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Preventive self-governance

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No field of western society has remained untouched by the events of September 11. Lastly, science and science communication are also bearing the consequences. During the annual meeting of the American Association for the Advancement of Science in Denver, Colorado, on February 15, 2003, the major international scientific magazines, faced with the bioterrorism alarm and the fear of seeing important information fall in the wrong hands, announced their intention to resort to an unprecedented security measure: preventive self-governance.[1] They consider the *Statement on Scientific Publication and Security* as a manifesto of the sense of responsibility that the scientific community feels about global terror. In part four, after recalling the 9/11tragedy, the 32 publishers, scientific associations and scientists who signed the *Statement* (among which also the directors of *Nature* and *Science*) stated that "On occasion an editor may conclude that the potential harm of publication outweighs the potential societal benefits. Under such circumstances, the paper should be modified, or not be published ".[2]

[1] American Association for the Advancement of Science, *World's leading journal editors urge self-governance and responsibility in publishing potentially 'dangerous' science*, Eurekalert, February 15, 2003, http://www.eurekalert.org/pub_releases/2003-02/aaft-wlj021003.php

[2] Journal editors and authors group, *Statement on Scientific Publication and Security*, Science, vol. **299**, February 21, 2003, p. 1149, http://www.sciencemag.org/cgi/reprint/299/5610/1149.pdf

The spectre of genomic weapons

Biological weapons are not a recent invention and man has been using them since the Middle Ages. It is only since the 50s, however, that we have been using our advanced biological knowledge to manipulate viruses, bacteria and toxins in order to make them more harmful and turn them into proper weapons.[3] Perhaps a new phase in the history of biological weapons is beginning today: the genomic phase. Our knowledge about DNA is being used to build new, increasingly powerful weapons: pathogens genetically modified to be even more deadly, to resist any treatment, and be nothing less than invincible.

Claire Fraser and Malcom Dando gave voice to the fear that technology of this kind could end up in the hands of terrorists-scientists in a commentary published in *Nature Genetics* just after 9/11.[4] Their article recalled the theory of viruses that can remain sleeping in the victims' DNA and wake only in specific conditions, such as the release of special chemical substances in the air. It recalled the idea of terrorists using a new kind of anti-cancer molecules able to induce cells to self-disruption, and that of "ethnic weapons": germs that would be lethal only for populations with specific genetic characteristics.

From labs to the Congress

To date, scenarios of this kind may still be considered science-fiction; but, in fact, someone could be willing to try it, sooner or later. What is more is that new biological weapons can even be created by chance. In early 2001, for example, an Australian research team involuntarily selected a viral strain of mousepox that could kill also vaccinated mice. Someone wondered:could the same thing be possible for the human strain.[5] In August 2002, biologists Eckart Wimmer, Jeronimo Cello and Aniko Paul, of New York State University, wrote on Science that you could synthesise

[3] Pietro Greco, *Le Armi Cbrn*, in *Bioterrorismo*, a cura di Pietro Greco, Editori Riuniti, Roma 2001, p.53

[4] Claire M. Fraser and Malcom R. Dando, "Genomics and future biological weapons: the nees for preventive action by the biomedical community", *Nature Genetics*, vol. **29**, November 2001, p. 253

[5] Ronald J. Jackson et al., "Expression of mouse interleukin-4 by a recombinant ectromelia virus suppresses cytolytic lymphocyte responses and overcomes genetic resistance to mouspox", *Journal of Virology*, vol. **75**, February 2001, p. 1205

poliovirus cDNA using information that you could easily find on the Internet,[6] provided the necessary equipment and knowledge, of course.

However, after the publication of their article, US representatives had invited the scientific community to take on security measures to prevent terrorist groups or enemy States from gaining easy access to useful information and building mass weapons. On January 9, 2003, publishers, scientists, public security experts and Government representatives met at the National Academy of Science to find an agreement on how to combine security and free access to scientific information. A common decision was taken by the major scientific journals and institutes the following day and was announced, on February 15, in Denver, during the annual meeting of the American Association for the Advancement of Science: self-governance of all articles that could contain useful information for bioterrorists.

Preventive self-governance

The publishers who signed the Statement marked that the decision of censoring publications also meant protecting their own publishing freedom. The main fear, mostly on the western side of the Atlantic Ocean, is that a stricter censoring would be exercised over scientific journals if they did not opt for self-governance. "We're aware that if we do not police ourselves then Congress may do it for us" Eckart Wimmer, the poliovirus synthesis biologist and co-signer of the Denver Statement, told Nature.[7] This fear is not as far-fetched as it may seem, as, already in February 2002, the US Department of Defence had announced their intention to review all biomedical papers before publication. They never really reached this point, but, by the end of 2002, many scientific documents had vanished from US public data banks. Among these documents were also a few old vintage studies dating back to the 40s which some reforms had made free to public access in order to give greater transparency to the Government action.

