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Why don't I take military funding?

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I don't take funding from military agencies. Why not?

Mostly it is a testimony that it is possible to have a successful career in computer science without taking military funding. My position has its roots in the Vietnam War, when I was a conscientious objector, did alternative service instead of submitting to the draft, and joined the Society of Friends (Quakers). During the 1980s and 90s, the position seemed to lose some of its urgency, so it became more of a testimony about career paths.

Since September 11, 2001, all the urgency is back. The defense of our country is at stake, so this testimony becomes critical. In short, I believe that non-violent methods of conflict resolution provide the *only* methods for protecting our country against the deadly threats we face in the long run. Military action, with its inevitable consequences to civilian populations, creates and fuels deadly threats, and therefore *increases* the danger that our country faces.

I will come back to this, but first some other thoughts.

How did you get started with this?

In 1978, after completing my PhD thesis on cognitive maps, I found that the only funding agency that was interested in supporting my research wanted to build smart cruise missiles that could find their way to their targets. This was not what I wanted my life's work to support. So I changed areas, and started working on AI in Medicine, which led to some very productive work on qualitative reasoning about physical systems with incomplete knowledge.

Well before that, I had been a conscientious objector to the Vietnam War, and had done alternative service to the draft from 1970 to 1972 before starting grad school. Since most of my graduate studies were funded by an NSF Fellowship, I did not think much about military funding and AI research at that time. After finishing my PhD, I did a year of post-doctoral research funded by a grant that Al Stevens and I negotiated directly with Craig Fields at DARPA. It was at the end of that year, looking for continuation funding, that I confronted the cruise missile scenario and had to decide what my research life is for, and who I am willing to have pay for it.

But how can you fund your research?

Defense Department agencies like DARPA, ONR, AFOSR, and ARO are certainly among the larger pots of money out there, and I have put these off limits for myself.

I have had funding from NSF, NASA, and NIH instead. There is a State of Texas Advanced Research Program that has supported several of my projects. And I have had small amounts of funding from several companies such as Tivoli and IBM.

These other agencies typically don't provide grants as large as one can get from DARPA, for example. So, there are limits to the size of research group I can have. With very few exceptions, I have decided that I will fund only grad students, and not try to support research staff or post-docs, who are *much* more expensive than grad students. I have sometimes had quite a few grad students, and a large lab, but the funding requirements remain moderate.

When I first decided to refuse military funding, I felt I would be making a serious sacrifice. As it has worked out, research money has sometimes been tight, but never disastrously so.

And as I watched my colleagues dealing with DARPA's demands for reports, PI meetings, bake-offs, delays and reductions in promised funding, and other hassles, I began to wonder whether I hadn't gotten the best side of the deal after all.

It's important to remember that the bottom line in research is productivity of ideas, not dollars brought in. At some point, the hassle of dealing with an agency may decrease one's intellectual productivity more than the money they provide increases it. But that's a practical issue, not a matter of conscience.

The bottom line here is that refusing military funding puts a limit on how large a research budget I can sustain. But that's not the same as limiting my intellectual productivity.

What's wrong with taking military money?

They have funded lots of great research!

Certainly so: AI and the Internet being two large categories of them.

That kind of research is enormously important, and I am glad that our society finds a way to fund it.

However, the goal of the military is to settle international conflict through violence. As a friend of mine was told by a general, "Everything we do ultimately has one of two goals: killing people or destroying things." I believe that this attitude towards conflict resolution has become a "clear and present danger" to our world and our country. The world has become so small through transportation and communication, and our weapons have become so deadly, nuclear and biological, that we cannot afford the illusion that violence makes us safer.

A true defense of our country would require both resources and research into non-violent conflict resolution methods. Both of these exist, but are starved compared with the technologies of warfare.

My stand is a testimony, saying "I will not devote my life's work toward making warfare more effective." I am also trying to show, by example, that one can be a successful and productive computer scientist, even while taking this stand.

Do you try to keep others from taking military funding?

No. Mine is an individual testimony, and each person makes an individual decision about how they will spend their life's work.

Many years ago, when William Penn converted to Quakerism and pacifism, he was troubled by the thought of having to give up the sword that he wore, a great honor at the time. He asked George Fox, the founder of Quakerism, what he should do. Fox told him, "William, wear thy sword as long as thee can."

Why not use military funding for virtuous research?

First, it's a testimony, and a testimony has to be clear and visible to be useful. Certainly there is virtuous research funded by military agencies. Many colleagues whom I respect highly take this approach and I honor them for it. But it doesn't send a clear message to others, and I want to do that.

Second, there's a slippery slope. You can start with a research project as pure as the driven snow. But a few years later, money is tight in the pure research category, and you get offered a research grant from a more applied office within the same agency. Do research on the same topic, but frame it in terms of a military mission. Step by step, you can slide into battlefield management and smart cruise missiles. One thing that makes the slope so slippery is that you have accumulated responsibility for a lab full of graduate students, and the consequences of a major drop in funding will be even more painful for them than it is for you.

Another thing that makes the slope slippery is that military problems are often very interesting. It's easy to get caught up in an interesting technical challenge, and lose sight of what is actually happening: that the objects in the plan are human beings, and that the actions that are being planned are to kill them.

With a little cleverness, you can find similarly fascinating problems in the space program, where there is NASA funding, or in the economic sphere, where there is private funding. Or in other areas of science, where NSF and NIH do the funding.

Is everything the military does tainted?

Certainly not. Most people don't realize that the US military is perhaps the largest educational institution in the world. It provides valuable academic and vocational training to a huge population, many of whom might not have access to it otherwise. It also provides training in character and discipline that are hard to match elsewhere.

There are even signs that the professional military is reaching a clearer understanding than civilian policymakers of the weaknesses of violence, and the strengths of non-violent approaches to conflict resolution. We may be moving toward the day when trained, disciplined soldiers will be able to move into a situation of conflict and restore civility and peace without loss of life.

That's a day worth working for.

The military can use your research anyway, from the open literature.

Why not have them pay for it?

