Science, the Basic Problem and Human Security:

or

What Is To Be Done[1]?

Invited Talk at the Roundtable on

Human Security Research: Achievements, Limitations and New Directions

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SUMMARY:

It is argued that we are in the midst of what may be the greatest revolution in human history. After a very brief re-statement of the resulting 'Basic Problem', the question is addressed: "What can we do, and what should we do?" The short answer is: we should study the five families of issues which must be mastered if we are to have any chance of avoiding, or coping with, a catastrophic civilization-changing event (or events). The problem is profound and urgent, and it may be that gradual, incremental improvements will not be sufficient, and that some very fundamental changes will be required. On the positive side, it may be that if this difficult but relatively well-defined problem can be successfully addressed, it may open way to deal with the much more difficult challenges of Human Security.

Apparently, the very first Conference on "Human Security and Science & Technology" took place in Vienna, October 2001. In his opening statement, Carlos Magarinos, UNIDO Director general, pointed out that – while preparing for the speech, he reviewed published materials on Human Security, and found nothing on Human Security & Science and Technology.

So I repeated the exercise, seven years later, and found that not much has changed. I found just one additional Conference (in Seoul, 2004) and even there, the issues that seem to me to be the Basic Problem, fundamental and urgent, have not been addressed. Therefore I very much appreciate the opportunity to present the issues as I see them, together with an outline of the steps which should be taken.

I. The Basic Problem

The main ideas on what I call the Basic Problem originated from my teaching of courses on Science and Society[2] since 1999. In our understanding of nature (science), and in the application of that understanding (technology), we are acquiring powers that will soon become truly god-like. The range of potential benefits is mind-boggling. Progress in Physics, Molecular biology, Computer science and other disciplines has already transformed the material conditions of human existence, and the implications for the future are truly astonishing. It may be possible to eliminate many if not most diseases, extend human life, solve the energy problem, solve the poverty problem, perhaps even achieve the lofty goals of Human Security….

However, our ability to use this power wisely has not increased correspondingly. For the first time in human history, the capability of causing extreme harm is, or will soon be, in the hands of individuals or small groups. This is the 'Basic Problem'. The actual manifestation of the problem will come as an intentional or accidental misuse of our new powers. Details and examples are discussed elsewhere[3] - for now it should suffice to imagine an accidental release of the newly reconstructed 1918 Spanish Flu virus, or an intentional release of a strain of smallpox engineered to be resistant to the existing vaccine.

The problem has a strong ethical component, but primarily it is a problem of foresight. Our ability for technical progress is remarkable, and equally remarkable is our inability to foresee the unintended consequences of our actions (or inactions). In fact, we are not really interested in thinking about the long term consequences - this would slow down our 'progress', so it is left to a few 'professional' futurologists.

And yet, it may be that without a radical change in our attitude we are heading towards a catastrophe which would be a truly 'civilization changing event'. This formulation is due to Bill Joy whose article caused an all-too-brief surge of interest in these issues a few years ago. More recently, Sir Martin Rees, British Astronomer Royal, estimates in his book *"Our Final Hour"* that the probability of our Civilization surviving the 21st Century is 50/50. Anyone who knows Sir Martin can testify that he is not an alarmist.

It may well be that - if we are lucky - there will be a wake-up call. A medium-scale accident or terrorist attack, with perhaps several millions of fatalities, might convince people that we have to change our ways. In fact, out of the few who spend their time thinking about this, most are convinced that this scenario is our only chance.

However, from an ethical point of view, it would seem wrong to wait for millions of people to die before we start thinking about the long term future. Even more importantly, considering our response to the relatively small-scale attack of 9/11, it is perhaps naive to expect that our response to a large-scale disaster will be rational.

On the other hand, many proposals which are "out of the question" today, may suddenly seem as "this is the least we can do" after a real wake-up call. But such proposals and options have to be prepared, thought through in advance. In the aftermath of a major disaster, this preparatory work may turn out to be crucial.