[6] Jeronimo Cello, Aniko V. Paul and Eckard Wimmer, "Chemical synthesis of poliovirus cDna: generation of infectious virus in the absence of natural templates", *Science*, vol. **297**, August 9, 2002, p. 1016

[7] Helen Pearson, "Biologists undertake bioterror surveillance", *Nature News*, February 16, 2003, http://www.nature.com/nsu/030210/030210-16.html

Actually, some self-censoring episode had already taken place in the US. Ron Atlas, president of the American Society for Microbiology, one of the main supporters of the Denver Statement, said that, between 2001 and 2002, the 11 papers controlled by his society had accepted 134 reports on lethal biological agents, and that 2 of them had worried the editors and had been published only after some changes had been agreed upon with the authors. One of them had had the introduction removed, because it excessively stressed the harmfulness of a biological agent; the other had had some passages censored, as they explained how to modify a natural toxin so as to kill one million instead of "only" ten thousand people. "Scientists, publishers and directors of scientific magazines have the moral duty to work for the wellbeing of humanity. Taking every possible precaution to prevent the information produced and published by the scientific community from being used in improper ways is part of that moral duty" said Ron Atlas.[8]

The End of Innocence

But when can a publisher come to the conclusion that an article is potentially more dangerous than useful? Deciding a priori which pieces of information are harmful is no banal issue. Even the Denver Statement admits that, at the moment, no definition or list of delicate information that should not be published is available. "Seeing the border line between a research that will lead to peaceful applications of a scientific discovery and a research that will give you the recipe for a bomb is not easy" says also Joseph Rotblat, the nuclear physicist who abandoned the Manhattan Project of the first atomic bomb and who was awarded the Nobel Peace Prize "for his efforts to diminish the part played by nuclear arms in international politics" in 1995.[9] "This is why many scientists of the most pertinent fields should be involved in this project. If we are careful about this, science communication will not suffer heavy consequences" he adds.[10]

Who the censors will be is still uncertain, as are the fields involevd; however, it is easy to foresee that the main target of censoring will be the methodological details. "These are the details every researcher reads first, because they indicate whether the

[8] Ron Atlas, personal communication, March 26, 2003

[9] Joseph Rotblat, personal communication, March 31, 2003

[10] Joseph Rotblat, personal communication, March 31, 2003

experiment was carried out properly and how it is possible to replicate it", says Marcello Buiatti, a geneticist at the University of Florence.[11] Some fear that undermining free access to this information will end up jeopardising the very basis of science. "The fact is that no experiment can be considered scientific if not replicable. And no one can replicate an experiment without knowing the details of the original", Mark Frankel, responsible for the "Program on Scientific Freedom, Responsibility and Law" of the American Association for the Advancement of Science, told the English journal The Lancet, which did not sign the Denver Statement. Many people today, whether members of the scientific community or not, feel that without public communication of science there is no science at all. On this issue, however, Ron Atlas is quite reassuring: "The Statement we signed in Denver stresses the importance of the integrity of science. It explicitly forbids any censorship undermining scientific bases and states science must be reproducible by definition: details that are useful in this sense will not be censored. However, it is important that ethical considerations also become part of the peer review process, which has so far focused on the articles' quality and originality. Both the public and the financial supporters of scientific research should agree on this, thusrendering the consequences on scientific communications negligible".[12]

Science Police

But who will be responsible of censoring articles? Will editors also filter information, as Ron Atlas hopes? "These people will, however, be chosen on an international level" Marcello Buiatti objects. "Will there be national, religious or ideological discriminations? And if they are not editors, who will they be? Will they be external experts, or perhaps part of this or that State's antiterrorism service?".[13] These fears, as well, are not completely groundless: last April, at a London meeting on bioterrorism[14], John Steinbruner, an arms control expert at the University of Maryland,

[11] Romeo Bassoli, "Censurare vuol dire bloccare le ricerche e distorcere il senso della ricerca scientifica", *L'Unità*, February 24, 2003

[12] Ron Atlas, personal communication, March 26, 2003

[13] Romeo Bassoli, "Censurare vuol dire bloccare le ricerche e distorcere il senso della ricerca scientifica", *L'Unità*, February 24, 2003