Many things have both good and evil uses. If I create new knowledge that can be used for either good or evil, and present it and evaluate in terms of the good purposes, then someone who converts it to evil use bears that responsibility. If I present it and evaluate it in terms of the evil purpose, then I make it that much easier and more likely for it to be used for evil. I must then bear the responsibility.

This argument is not very robust against speciousness and rationalization. If I make a rapid-fire machine

gun firing armor-piercing bullets, and present it and evaluate it for the sport of target shooting, I am deceiving myself (or more likely, not). Whoever funds the work, I am responsible for anticipating who is likely to use it.

At the same time, if I develop a new scheduling methodology for industrial processes, the military is likely to benefit, since it includes many industrial processes. But peaceful economic activity will benefit more, and the military benefits only in the aspects it shares with peaceful enterprises.

Do work that makes the world a better place. The fact that the military becomes better too is not a problem.

(From a graduating senior) Should I consider military involvement when I choose a graduate school?

Probably not too much, but keep your eyes and ears open when you visit the different schools. Most top graduate schools in computer science will have substantial amounts of military funding, but most will also have faculty who are seriously concerned about the militarization of research. You should look for a balance that leads to productive discussions, rather than a "party line."

Look for faculty members who can guide you in directions you want to go. This means looking for both intellect and integrity.

Are you ever tempted by large military grants?

Yes, of course. Recently a friend of mine, whom I respect highly, took a leadership position in a major agency, and created a research program I find enormously attractive.

After struggling with the question for several weeks, I decided that the need for testimonies like mine was becoming greater, not less, in these difficult times, so I have reluctantly passed on this possibility. Sigh.

The fact that a course of action is right does not necessarily make it easy.

What about September 11? We're under attack!

Our country suffered horrific losses from a terrible attack. The criminal gang responsible must be brought to justice, and we must protect ourselves against possible future attacks.

However, violent actions taken in the name of defense against terrorism are very likely to increase the likelihood and magnitude of future terrorist attacks. We need a combination of short-term vigilance and protection, and long-term efforts to reduce the problems that breed terrorism, both in non-violent ways.

Much more to be said about this, probably in other opinion pieces.

I am writing to ask for advice. I am one year away from graduating with a BS in computer science and am considering graduate school. When I started looking around my department for some research to get involved in, I was surprised to find how much of it relies on military funding. This led me to find your essay on why you don't take military funding. I share your views and as tempting as it is, and as much as I feel I'm missing out on some really interesting projects, I've decided I will not work on anything that receives military support. So, I'm hoping you can offer further advice on how and where to look for grad programs. How do I find other faculty who share this concern for the militarization of research? Will I find more options overseas? How and when do I tell prospective schools about my decision?

Let me applaud you for your principled stand. As you have surely noticed, these are times that require good people to stand up and be counted, publicly.

Although I did alternative service as a conscientious objector during the Vietnam War, I did not decide to avoid military funding until a year after completing my PhD. I was fortunate to have obtained NSF and Danforth Fellowships that funded almost all of my graduate studies. After I became a faculty member, I got quite good at raising grants from NSF, NIH, NASA, and other places.

You will need to do similar things, just starting earlier. There are a number of competitive fellowships for graduate study that you can apply for as an individual, and carry with you to your choice of graduate school. Many of these, like the NSF, the Hertz, the Gates, etc, are very competitive. It is a big advantage in such competitions to be clear on your own beliefs and your own priorities. Make sure you can express yourself in a clear and compelling way, and you have a significantly better chance. If you succeed in obtaining your own funding, it makes you much more desirable at top graduate programs.

A couple of useful quotes for this enterprise are, "Momma may have, and Poppa may have, but God bless the child who's got his own!" and "Be wise as serpents and gentle as doves." (Look them up.)

Even if you don't get this kind of fellowship, there are plenty of options for supporting yourself through graduate school without military funding. You can be a teaching assistant; you can be a research assistant to a faculty member with other kinds of funding; you can find work maintaining computers for a lab in another department; you can get a part-time outside job; and so on. Generally, rejecting the single largest funder will require you to be more creative about looking at other funding possibilities. This creativity will serve you well. One of the fortunate things about working in computer science is that you have a practical skill that is needed by people in many different areas, and they are often willing to pay for your services.

On finding faculty with similar beliefs, I would suggest just asking. A quick scan of each faculty member's web page, and especially the acknowledgements on publications, will tell you where they get their funding. Find a few people whose research you find attractive who have non-military funding, and talk to them.

Personally, I find it most productive to be clear and straightforward, without being judgmental or confrontational. You will very likely find plenty of people who are very sympathetic to your values, but who aren't willing to make what they perceive as too large a sacrifice. In my personal opinion, it is more important to encourage people to see their choice of work, how it's funded, and what it's used for as an important moral decision that must reflect their own fundamental values, than to pressure them to make the same moral decisions that I have.

I doubt you will find better options overseas. I believe there is generally less funding available outside the US, and little of that would be available to a US student. There are some very fine graduate schools in other countries, but on average, the US has the best graduate schools in the world. Again, personally, I love this country, and I want my work and my life to help strengthen its good parts and help fix its problems. So I wouldn't want to leave.

How and when to tell is another judgment call. It depends on your own style, and how vocal a testimony you want to make. You may legitimately decide that this point is not relevant on the application for graduate school, or on the other hand, you may feel that it is central. You are not obliged to explain or justify every belief you have, however strongly held or controversial, to everyone you meet. You have to decide when you think it is relevant.

A final point. I think you are doing a good and noble thing. Following this path will be demanding, and maybe quite difficult, but I believe and hope it will also be rewarding in many ways, including practical ones. However, getting the education you need to make the best use of your gifts through the rest of your life is also an important value. You should not participate in activities that you believe are morally wrong, but there may be times in your life when preparing yourself for your future takes priority over making a visible testimony. There will be time and need for that later, you can be sure.