So what can we do? In the JANUS essay (Ref. 2), several distinct but interconnected tracks are outlined: education, risk assessment, defensive measure against particular dangers, and strengthening of international law. A comprehensive effort along these lines will have to be a truly interdisciplinary enterprise, combining results from the 'hard' sciences with contributions by economists, social and political scientists and Humanities in general. Here are some additional notes; comments, criticism and contributions of additional links and references are solicited (to vladi@u.washington.edu)

II. What Is To Be Done

1) Education:

I asked a biology major, in her senior year, what courses or lectures about the dangers of molecular biology she might have attended, and she said: 'What dangers?' More education is clearly needed: education of the general public about science, as well as education of scientists (and scientists-to-be) about the need for social responsibility and foresight.

This will not be an easy task. The new UW President sent out an EMAIL encouraging anyone who has anything to say to send him a note. So I wrote University of Washington President Dr. Emmert a letter arguing that courses on foresight should not be just optional but *required* from all students, first at the undergraduate, then again at the graduate level. Suppose I am successful, and the UW administration takes interest in this project. Who will teach all these new courses[4]?

The project to improve on the situation is difficult but not hopeless nor unprecedented. Many of the top Universities (Harvard, MIT, Cornell, Stanford, Princeton and others) do have a Science, Technology and Society (STS) program or an STS track[5]. At the University of Washington, there is a Proposal[6] in this direction. There is also a proposal, at our Henry M. Jackson School of International Studies, to introduce at STS undergraduate track, as well as a new graduate (Master) degree to accompany a Master or PhD degree in a scientific discipline such as Physics or Biology. We also hope to create a community of scholars interested in discussions and research of these issues[7].

The most important part of the education effort is to include both Science and the Humanities (including Political Science!) – neither scientists, nor politicians or philosophers can figure it out on their own!

2) Risk Assessment

The Genome project is proud to have dedicated 3% of its budget to ELSI: Ethical, Legal and Social Issues. 3% is not a large fraction, and I am afraid only a small fraction of it went to the issues of foresight and risk assessment (I will leave it to reader's imagination where a good fraction of the ELSI funding went: the choices are ethical, legal and social ...).

At the other end of the spectrum, even the certified technology enthusiast and optimistic futurist Ray Kurzweil has proposed - in an unguarded moment, I suppose - that *"for every dollar we spend on new technologies that can improve our lives, we spend another dollar to protect ourselves from the downsides of those same technologies"*. I am not sure that 1:1 ratio is what we should expect (certainly not in all fields across the board) but our attention to the issues of foresight and unintended consequences should go up by at least an order of magnitude.

3) Defensive and Preventive Measures against particular dangers

This family of issues consists of four distinct categories:

a) *Intentional acts*

This addresses terrorism and other evil acts, so much of the existing effort is being done by the military[8] and is classified. The Basic Problem Bibliography contains several starting points for what is openly available. This category should be split between the acts of the mentally deranged persons and plain criminals, and the acts of groups with legitimate grievances, who see terrorism as their only weapon against a superior enemy. For the latter category, a difficult problem is how to address the grievances which are at the root of a particular terrorist attack, without encouraging other groups to resort to terrorism in order to get *their* grievances addressed. For the most part, our current approach to this problem is not to address the roots at all.

b) *Accidents*

Here we are doing what we can, which is not much. Accident prevention is very difficult, and accidents do happen. Between 1955 and 1963, *millions* of Americans were injected with the polio vaccine contaminated by the monkey virus SV40 (this time, we were just lucky - it seems (but it is not certain) that this one turned out to be harmless ...).

The difficulties are especially serious with powerful modern techniques becoming available to states with otherwise low level of technological maturity, stability and responsibility, and even to small groups and individuals. And in many scenarios, the consequences of an accident will be not local but widespread or possibly global. In the long term, and borrowing the clever nomenclature of Martin Rees, I believe that *bioerror* is more of a threat than *bioterror*.

c)   *Unintended consequences*

This is a broad category involving all kinds of consequences of our actions or inactions. A prime example is the climate change or "global warming", predicted as a consequence of our burning of fossil fuels. Possibly even more serious problem is the (impossible) task of bringing the currently 'developing countries' on the consumption level of the current 'developed' countries – the simple arithmetics documenting the impossibility is pointed out by Jared Diamond in his recent NYTimes article[9]. It is hard to resist pointing out that the worry about unintended consequences has been an important part of the "original " neoconservative program, as represented by thinkers such as Irving (but not by William) Kristol.

