990s—to convince the public that biotechnology posed real concerns to health and the environment. Most of those years were devoted to extending the awareness of CSOs themselves. When nanotech is introduced into any CSO conversation today, the awareness is immediate. Our sense of science and our willingness to perceive that the move downwards from genes to atoms is logical and possible means that we will not easily make the same errors we made in the past. Society too, after Mad Cow disease, tainted blood scandals and genetically modified seed management debacles, has a healthy distrust of government and of scientific independence. Nanotechnology will become a significant topic at the RIO+10 summit next year and it may be possible to establish an International Convention on the Evaluation of New Technologies that will make it possible for science and society to analyze nanotech and

other tools before the risks become too great. Twenty-five years from now, nanotechnology will be a viable, operational technology. Whether it is used in society—and how—will depend upon the actions of CSOs in the intervening years. The potential for utility should not be ignored but the potential for tyranny and destruction should not be underestimated. The optimism gene still dominates—but it is not naïve!

5. Human rights and the Genome Genie

The challenge to the right to dissent in a world of genomic controls and neuroscience manipulation

Background

From the 1930s to the 1970s, the public and private sector pharmaceutical establishment largely sought to develop drugs that would cure or prevent illness. Though heavy-handed and insensitive to traditional systems, some great successes were achieved.

Beginning in the late 1970s, however, the private sector began to turn its attention to a more lucrative market—making well people better. The sick, after all, make poor customers. They might be unemployable and unable to afford expensive treatments. They might die and cease being clients altogether. They might even get better and stop needing medication. Well patients come with no such limitations. They are employed and healthy and they will always want to get better still. There is no upper limit to “betterness”. The one possible limitation is common sense and the fear that our sometimes seemingly insatiable self-indulgence might be constrained by logic or legislation.

Research into human genomics is mapping a route around this problem by allowing companies to turn governments and other employers into proponents of Human

Performance Enhancement (HyPE) drugs and therapies. Today, a huge portion of the pharmaceutical industry’s research is devoted to HyPE developments that citizens will find it difficult or impossible to refuse. The advances are based upon our new knowledge of the

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human genome combined with the equally stunning advances in neurosciences that allow researchers to pinpoint specific genes and techniques that can alter our physical, social and intellectual performance.

Battleground

HyPEs have important industrial and military benefits. Early in 2001, industry studies in the US warned that about one-fifth of all workers in that country are “actively disengaged” from their work place and are costing industry almost US\$300 billion in lost productivity and sabotage. In June 2001, the US National Science Foundation (NSF) publicly endorsed the use of HyPEs for the military—emphasizing the physical attributes that could be achieved, as well as the potential to overcome exhaustion, stress or fear. The NSF study urged close military-industry collaboration on the further development of the neurosciences.

The use of HyPEs to counter obesity (or to restructure a more desirable body shape) is easily understood and the market is huge. But HyPEs also include gene therapies that can “correct” skin colour and racial features or create blonde hair and blue eyes. HyPEs can increase (or decrease) the capacities of any and all of our senses. If sensitivity to smell is contraindicated in a chemicals plant, HyPEs can make the problem go away. If visual or hearing precision is important, it can be enhanced. Biological clocks can be adjusted to manage shift changes or to allow people to work longer hours. Job satisfaction can be improved through pills rather than labour negotiations. The cost of HyPEs can remain with the employee, merely by raising the bar for employment to a level where HyPEs are essential.

The ability to use HyPEs (or reverse HyPEs) or neurosciences to exercise social control is also enormous. Biosensors can now identify testosterone levels (making it possible to seek out gender and age group), as well as specific genetic trait coding for ethnicity. Weapons-grade chemicals can then be designed to target specific population groups while leaving others unaffected. In these instances, military applications are less significant than civil uses to control crowds and monitor dissent. However, the cost-efficient use of such weapons in the South should also not be underestimated.

The use of HyPEs in the years ahead is no less unrealistic than the use of rum in the navy a century ago or the use of gin in the factory about the same time. Unlike alcohol however, HyPEs have an insidious capacity to appeal to almost every segment of society and to surrender power to those who design the neural drugs.

Grounds for optimism

The optimism gene could and should over the next 25 years, turn the four issues discussed earlier from funerals into weddings. Within civil society, we should have the ability to understand and overcome the obstacles in our path. This fifth challenge—because it strikes at the very meaning of being human and our right to decide and dissent, is the most threatening. If in Canada we worry about a two-tiered health system, we must be aware of the possibility of a two-tiered species—those medically or genetically modified to meet certain conditions—and those who are not. Civil society’s responses to health issues have always been sloppy. Our analysis has never been sharp and our actions have always been muted. Unless we are prepared to apply the same tools of analysis to human genomics as we have to understanding agricultural research or multinational corporations or globalization, we will fail. And the first important HyPE will be a therapy for the optimism gene.

Pat Roy Mooney, lives in Winnipeg, Manitoba, Canada where he is the Executive Director of the Action Group on Erosion, Technology and Concentration (ETC Group), formerly known as RAFI. For more than 30 years, he has worked with civil society organisations (CSOs) on international trade and development issues related to agriculture and biodiversity. The author or co-author of several books on the politics of biotechnology and biodiversity, Mooney received The Right Livelihood Award (the “Alternative Nobel Prize”) in the Swedish Parliament and the American “Giraffe Award” given to people “who stick their necks out”. Together with Cary Fowler and Hope Shand, Pat Mooney began working on the “seeds” issue in 1977. In 1984, the three co-founded RAFI (Rural Advancement Foundation International).