SYMPOSIUM ON CURRENT DANGERS OF NUCLEAR WEAPONS

27th of September 2007

Landtingssalen, Christiansborg Palace, Copenhagen

The symposium will discuss a number of serious dangers posed by nuclear weapons despite the end of the Cold War. These include the weakening of the Nuclear Non-proliferation Treaty, the spread of nuclear weapons associated with nuclear power generation, dangers from inadequately guarded plutonium and highly-enriched uranium, the danger of accidental nuclear war, the danger that tactical nuclear weapons will be used in a war and the dangers of nuclear terrorism. A tentative program of the symposium is attached. The organizing NGO's believe that the time has come for the total abolition of nuclear weapons.

PROGRAM

13.30-13.35 **Welcome**, Assoc. Prof. Emeritus John Avery, Danish Pugwash Group.

13.35-14.00 ***MF Mogens Lykketoft:***
NUCLEAR WEAPONS IN EUROPE.
Chairperson Mr. Kjeld Aakjær, Mandela Center.

14.00-14.30 ***Dr. David Krieger***, President, Nuclear Age Peace Foundation:
A BIPARTISAN PLEA FOR NUCLEAR WEAPONS ABOLITION.
Chairperson: Assoc. Prof. Jørgen Estrup, Chairman, Danish United Nations Association.

14.30-15.00 ***Minister Counsellor Vladimir Ulasovich,***
Embassy of the Russian Federation in Denmark:
TITLE TO BE ANNOUNCED.
Chairperson: Assoc. Prof. Jørgen Estrup, Chairman, Danish United Nations Association.

15.00-15.30 ***Discussion from the floor***
Chairperson: Mr. Jan Møller, President, SGI Denmark.

15.30-16.00 Coffee break.

16.00-17.00 ***Dr. Maj Britt Theorin,*** former Disarmament Ambassador for Sweden and former Member of the Swedish and European Parliaments:
TITLE TO BE ANNOUNCED.
Chairperson: Dr. Cæcilie Buhmann, Board Member, International Physicians for the Prevention of Nuclear War.

Because of space limitation, registration is necessary. Please send a message to John Avery, john@ccs.ki.ku.dk before August 1st.

The symposium is organized by the Danish Pugwash Group, the Mandela Centre, Soka Gokkai International, Dansk Læger Mod Kernevåben, the Danish Peace Academy, and the International Network of Engineers and Scientists for Global Responsibility (INES).

THE SOCIAL IRRESPONSIBILITY OF SCIENTISTS

Jean-Jacques Salomon

Dr Salomon is Honorary Professor, Chair Technology and Society at the Conservatoire National des Arts et Métiers in Paris. The present article was presented on March 29th 2007 at the Niels Bohr Institute, University of Copenhagen as the first contribution to the project Social Responsibility of Engineers and Scientists, conducted by the INES Working group INESPE. The full text of the lecture that also contains references can be found on the website: www.inespe.org/lectures/

Scientists whose behaviour and thoughts challenge the conformism of the institution – I call them the dissidents – are indeed a minority. The conformist position is to claim that basic research has nothing to do with other values besides the pursuit of knowledge for its own sake, that science is neutral and completely separate from the political, economic and strategic challenges and threats faced by the world. The point I tried to stress in the book I published recently, The Scientists Between Power and Knowledge, is that since the Industrial Revolution of the 19th century most scientists are in fact immersed in activities in which it became more and more difficult to dissociate basic research from applied research and even development. Let me tell you a revealing anecdote. Because of this book I was interviewed by a journalist from a monthly French journal, Ciel et espace (Sky and Space), who asked me to define the boundary between basic research and other kind of research activities. I answered, "Well, on one side you have cosmology, on the other astronomy." I was thinking that what is going on in the cosmos is the realm of "pure" science in the traditional sense of the term, whereas astronomy today refers to space research, missiles, satellites, whether the peaceful Shuttle, the international space station or military intercontinental missiles or the "star wars" system. But, having read the recent Memoirs by Robert Dautray, the man who was behind the French H-bomb, I must admit that I was still naive and indeed wrong: there is a direct connection between looking at the combustion in the sun and that which is provoked in a thermonuclear bomb, so much so that Dautray could write, "I have been a ferryman between the sun and weapons."

For scientists who devote their efforts entirely to basic research, the only thing that matters is the pursuit of knowledge for its own sake, without any concern for what repercussions it might have. And many who work in applied research have the same attitude: the effects of a discovery or an invention are not their business. If as Aristotle says, what sets human beings apart is the desire for knowledge, then research can truly be a passion. The scientific institution relates to the ideal of basic research, "pure and disinterested," still conducted only in university laboratories.

The search for truth – for an understanding of phenomena, a passion for getting to grips with natural phenomena by expressing them through the language of mathematics in particular – undoubtedly still exists, and there is no greater happiness, as Stendhal said, then when one's passion coincides with one's professional occupation. However, it is a long time since research was just a job. There is no way of disguising the huge changes that have occurred to the scientific institution over the last half-century: changes in scale, in who the scientists are and where they work. The vast majority of researchers now work in industrial or military laboratories, and among them – whether they are scientists or engineers – there are those who do basic research very similar to that of their counterparts in universities. Despite this pre-industrial image – maybe ideology – of an activity that still claims, not unjustifiably, to be concerned with pure intellectual speculation, a love of truth and disinterestedness, the scientific institution is in fact closely dependent on industrial capitalism, supplying its innovations, updating its weapons systems, inspiring, shaping and providing the model for the management of firms of all kinds – private, public and international – while at the same time being sustained by their contracts and subsidies.

In order to understand the changes to science that have taken place, its growing involvement with the affairs of the world, we need to go back to the early days of modern science, to the experimental science associated with Galileo, Bacon, Descartes, Newton. The context of its mission is well summed up in the Charter of the Royal Society of London (1662): its aim was "perfecting the knowledge of natural things and all useful arts," while at the same time "not meddling with Metaphysicks, Moralls and Politics." This proclaims – in addition to objectivity of methods and results – the independence and neutrality of science in relation not only to religious, political and economic power, but also to values other than its own. Yet the professionalisation and industrialisation of scientific research has increasingly placed scientists at the heart of history: this development became ever more rapid from the end of the 19th century as the distinctions became more and more blurred between theoretical knowledge and practical know-how, between basic and applied research, between science and technology, and therefore between universities, industry and the armed forces, as well as between the public and the private sectors.