Natural catastrophes

It is enough to look back at the flu pandemic of 1918 (about 20 - 50 million fatalities worldwide) or at smallpox (200 - 400 million[sic] fatalities in the 20th century, before smallpox was eradicated) to appreciate the scale of naturally occurring catastrophes.

As the inept management of the Katrina hurricane demonstrated, our society is ill equipped to foresee even events which are predictable – another example with potentially much more serious consequences may turn out to be the avian flu[10] (the H5N1 virus first infected humans as early as in 1997 …). A possible abrupt climate change[11] would be equivalent to another dramatic, global, "civilization-changing event".

4) Coping with the aftermath

It is probably inevitable that sooner or later a large-scale upheaval will happen, even with the most precautionary attitude. For the sake of the recovery from such an event, it is imperative to significantly decrease the vulnerability of our society to disruptions and shocks. It is instructive to recall the scope of the Y2K panic – and that change of the date was a minuscule problem. Even the September 11, 2001 attacks would pale in comparison with a truly large disruption such as a nuclear or biological attack or a deadly epidemics. And yet, our response to 9/11 was hardly rational, and one shudders contemplating our response to a truly massive disruption.

William Calvin ends his speech (ref. 9) on this subject by pointing out *"…how difficult it is to make people aware of what must be done and get them moving in time. It's going to be like herding kittens, and the political leaders who can do it will be remembered as the same kind of geniuses who pulled off the American Revolution"*. I have been using the analogy to the task faced (and solved, at least for a while …) by the "Founding Fathers" for a long time now, in a broader context (see below).

5) Reform and strengthening of the International Law

This is, in my opinion, the most important task. I believe that it is a necessary (not sufficient - just necessary) condition if we are to have any hope to make it through this technological bottleneck. We must find a way to install the rule of international law, strong enough to be commensurate with the danger we are facing. Without it, we *must* invade Uganda if we obtain solid intelligence that someone in Kampala is cooking

something deadly in his basement and the government there is not willing or able to look into that. And we will have to do the same in Malyasia, Uzbekistan, Colombia ... - anywhere, eventually including huge, strong countries such as e.g. China should it turn out that China is too lax controlling its biomolecular research and applications. Rule of international law is not sufficient - the problem will still be formidable[12], but it is hard to see how we can even think of avoiding large-scale catastrophes without it.

I find it inconceivable that say in the year 2305 there will still be more than a hundred of independent, fully and absolutely sovereign nation-states, some huge, some large, medium, small or miniature, and every single one of them capable of causing extreme, global harm – intentionally, or by careless implementation of their "sovereignty". In this year of celebrations of the centenary of Albert Einstein's *Annus Mirabilis* we might recall that Einstein spent much of his life thinking, writing and speaking about the necessity of a "supranational government". Rather than to dismiss his ideas as an example of how naïve a physics genius can be in political matters, we would be well advised to think about what he would say today, when our technological powers has increased immeasurably, and still without any noticeable increase in wisdom and foresight.

Obviously, any form of a truly "supranational" government is out of the question for the foreseeable future. But equally obviously, any meaningful reform will have to include a redefinition of national sovereignty, and the difficulty of any progress in this direction is staggering. The spectrum of opposition ranges:

[ ] from the gun-rights websites accusing everyone, including the US government, of conspiracy

[ ] through our current government approach to international issues[13]

[ ] all the way to the deeply ingrained American sense of independence.

Achieving a thorough reorganization of the present system will be exceedingly difficult but it is inevitable. These arguments are more fully discussed in my Iraq essay - read the Addendum carefully to see that this is *not* a partisan problem. Unfortunately, it is much deeper than that!