[14] *Bioterrorism: the current threat*, The Royal Society of Medicine, London, April 3-4, 2003, http://www.rsm.ac.uk/academ/243-terror.htm

called for an "international body of scientists and public representatives who would authorise scientific research carrying potential for grave social consequences". His proposal has already been nicknamed "science police".[15]

Obviously, however, the very ambiguity of judging the harmfulness of an article could mean that a very high price will be paid to self-censoring. The biggest risk is that researchers may fear not being able to publish their results, thus slowing down their own career, and could abandon some research fields – such as that of pathogenic micro-organisms – leaving them to become the monopoly of military laboratories, just where a stronger public control would be needed.[16]

The Opposition: Gagged Scientists

The scientific community is not unanimous on this issue: the critiques focus on the effectiveness of this measure. Already in May 2002 the American geneticists Timothy Read and Julian Parkhill had underlined, in a letter to the journal Nature, that having access to genetic information is of absolutely no help to terrorists, because the real difficulties of creating a biological weapon are the techniques needed to select, grow and spread pathogenic germs. On the other hand, if scientists are prevented from consulting genetic data banks, preventive actions such as the creation of new drugs, new vaccines and surveillance systems will be undermined.[17]

The problem of free access to information is not new to modern life sciences: scientists have been coping with difficulties deriving from the patenting of economically significant scientific discoveries for some years now. Nor is it the first time that the circulation of the results of scientific research is controlled by someone else. Just think of what happened to nuclear physics during the 40s, with the militarisation of the Manhattan Project, and the entire period of the Cold War between the United States and the Soviet Union. The situation of biomedical sciences is

[15] Peg Brickley, "Science Police needed?", *The Scientist*, April 8, 2003, http://www.biomedcentral.com/news/20030408/01

[16] Pwd9148, "Saperi al bivio", *e-Laser*, February 24, 2003, http://www.e-laser.org/htm/newsgroup.htm

[17] Timothy D. Read and Julian Parkhill, "Restrictign genome data won't stop bioterrorism", *Nature*, vol. 417, May 23, 2002, p. 379

different, however, because research in this field always has important direct or indirect effects on our health. The Public Library of Science, a San Francisco non-profit organisation supporting free access to scientific publications[18], gave a very harsh judging of the Denver Statement and charged its signers with lack of far-sightedness: "The benefits and dangers that a new discovery holds are rarely immediately evident, and the discoveries that have brought the greatest benefits to society have often had the most overt potential for danger. The identification of the agent that causes a deadly disease, and the development of methods for culturing the deadly agent, can be viewed as critical steps toward development of a vaccine, or a cookbook for bioterrorists. It is naive to imagine that the censorship of scientific ideas and discoveries based on their foreseeable potential for destructive use would significantly diminish the danger of terrorism. Instead, limits on intellectual freedom and the free flow of scientific information would stifle the scientific creativity that is vital to our defense against terrorism and other, greater threats to human welfare".[19]

The Two Cultures

Donald Kennedy, director of Science and signer of the Denver Statement, in the leading article of February 21,[20] speaks of two colliding cultures. He does not refer to the long-lasting, now obsolete conflict between the scientific culture and the humanities. Kennedy maintains that what we are witnessing today is a new conflict between the "culture of free science" and the "culture of security", between those who think that the fears about scientific research are irrational and derive from poor understanding of the issue, and those who think that scientists are not aware of the potential dangers deriving from their profession. It is, in fact, a conflict between those who maintain that scientific activities have to be controlled by society and those who support the independence of science from any external constraint.

The scientific community has been discussing fears deriving from potential risks of biotechnologies since 1975, when at the end of a famous Asilomar, California

[18] http://publiclibraryofscience.org

[19] *PloS Statement on Censorship*, Public Library of Science, February 15, 2003, http://www.publiclibraryofscience.org/announce_censorship.htm

[20] Donald Kennedy, "Two cultures", *Science*, vol. **299**, February 21, 2003, p. 1148

meeting, researchers opted for a moratorium, that is, a suspension of every activity, until security measures had been satisfied.[21,22] However, the risks of biotechnologies became a politically and socially alarming issue only at the end of the 90s, when the first GMOs entered the market and the spectre of human cloning gave rise to increasing fears. Today the threat of bioterrorism wakes an old fear: that powerful technology can end up into the wrong hands. Brian Spratt, of the London Imperial College, as much as hopes that the perils of biological weapons will arouse an appropriate response from the academic world: an answer based on a shared scientific code of conduct that should be part of every student's training.[23]