The noun "scientist" – someone who does science – appeared for the first time in 1840 in a book by W. Whewell, but it took another 50 years for it to be widely adopted across Europe, replacing "savant" or "natural philosopher." This change reflects

a major cultural shift whereby philosophy stopped being a point of reference for science, if not its extension. The spread of the term confirms the transition from a state to a function, i.e. to a profession that increasingly distinguished itself, by its language, procedures and channels of communication, from the humanities.

In fact, some scientists aspire to exercise real power. One has only to recall the influence of eugenics – a false science, but an ideology that was all the more attractive because it developed in the 20th century against a background of fears about the degeneration of the population (and of the White race) – first on legislation in the United States, Switzerland, Germany and Sweden (with the sterilisation of the "unfit" and "deviants"). In Antiquity, Plato aimed to alter what was transmitted biologically by means of changes to society, whereas more recently, biology was seen as the key to changing society (one thinks of Galton, relying on demography and genetics). Under the Nazis this "biopower" was applied to exterminating the mentally ill, to the experiments conducted in the concentration camps and the resort to industrial methods in the gas chambers to achieve the "final solution." It is impossible to minimise the role played in all this by biologists, demographers, anthropologists, psychologists and doctors: to echo Hannah Arendt, it was not harmless, it was not a matter of scientists "led astray," but often also it is the ordinary researchers, associated with the network of Kaiser Wilhelm Institutes (later Max Planck), who illustrate the banality of evil when the power of science coincides with the desire for domination on the part of a group or a nation.

It is striking – and worrying – to see eugenics shake off its bad reputation thanks to the development of molecular biology: genetic engineering, preimplantation genetic diagnosis (PGD), therapeutic cloning (even more so reproductive cloning), are leading some people to revive the idea of creating a society cleansed of its genetic defects and abnormalities through the intervention of science. In the past this was done by coercion under totalitarian regimes, today it goes on under democratic ones. Thus Francis Crick, one of the three biologists awarded the Nobel Prize for their discovery of the double-helix structure of DNA, was able to say to a conference: "Why should people have the right to have children?" He suggested there should be a system of permits, so that parents who did not seem very suitable genetically would not be allowed to have more than one or maybe two children, under certain conditions. The fantasy of control over human reproduction is still there in what has been called "the search for the Holy Grail" with regard not only to PGD, but also to sequencing the genome. Hence, the question raised by the philosopher Habermas: are we not sliding inexorably towards free-market eugenics? So much that Professor Didier Sicard, who chairs the French National Committee for Bioethics, gave a full-page interview in which he warned that the diffusion of PGD may threaten France to lead to such a free-market eugenism by invoking the "perfect child." And still he concluded by saying that this scientific achievement is irreversible: one doesn't stop progress. In the history of the politicisation of science, eugenics was the occasion for what could be called – by analogy, if you will pardon the barbarism – the scientification of politics: demographers, geneticists and doctors were called upon to determine policies. This politicisation occurred even more strongly under totalitarian régimes: one thinks of the division between Aryan and Jewish science in Nazi Germany, between proletarian and bourgeois science in the Soviet Union (culminating in the Lyssenko affair). All of this is a far cry from the vocation and the precepts expressed in the Charter of the Royal Society.

It was the Second World War that brought truly basic research onto the battlefield. In the words of J. Robert Oppenheimer, the scientist in charge of the Manhattan Project which was to develop the bombs dropped on Hiroshima and Nagasaki, "physics has known sin." But in the same speech he insisted on the distinction between the actor and the instrument: "In the worst instance [the instrument's claim to being an actor] is used as a sort of screen to justify the most casual, unscholarly and, in the last analysis, corrupt intrusions of scientists into other realms of which they have neither experience, nor knowledge, nor the patience to obtain it." Oppenheimer was a fascinating and contradictory figure. Some commentators have recently underlined the influence that the Bhagavad-Gita and the Vedic culture exerted on Oppenheimer (before the war he was a disciple of Arthur William Ryder, a Berkeley specialist in Sanskrit and Hindu philosophy).

In the Hindu poem, Prince Arjuna refuses to fight because he has recognised in the opposing army many relatives and masters. But the driver of his cart, Krishna (an avatar of Vishnu), instructs him to fight, since he belongs to the warrior caste, and thus his duty is to face the battle. Oppenheimer's dharma implies that he has to do what a warrior has got to do, since the hand letting loose the arrow is not the one that kills, it is the Lord's doing. In the Gita, the notion that the "fruits of the work" or "the fruits of action" – the consequences of what one does – is used repeatedly to emphasise that the arrow that kills is indeed in Vishnu's hands: you are not responsible for the fruits of your action. It is your duty to get on with the work, and this suffices to overcome any sense of responsibility since the decision to launch the bomb is not your affair. It is not that obvious that Oppenheimer was not part of the decision-making process which led to Hiroshima. On the contrary, two weeks before the dropping of the bomb, he urged the military leaders to make sure to explode the "gadget" at the right height and in the right weather conditions so as to create the maximum damage from fire and blast. Despite announcing that physicists had known sin, he later told a national television audience that "when you play a meaningful part in bringing about the death of over 100,000 people and the injury of a comparable number, you naturally don't think of that as – with ease." Unease is felt, not real anguish; in fact, his detachment was that of Veda, and he had just done his job. As he said once, "When you come right down to it, the reason that we did the job is because it was an organic necessity. If you are a scientist,

you cannot stop such a thing. If you are a scientist, you believe that it is good to find out how the world works [...] that it is good to turn over to mankind at large the greatest possible power to control the world."