Also unfortunately, the possibility (existing after 9/11, now squandered) of rebuilding the United Nations seems to be gone for the foreseeable future: the recently published recommendations by a UN commission for the reform of the Security Council don't even begin to address the major issues (e.g. it is still proposed that the existing five permanent members will keep the right of veto, and the rule which gives India (population 1 billion) and Tuvalu (population 9,000) one vote each will continue to paralyze the General Assembly).

It may be that a fresh start is required. Something like a "Federation of Democratic Nations" - an enlightened version of the "Coalitions of the willing" advocated by the current neo-conservatives - may be a possible alternative. This, together with the concept of "global transparency", may have a chance of gradually overcoming our (and other nations') obsession with unrestricted sovereignty. Many aspects of the development of the European Union look encouraging, but there are many fundamental problems with their approach, too.

Much hard work and creative thinking lies ahead, and time is of the essence. We need to figure out an arrangement of human affairs which would be able to cope with intentional or accidental misuse of science and technology. This does not have to be a World Government, World Federation or Global Governance, and we don't have to address all the topics currently being discussed under the heading of Human Security. All these commendable efforts will take much time which we don't have – first we have to figure out, urgently, the much more limited but still extremely difficult reform addressing the issues of Science and Technology. As noted above, this will require the cooperation of hard sciences, political science and economics, philosophy and Humanities in general, and of course politicians and informed citizens - a formidable task. Considering that currently the effort in this direction is almost nonexistent[14], the question is whether we manage to figure this out before it is too late. And I believe that, in fact, this relatively well defined task, if successfully solved, might very well overcome many of the obstacles currently making the more general issues of Human Security look hopelessly unsolvable.

III. Discussion

The Dual Role of Science and Technology

Modern science and technology plays a key, and dual, role in all of this.

On the one hand, it is the science and technology which amplifies our follies and exceeds our wisdom, and thereby threatens us all. And, as Vaclav Havel points out so eloquently, it is foolish to think that we can always find a technological fix to the problems caused by science and technology in the first place. On the other hand, it is in the wise use of science and technology that we can hope to find answers to many problems facing us. Sometimes we hear "radical" notions of going back to the hunter and gatherer society, but such naive idealizations of Nature are misguided: Nature is rough and merciless, and our ability to think distinguishes us from animals. As discussed above, there are many natural hazards capable of causing extreme harm, ranging from the inevitable pestilences coming our way[15] all the way to low probability catastrophic events such as a collision with an asteroid, and science and technology will be key to avoiding and/or mitigating those threats.

For the Marxist-Leninists (it seems so long ago ….) the driving force of the history was the economy. The current neo-conservatives claim that history is driven by "the ideas". Rather, it appears that the real driving force of History will be Science and Technology, and to survive we may have to re-think and re-define some very fundamental concepts, quite possibly including the sacred concepts of sovereignty, freedom, privacy and democracy. In particular, the explosive, exponential progress in Science and Technology will bring about a revolution in the theory as well as in the practice of international affairs.

Human Security and the Basic Problem.

The new field of "Human Security" basically transfers the concept of security from the level of states to the level of individuals. The new view appears to have been fully developed for the first time in chapter 2 of the 1994 UN "Human Development Report",

and since then it has spread to Universities and think tanks worldwide. Two major schools have emerged: some scholars emphasize the "Freedom from Fear", while a broader, more ambitious agenda is described as "Freedom from Want". By and large, this movement is idealistic – in the best sense of the word: it is based on wishes for a just and sensible arrangement of human affairs. It seems to me that many aspects of the Human Security program will be – very soon – forced on us by Science and Technology, and when I say forced, I mean – with the full force of a law of Nature! In other words: before we address freedom from want and freedom from fear, we should deal with the third imperative: freedom from a catastrophic setback, i.e. freedom to continue as a functioning civilization.

Underlying problems:

From the many concrete, specific difficulties underlying the Basic Problem, the foremost one is overpopulation. It seems to me that 6 billion people – not to mention the 9 plus billion expected in the not so distant future - is definitely incompatible with all of them achieving the material conditions currently enjoyed by the "developed" minority. The resulting scarcity and competition for resources (oil/water/…) is certain to drive not just nation-states, but also the now empowered individuals to actions which are bound to have far-reaching consequences.