The roots of fear

Biological weapons have always aroused a very strong sense of disgust. In ancient times people called them poisons, because they did not know that infectious diseases were caused by micro-organisms. Poisons were banned from the war code by Greeks and Romans, they were banned by Saracens, because they were incompatible with the teachings of the Koran, and by the laws of the Indian Code of Manu, as they were considered inhuman weapons.[24] Biological weapons continue to arouse fears today. It hardly matters that military strategists assure the public that terrorists will keep preferring conventional weapons like explosives, which are more effective and easy to use; or that statistics show that viruses and bacteria rarely cause any victim when actually used as terrorist. The Washington Henry Stimson Center, a non-profit organisation working for peace and international security[25], has collected data showing that during the past 25 years (1975-2000) terrorist attacks with biological weapons have caused only 2 victims.[26] Five more people were killed in Autumn 2001 in the US by

[21] Luca Carra and Fabio Terragni, *Il conflitto alimentare*, Garzanti, 2001

[22] Yurij Castelfranchi, *Xlife*, Avverbi, Roma, 1999

[23] Philip Cohen, "Recipes for bioterror: censoring science", *New Scientist Online News*, January 18, 2003, http://www.newscientist.com/hottopics/bioterrorism/bioterrorism.jsp?id=ns99993266

[24] Leonard A. Cole, "Lo spettro delle armi biologiche", *Le Scienze*, vol. **342**, February 1997, p. 40

[25] http://www.stimson.org/?SN=TI200110174

[26] Amy E. Smithson, "Ataxia: The Chemical and Biological Terrorism Threat and the Us. Response", *The Henry Stimson Center*, October 2000, p. 64

mail-spread anthrax. This means that, during the past 28 years, bioterrorism has caused 7 deaths all over the world: an extraordinary low number of victims.

Then why are we so afraid? What led the major international scientific journals to the undertaking of such a clamorous measure as self-governance? The fact is that the very idea of terrorists using this terrible kind of weapon awakes fears that are very deeply rooted in the collective unconscious. Biological weapons remind us of biblical plagues, and terrorists with no face or name strongly recall the plague spreaders. As if this were not enough, after what happened on 9/11, many people now think anything possible. The terrorist attack against the Twin Towers and the anthrax mails have led to a completely new perception of the risk of mass weapons. People now think that rudimental equipment and some recipes taken from the Internet are enough for anyone to build a biological weapon in his garage.

The media, and not just the popular ones, have also contributed to the diffusion of this idea (see box). Ian Roberts, pubic health expert at the London School of Hygiene and Tropical Medicine, states that the American medical journals have given too much room to bioterrorism, leading people to think a biological attack to be imminent, thus justifying the political necessity of a war in Iraq.[27] "Actually, changing a virus or a bacterium into a biological weapon is a very complicated process: it requires abilities that no biology student has, and very expensive equipment that pharmaceutical industries, not university labs, dispose of" says Arturo Falaschi, director of the International Centre of Genetic Engineering and Biotechnologies (ICGEB) of Trieste, Italy. And he adds: "The success of a biological attack is a very remote chance, and editors know that. But in the collective psychosis of this period they have given up to those maintaining that sooner or later someone will try it out."[28]

We ought not to forget that fear is also business, that fear can also produce money. Nature states that biotech companies, struggling for survival after 3 years of low investments, are now queuing outside the US Department of Treasury to get their share of the generous investments the Government is making on bio-security. The year 2003 should see the investment of 6 billion dollars in long-term projects such as the

[27] Ian Roberts, "Medical journals may have had a role in justifying war", *British Medical Journal*, vol. **326**, April 12, 2003, p. 820

[28] Arturo Falaschi, personal communication, April 1, 2003

development of new anthrax and smallpox vaccines, “indispensable” to face pandemics we will probably never see. “This is an opportunity created by fear” said Charles Cantor, an expert of bio-defence and scientific representative of Sequenom, a genetic company of San Francisco, California.[29]

Conclusions

The bioterrorist threat and “the culture of fear”[30] prevailing in western society after September 11 has led the scientific community to revise the ethical norms controlling scientific production and communication methods, and firslty the process of peer review. Self-governance is a sign of the deep change that is increasingly forcing scientists to come to terms with the needs, the wishes and the fears of the society they live in. This change, as it usually happens, is also affecting the communication processes by which a community, in this case the scientific one, defines its language and identity. This time it is not an internal process: it is society making explicit requests that call for a change in the usual ways of producing and communicating science, thus changing the idea society, itself, has of science.

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[29] Helen Pearson, “Biotech firms pin hopes on defence”, *Nature*, vol. **422**, April 24, 2003, p. 79

[30] Barry Glassner, *The culture of fear*, Basic Books, New York, 1999