We know that not all the scientists who took part in the Manhattan Project limited themselves to their technical expertise but instead tried to oppose the decision to launch the bomb. James Franck chaired a committee whose report in June 1945, prepared by Leo Szilard, argued against the atomic bombing of a city and suggested instead a demonstration on an uninhabited desert island. After the July 16 Trinity test, the first nuclear explosion over the New Mexico desert, a group of 68 other scientists, again led by Leo Szilard, signed a petition to President Truman urging that the government make greater efforts to avoid dropping the bomb on the Japanese population. And we know that behind this campaign by Szilard, Niels Bohr was already trying to inspire Roosevelt and Churchill to seek an international agreement that might rule out such a decision. In brief, some do believe that doing science is not just a technical matter, but that it implies assuming responsibility for "the fruits of their work." It was only at the end of his life that Oppenheimer appeared somewhat distressed by what the scientific-industrial-military complex was doing with what he was the first to have built.

In other words, scientists are both involved and not involved: as children say when they are caught doing something they shouldn't, it wasn't me, it was the others. I have called this "the community of denial," drawing on the personal accounts of many scientists who have worked on the development of the most sophisticated and awesome weapons systems and who count themselves, like Freeman Dyson, "on the side of both the warriors and the victims."

Dyson, a member of the Princeton Institute for Advanced Study, who in his youth took part with his friend Richard Feynman in the Manhattan Project, attached to a local peace movement and a consultant to the Defense Department – two roles, two commitments, two visions of a "nuclear ethics" that are poles part – turned this dichotomy or schizophrenia into a book that is remarkable and revealing for the way he discusses deterrence and the problems from the viewpoints of these two worlds to which he belongs equally. "The world of the warriors is the world I see when I go to Washington or California to consult the military people about their technical problems," a world dominated by men, both hawks and doves, generals and academics, who speak the same language, in the same way, deliberately, without emotion or elaborate arguments, applauding dry humour and abhorring all sentimentality. "The philosophical standpoint of the warriors is basically conservative, even when they consider themselves liberal or revolutionary. They accept the world with all its imperfections as given; their mission is to preserve and to ameliorate its imperfections in detail, not to rebuild it from the foundations." This is the world of John von Neumann, Herman Kahn, Edward Teller and all the others for whom war and its threats and costs is a matter of quantitative calculations, where the delight in the "technical sweetness" is matched by the sense of political domination.

By contrast, Dyson says, "the world of the victims is the world I see when I listen to my wife's tales of childhood in wartime Germany, when we take our children to visit the concentration camp museum at Dachau, when we go to the theatre and see Brecht's Mother Courage, when we read John Hersey's Hiroshima or Masuji Ibuse's Black Rain [...] when we sit with a crowd of strangers in church and hear them pray for peace or when I dream my private dreams of Armageddon." This is a world dominated by women and children, where the young people outnumber the older generation, where more attention is paid to poets than to mathematicians, the world of pacifists and ecologists, but also that of scientists whose respect for Nature and for life matches their passion for their subject. Two simultaneous persons in the same human being, in whom neither the style nor the substance of their arguments is the same and each plays by its own rules which are not shared by the other – a case of exceptional "double bind" according to the definition of the anthropologist Gregory Bateson, a situation in which someone compels himself to face two absolutely contradictory alternatives, so impossible to sustain that it leads to madness: "The warriors' world describes the outcome of war in the language of exchange ratios and cost effectiveness; the victims' world describes it in the language of comedy and tragedy."

Such an ambivalence – contradiction, dichotomy or even schizophrenia – highlights the peculiar role that the scientists-warriors assume today in our societies. And it is not enough to evoke their patriotism or ideology as the major spur for their behaviour! No one surely would question that they have to contribute, like any other citizen, to the defence of their country, maybe by working to renew the arsenals. Personally, from my own experience, I would be the last to claim that a country can do without the military and a defence policy to which scientists have to contribute. Moreover, few scientists proclaimed that they were, like Einstein, pacifists and called on the spirit of non-violence. However, Einstein himself admitted, like Gandhi, that the use of force is unavoidable when one is confronted by an enemy who pursues destruction of life as an end in itself. The moral problem that these scientists face does not stem from the fact that they can be called upon in their laboratories, it stems first from the very nature of the weapon systems of mass destruction that they alone are able to measure, conceive of, invent, adjust – in short, from their gigantic capacity to destroy. Here we have many testimonies of researchers associated with the military industrial complex who discovered, like sorcerers' apprentices, that they "went too far." However, there is something else in this awareness: what made them warriors was not so much the sense of duty as the irresistible pleasure of research. In Freudian terms, the culture of death which may feed the military art finds in research devoted to weapons of mass destruction a true source of eroticisation and narcissism. And from such a standpoint, the notion of denial is not that they go too far, but

that in their eyes they never go enough far.

Yet we need to bear in mind that scientists are alone able to manipulate natural phenomena, to understand and harness the secret of atoms and their nuclei – or genes and viruses, since today the military are no less interested in genetic engineering resulting from the progress of molecular biology – to the point where they can turn them into weapons of mass destruction. It was not Roosevelt who had the idea of a nuclear weapon, but Leo Szilard, who wrote the letter signed by Einstein to warn President Roosevelt of the possible threat of a Nazi atomic bomb. Nor was it Ronald Reagan who invented the notion of "star wars," but Edward Teller who inspired and initiated it, just as he was at the source of the Super, the thermonuclear bomb. Herbert York, who was head of the Pentagon's Advanced Research Projects Agency (ARPA) under several Presidents, described his "philosophy" (his word) as having no goal beyond innovation at any price: "Our working philosophy [...] called for always pushing at the technological extremes. We did not wait for higher government or military authorities to tell us what they wanted and only then seek to supply it. Instead, we set out from the start to construct nuclear explosive devices that had the smallest diameter, the lightest weight, the least investment in rare materials or the highest yield-to-weight ratio or that otherwise carried the state of the art beyond the currently explored frontiers."

To judge from what these scientists say, while on the one hand they take great pleasure in their research, they can also be seen turning into missionaries for peace, in particular through the meetings of Pugwash where they work to oppose proliferation and in favour of disarmament. Einstein said that those who had worked on the atom bomb were driven to promote peace as an expiation. The community of denial oscillates between Eros and Thanatos, between the instinct for pleasure – the "technical sweetness complex" that Oppenheimer himself acknowledged – and the culture of death that inspires the escalation of systems of weapons of mass destruction. Oppenheimer opposed Teller's program for the superbomb not on moral grounds, but in the first place because he was convinced that the available atomic bombs were then enough to face the Soviet threat, and also because he thought such a program doomed to fail.