In addition, overpopulation - together with the recent awakening of giants such as China and India, and expected awakening of Africa and Latin America – will produce environmental effects of monumental proportions, ranging from pollution of the air and water, all the way to the possible climate change. Optimistic technocrats are confident in our ability to find technological solutions – I wish I could share that optimism!

Although an extrapolation of the current struggle with the extremist, militant Islamism into a "Clash of Civilizations" may be going too far, any such large-scale ideological conflict – when combined with the empowerment of individuals by modern science – is bound to produce far-reaching consequences[16].

Scope, scale and nature of changes needed:

It is a discouraging fact that most people do not see the danger on the horizon, and when it is pointed out, they react dismissively. [cf. reaction to Bill Joy].

Unfortunately, many thinkers who do see the problem propose solutions which can hardly be expected to produce the changes needed. An interesting example is that of the Czech playwright, amateur philosopher and former President Vaclav Havel.

In fact, it may well be that in order to be able to maximize the benefits from science while minimizing the dangers, we will have to rethink not just the concept of national sovereignty, but other fundamental issues such as freedom, democracy and privacy. This will require a more intense and serious effort than that provided by a typical "think tank" or two. We need to take lessons, both positive as well as negative, from our UN experience, specialized international agencies such as e.g. International Atomic Energy Agency, as well as from the experience of building the European Union. I always compare the necessary development to the brilliant achievement of the Founding Fathers of the United States. They did not hope for, or rely on, an improvement of human nature. Instead, they took the people as they were, with virtues and vices, and designed a system

which has – so far – worked out very well. Something like this has to be accomplished on global scale …

The positive aspects

The concerns about the misuse – accidental or intentional – of Science and Technology could have an optimistic resolution. Elsewhere, I have compared the present stage of history to the birth pangs – birth pangs of a true Civilization. As a sage said: what does not kill you makes you stronger. If we do manage to survive the bottleneck, the future may be bright indeed!

IV. Conclusion

Some time ago, a "professional thinker" and political scientist Francis Fukuyama wrote a book "*The End of History*". He argued that the collapse of communism left the liberal capitalism as the only, non-contested option for the mankind, ending the struggle of various ideologies and thereby ending History as such. It seems to me that not only is History not over - it is just beginning! The struggles between various ideologies which seemed so important to the contemporaries will be seen as mere skirmishes of pre-history, as the birth pangs of our Civilization. The 18th century is now remembered not for the exploits of Frederick the Great, but for the music of Johann Sebastian Bach. The 19th century will be remembered not by the Communist Manifesto, but by Maxwell's unification of electricity, magnetism and optics, and by Darwin's Origin of Species. Similarly, the 20th century will be remembered not by all those political and military events which seemed so momentous at the time, but for the discovery of Quantum Mechanics and for the deciphering of the genome. Our task in the 21st century is to arrange our affairs so that we deserve the name *Homo Sapiens* which we so expectantly gave to ourselves.

[1] Readers well versed in the history of political philosophy will have recognized the subtitle of this essay as identical to the title of the most famous piece by my infamous namesake. Well, he was a rebel, and so am I. But the similarity ends there, I hope.

[2] See my original JANUS essay (now somewhat outdated at places) at http://www.phys.washington.edu/users/vladi/janus.doc or a more recent sample lecture.

[3] www.phys.washington.edu/users/vladi
[4] For a report on a new and – I think – novel course on science and Society, see www.phys.washington.edu/ysers/vladi/TeachingPHIS216.doc

[5] See the JSIS Qualifying Paper by Grant Twitchell for an overview and discussion of existing STS programs. An interesting example is the program granting Bachelor of Science (BS) Degree in Integrated Degree in Engineering, Arts, and Sciences at the Lehigh University. Their description points out that **"**the complex challenges and problems confronting us in the 21st century dramatically underscore the importance of liberally educated and technologically sophisticated individuals whose habits of thought are thoroughly, comfortably interdisciplinary."