Again, Dyson puts his finger honestly on the very sense of this denial. "The sin of the physicists at Los Alamos did not lie in their having built a lethal weapon. To have built the bomb, when their country was engaged in a desperate war against Hitler's Germany was morally justifiable. But they did not just build the bomb. They enjoyed building it. They had the best time of their lives while building it. That, I believe, is what Oppie (Oppenheimer) had in mind when he said that they had sinned. And he was right." In sum, on the one hand there was the thrill of the technical problem to be tackled and then of finding the solution, narcissism and sublimation, the pleasure and intoxication of research: since it is possible, it must be done with the irresistible enthusiasm which leads to the discovery of the New World. On the other hand, the twisting turns of history, the conflicting values and the responsibility carried by other people: what you are going to do about it once you have it is purely the military, the political and the humane problem which is beyond the researcher's Eros – no more the concern of the scientist's imagination than of his conscience.

Thus, Herbert York proposed to General Eisenhower soon after his election to the White House a plan for a 20-megaton atomic bomb, to which Eisenhower replied, "The whole thing is crazy; something simply has to be done about it!" Similarly, Sakharov, before he became a champion of human rights in the Soviet Union, suggested the development of an even larger nuclear device to be carried on a giant submarine which could attack from close to the coasts of America. To his great surprise, Admiral Tomin's response was: "The officers and men of my fleet are accustomed to fighting their enemies only in open battle." "I felt deeply uneasy," Sakharov says, "and I never mentioned the subject again to anyone." It was Sakharov, too, who said that in tackling the H-bomb he had seen "the theoretician's paradise" in the physics of the atomic and nuclear explosions. This is what made Karl Popper consider him to be a war criminal for this part of his career.

We see the same pleasure, the same eroticisation of research, in the case of Oppenheimer or of Dyson, who looked back on his research on the Orion project (an enormous nuclear-powered rocket that was never built because it could fall back to the ground and spread its radioactivity) as the happiest days of his life. "It was possible for us in 1958 to enjoy the thought of leaping into the sky with a trail of nuclear fireballs glowing behind us." Later, once he had (as he said) changed and realised the importance of the environment, Orion seemed to him "a filthy creature leaving its radioactive mess behind it wherever it goes." Or take Ken Alibeck, who was in charge of the Soviet Union's Biopreparat, the network of laboratories developing biological weapons, who wrote with child-like innocence: "The results of my studies could be used to kill people, but I couldn't figure out how to reconcile this knowledge with the pleasure I derived from research." And when it isn't pleasure, it's the focus exclusively on the interest of the experiment, whatever its ultimate purpose. This is what made Werner von Braun, move happily from being a senior SS officer, to a mercenary building the V1 and V2 at the Dora death-camp, and finally to building the Saturn rocket for the Apollo program. He freely acknowledged: "All I really want is grounds should the scientist serve any other purpose other than its technical competence? Sydney Drell, who was deeply involved in military research, underlined clearly that scientific activity has nothing to do with morals: "As scientists, we are trained in, we are expert in, and we work in a field whose content is without moral values, such as the study of the laws and the building blocks of physical nature. But as human beings we must make a moral choice whether or how to involve ourselves with the Devil – the political process, government and weapons of war." In short, the Devil

merely haunts society, not the scientist's activity.

Yet the speech given by Sir Michael Atiyah – winner of the Fields Medal and the Abel Prize in 2004 – on his retirement from the presidency of the Royal Society reveals a deep concern about how the great majority of scientists might be able to regain the prestige that they have lost because of the equivocal nature of the roles they play in our societies. Criticizing the building up of the nuclear arsenal, he stressed that it had done so much to undermine their integrity: "Close collaboration with governments, both for military and for industrial purposes, has brought substantial material benefits. But this support has been bought at a price and public suspicion is one of the consequences. […] The crucial question we scientists face is how to conduct our relations with government and industry so as to regain the confidence of the public. Here we need humility. It is no use complaining that the public is simply ill informed and needs re-educating." The example he gave, among many others, clearly illustrates the direct responsibility of scientists in the development of a weapon and the way that they – creators and repairers, both instruments of death and champions of life, firemen/ arsonists – are called upon to remedy the problem that they themselves have caused: "Traditional mines contained enough metal that they could be easily identified and recovered by metal-detectors. Newer mines use little metal and are hard to detect. Presumably, they were developed precisely for this purpose. An asset in military operations became an environmental disaster when peace follows. Ironically scientists are now faced with solving a problem of their own making."

This problem — both an ethical and a political issue — is nonetheless regularly a matter of denial on the part of many scientists. There is no getting away from the fact that today very few scientists devote themselves to basic research without any thought of the objectives in the short or medium term. Nowadays, the vast majority conduct their research in laboratories in industry or for the military, and it is not easy for them to resist the pressures from the military-industrial complex whose needs they meet and on which they depend.

To resist or even to stand apart obviously carries a cost: the risk not only of cutting oneself off from the rest of the community, but also of not being able to take part any longer in scientific activity. Worse still, in a totalitarian régime, it could mean the threat of prison, torture, psychiatric hospital or death. The story told recently by Hussein Al-Shahristani offers a vivid picture: in 1979, having refused to work on a nuclear bomb for Saddam Hussein, he was tortured for 22 days and nights, and then spent more than 11 years in solitary confinement. He was eventually able to escape and settle in England until the régime fell.

By definition, these examples of resistance are not a dime a dozen, but neither are they all that rare. One thinks of Norbert Wiener, Erwin Chargaff, Linus Pauling, Joseph Rotblat, Bertrand Russell. Chargaff in particular was a black sheep within the community as a result of denouncing his own links with the military and money (which meant that he was not put forward for the Nobel Prize that he richly deserved). He stressed "A scientist attempting a dialectical meditation on science is immediately faced with a dilemma: on the one side, the harmonious beauty of science, its orderliness, its attraction for the acute and searching mind; on the other side, the dehumanising and cruel uses to which it has been put, the brutality of thinking and imagination to which it has given rise, the increasing arrogance of its practitioners." In his view, everything comes down to a question of power: "If oratorios could kill, the Pentagon would long ago have supported musical research."

The spirit of resistance is not only a matter of saving honour, it also prevents any involvement in evil. This is why my book's conclusion is entitled "In praise of dissidence;" I describe three cases that are all the more exemplary for the fact that their interventions in affairs of state were made precisely on the basis of and in line with the values that inspired their scientific approach. Paul Painlevé intervened in the Dreyfus case, demonstrating both the incompetence of Bertillon at the Préfecture de police in handling the statistics in the case and the forgery of the famous item 96 in the secret files. Painlevé was reproached for becoming involved in the affair not just as one of the intellectuals but acting in the very name of science.

My last case is Einstein, who embodies all the contradictions of a scientist irresistibly caught in the traps of history, simultaneously a citizen of the world, "a bohemian without a country" as he labelled himself, a fighter for peace convinced that the "absence of cunning" which he saw as typical of Nature's system could serve as a model for reducing the cunning in the human system of collective relations (Gott ist raffiniert, aber nicht bösartig). Faced with the barbarous behaviour that characterised the 20th century, he that is, one fully conscious of its social responsibility and prepared to live it as Niels Bohr did. In this regard, I cannot think of a finer apologia constantly criticised the "debasement of researchers subjected to the slavery of the nation-state" and dreamed of a supra-national global organisation inspired by the values of truth and cooperation proper to the scientific method.

Niels Bohr was one of those who was fully aware of his social responsibility, both a citizen of the world and a Danish citizen. One can, one should, reflect today on what conditions must be met for a truly "civic" science to be possible – than that of Victor Weiskopf, a student and disciple of Bohr, who was the director of CERN after having taken part in the Manhattan Project: "All parts and all aspects of science belong together. Science cannot develop unless it is pursued for the sake of pure knowledge and insight. It will not survive unless it is used intensely and wisely for the betterment of humanity and not as an instrument of domination by one group over another. Human existence depends upon compassion and curiosity. Curiosity without compassion is inhuman. Compassion without curiosity is ineffectual."

APPEAL TO G-8 SUMMIT MEETING:
ACT TO REDUCE MILITARY DANGERS

The International Network of Engineers and Scientists for Global Responsibility appeal to the leaders of the G-8 summit meeting in Heiligendamm to take the following critical steps for the benefit of all humanity:

Act immediately to return to the original purpose of the United Nations in assuring the prohibition of all warfare and the strengthening of international law;

Fulfil your own obligations for good faith negotiations to achieve the urgent phased, verifiable, irreversible elimination of nuclear weapons;

Ban the sale of armaments, both small arms and larger arms, to developing countries;

Commit to dramatic reductions in military budgets and funding for military research;

Ban research in nanotechnology and genetic engineering for military purposes;

Place all space research and space exploration under the auspices of the United Nations.

Adopted at the INES Council meeting, Berlin, 4th June 2007.

Another science, other technologies are possible: Meeting the challenges

Summary of seminar organised by the International Network of Engineers and Scientists for Global Responsibilities (INES) and the World Federation of Scientific Workers (WFSW), Berlin, 31st May – 1st June 2007.

Reiner Braun, Stuart Parkinson

A couple of days before the G8-meeting in Heiligendamm, close to the end of German EU-presidency, around 70 researchers, professors and teachers, students, engineers and technicians participated in the seminar *Another science, other technologies are possible: Meeting the challenges*. They tried to tackle within two days the topic *Science in Europe*. The European science and research policy resulting from the neoliberal orientations of the governments, its consequences on the role of science and its very future were critically discussed. And a lot of questions were asked: What for instance is the divergent element between science policies in different regions of the EU like the East and the South? Is science maybe already geared to interests of the big industries?

For the first time a serious attempt was made to restart the analysis of European science and research policy. The speeches and presentations of the seminar you will find in August on www.inesglobal.com. The speakers showed that science policy is in the end quite similar in different European countries. And this is not always a good thing. Instead, science seems to be short-sighted and partly too unidirectional: Nano-, bio- and atom technologies are emphasised, meanwhile fundamental research is undervalued. Especially highlighted was the lack of democracy in some universities and research institutes that leads to dependencies of particular younger scientist and researchers.

The function and role of science and research was discussed more generally. Both are partly responsible for the huge problems the humankind is facing. Weapons are invented by scientists and engineers, new computer systems can increase unemployment and raise the productivity which again increases the environmental pollution. But on the other hand science and research can also be part of the solutions to global challenges. The scientists of the Intergovernmental Panel on Climate Change (IPCC) are only one outstanding example. What exactly sustainable science looks like was debated zealously.

Unfortunately, the dialog between science and politics as well as between science and the public is almost completely missing. But science and research are far too important fields to be left to the scientists, researchers and engineers only.

And still, one can hardly find anything about the societal relevance of science and research. Critical evaluation only takes place at the margins of research. Instead, the militarisation of science increases. And here it is often not quite clear exactly who is actually carrying out the work with the dual use problem being just one of the key issues.

The alarming elements of the analysis could be continued. But alternatives exist as well. We can often find them outside rather than within the science and research system. But they need to be recognised and can only be promoted with a radical and fundamental change of the policies inside the European countries and at the European level itself.

Many encouraging examples have been presented at the seminar. They include for instance peace research, sustainable science, climate research, sustainable land use, renewable energy research and alternative technologies

Every change requires *actors*: people that are willing to put the new and maybe better ideas into action. But they also are often missing. Encouraging projects are obstructed by apathy and conformity. Much needs to happen before science and research are again taking the responsibility to be a crucial part of the enlightened culture, so that the dominating structural irresponsibility in science stops.

The seminar was a small and hopefully motivating example. The organisers will continue their work in enhancing the responsible culture of scentific responsibility, and those of you who would like to get involved please do not hesitate to contact us. The homepages of the two organisations INES and WSFW provide further information. The documentation is coming up soon.

The Hamburg Call To Action

The World Future Council

The Hamburg Call to Action was released on May 13, 2007 following the inaugural meeting in Hamburg, Germany of the World Future Council.
More information to be found at:
www.worldfuturecouncil.org

Today we stand at the crossroads of human history. Our actions – and our failures to act – will decide the future of life on earth for thousands of years, if not forever.

Our generation will be scrutinized with exceptional fierceness by those coming after us, for decisions taken now will have profound consequences for them in terms of lives saved or lost.

The World Future Council identifies necessary policies and works to develop a new political realism, based on ethics and science and freed from dogmas which sacrifice our real wealth – our climate, water, soil, air and the health of our communities.

We seek to promote systems and institutions based on equity and justice, replacing those that perpetuate inequity and injustice. We seek equally to overturn policies that violate our future and promote best policies to safeguard our future.

We have decided to focus first on climate change, because this is no longer just an environmental issue. It touches every area of our lives: peace, security, human rights, poverty, mass migration, hunger, health, economics.

We all know what needs to be done. We have unprecedented skills and resources. Our earth receives ample energy from renewable sources, which we can no longer afford to waste, for the sunshine and wind of today cannot be harnessed tomorrow!

Natural laws supersede all others because they determine the conditions of our existence. If we do not succeed in limiting climate chaos, our earth will no longer be habitable for most of its inhabitants. Already the global water crisis is the leading cause of death in many poor countries.

It is not possible to negotiate with melting glaciers or to re-schedule environmental debts. The protection of the earth's vitality, diversity and beauty is not only a matter of political choice. It is a sacred trust.

The World Future Council is committed to protecting present and future generations from war crimes and crimes against humanity. Depleted uranium, cluster ammunition and landmines, among other weapons, are already damaging and threatening lives now and in the future. We support the initiatives working to ensure that they are universally banned.

Nuclear weapons remain humanity's most immediate catastrophic threat. These weapons would destroy cities, countries, civilization and possibly humanity itself. The danger posed by nuclear weapons in any hands must be confronted directly and urgently through a new initiative for the elimination of these instruments of annihilation.

The World Future Council speaks up for and acts to protect the interests of future generations. It will work with policy-makers and civil society worldwide to identify, draft and help implement model policies, laws and agreements to:

- rapidly phase in renewable energy technologies in all relevant areas;
- protect our forests and oceans;
- secure healthy food and water supplies while minimizing environmental impacts;
- shift funds from military to environmental security, healthcare, education and shelter;
- shift taxation from labour to resource use, pollution and waste;
- build a sustainable production, trade, financial and monetary system;
- revive local democracies and economies;
- reform global governance within a strengthened, democratised and revitalized UN system, capable of preventing war, genocide and crimes against humanity;
- safeguard traditional indigenous tribal rights, including land rights;
- contribute to reforming education in accordance with these purposes.

History reminds us that, in times of crisis, humans can take giant steps in a very short time. For example, when attacked, countries have managed to convert their entire production within months to serve the needs of the war economy. When environmental disasters struck, some peoples quickly adapted and changed their ways of life – while others failed and perished.

Our political and economic goals will from now on have to aim for the maximum of present well-being compatible with our obligations to future generations. The alternative is ethically and humanly unacceptable. For one common value has always united humanity: respecting the birthright of our children to a healthy planet.

Decisions by governments determine rules and influence our values. They enable the private sector and all of us to act more effectively. The World Future Council calls on the G8 and EU and other upcoming summits to face up to their unique responsibilities by responding actively and immediately to the planetary ultimatum we have all been given. Outdated rules and economic dogmas must not be allowed to endanger our common future. The challenge of climate change will only be overcome by global sharing of access to vital resources and technologies, ensuring clean energy, water, nutrition and education for all.

The duty of caring for our environment and future is stressed in all human faiths. From time to time our ancestors created institutions, sometimes called Councils Of Seers Into The Future, to guide their decisions. Today we again need such councils on all levels.

With its broad membership from governments, parliaments, civil society, business, science and the arts, the World Future Council will be a global voice highlighting our responsibilities as citizens of the earth and supporting the many growing initiatives working to support the planet. It does not claim to represent anyone else. It is mandated only by the conscience and integrity of its members who have joined together to fill a vital gap among global institutions.

Today there is no alternative to an ethics of global responsibility for we are entering an era of consequences. We must share, co-operate and innovate together in building a world worthy of our highest aspirations. The decision lies with each one of us!

We, the Councillors and Advisors of the World Future Council, invite everyone to participate in fulfilling the commitment we have made here in Hamburg to all children living now and in the future:

We promise to do everything in our power to help sustain life on earth with all its beauty and diversity for future generations, and to speak up for comprehensive peace and true justice between the world's peoples and countries.

Communities Building Knowledge Innovation through citizens science and university engagement

The 3rd Living knowledge conference

August 30 to September 1 2007

Paris, Cité Universitaire

Organised by FSC, the Fondation Sciences Citoyennes and the International Network of Science Shops, supported by INES, the International Network of Engineers and Scientists for Global Responsibility.

This international conference will provide a forum where information on community based research, carried out in both community and academic settings, can be shared and developed. It will reflect the social impact and scientific and democratic value of research from a range of disciplines including social, natural, physical and technological sciences. This conference will be of interest to people who are active in, or interested in, the field of community-based research. Practitioners from NGOs, research institutes and universities, science and society policy makers and students are invited to share their experiences. The themes of the conference will include:

- Participatory processes in science and technology;
- University / community engagement;
- Research policy – from local to global;
- Innovation, citizens and sustainable development;
- Transdisciplinarity and experiences of participatory research;
- Citizens' science and social movements.

The official languages of the conference are English and French. Translation will be available during the conference. The Conference will include plenary sessions, oral presentations, workshops, and a marketplace (with poster session).

During the conference, a workshop organized by INES will be held.

On-line registration for the conference can be made through the FSC website, which also provides more detailed information and the program:

www.sciencescitoyennes.org

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