[6] http://www.phys.washington.edu/users/vladi/stsuw.doc

[7] See e.g. the Agenda of the Workshop on "Science: Breathtaking promise and dangers. Can Humanities help?" at www.phys.washington.edu/users/vladi/ssnet/workshop.doc

[8] On the subject of the military, I must note a recent article pointing out the profound impact of science and technology on the armed forces from a novel point of view – see http://www.phys.washington.edu/users/vladi/science_technology_and_war.html .

[9] http://www.nytimes.com/2008/01/02/opinion/02diamond.html?ref=opinion

[10] For a sobering account of the possible avian flu pandemic see http://www.liebertonline.com/doi/pdf/10.1089/bsp.2005.3.9

[11] For a compact account of the abrupt climate change scenario see a speech by William Calvin at http://williamcalvin.com/2002/PBK.htm

[12] Sir Martin Rees notes in his "Our Last Hour" that
[13] Just a few remarks to the current situation:

United Nations is an inefficient organization: 40 of its 191 Member "States" have fewer than one million citizens each, and the Security Council is an archaic institution set up as a result of WWII. After September 11, we had an unprecedented opportunity to use our enormous weight, together with the sympathy of the whole world, to achieve deep and significant reform and strengthening of the UN - we could have literally rebuilt the organization. Instead, we have damaged it. This comes at the worst possible time from the point of view of dealing with the 'Basic Problem'. The Sisyphus rock has slipped quite a ways down the mountain ...

The damage done to the UN is acknowledged, sometimes even celebrated, by people responsible for our actions. The article in the Guardian on March 21 by Richard Perle, member of the Defense Policy Board and a close advisor to the Bush Administration, has the unambiguous title *"Thank God for the death of the UN"*. As Mr. Perle belongs to that very small group of officials and thinkers who designed our present policy, it is worth it to look into their state of mind in some detail:

"The 'good works' part will survive, the low-risk peacekeeping bureaucracies will remain, the chatterbox on the Hudson will continue to bleat. What will die is the fantasy of the UN as the foundation of a new world order ....."

"..... dangerously wrong idea that leads inexorably to handing great moral and even existential politico-military decisions to the likes of Syria, Cameroon, Angola, Russia, China and France."

"This new century now challenges the hopes for a new world order in new ways. We will not defeat or even contain fanatical terror unless we can carry the war to the territories from which it is launched."

"We are left with coalitions of the willing. Far from disparaging them as a threat to a new world order, we should recognize that they are, by default, the best hope for that order, and the true alternative to the anarchy of the abject failure of the UN."

I find these ideas incomprehensible. Imagine a new world order in which the "likes of China" will organize a "coalition of the willing" to deal with Taiwan, then perhaps the US will organize a coalition of the willing to deal with China ..... . And what territory shall we "carry the war to" if one day a terrible epidemic of a new, deadly disease erupts simultaneously in New York, Chicago and Los Angeles?

This attitude towards world affairs is now part of official government documents. While it theorizes about meaningless concepts of "full spectrum dominance" based on our (current) lead in science and technology, it ignores the fundamental revolution by which science and technology is bringing extreme destructive capability within reach of small groups or even individuals.

[14] An example of a program which does try to address the issue is the Belfer Center for Science and International Affairs at Harvard. From its description we quote:

"The Center's leadership begins with the recognition of science and technology as driving forces transforming threats and opportunities in international affairs. The Center integrates insights of social scientists, natural scientists, technologists, and practitioners with experience in government, diplomacy, the military, and business to address critical issues."

[15] An almost unnoticed event illustrating that our government may be ready to start paying serious, comprehensive attention to the Basic Problem is the "*Manhattan Project for the 21st Century*" launched by the Senate Majority Leader Bill Frist, M.D. – see http://frist.senate.gov/_files/060105manhattan.pdf :

"How would we react to the devastation caused by a virus or bacteria unleashed not by nature, but intentionally by man? ... In such circumstances, panic, suffering, and the spread of the disease would intensify as – because people were dead, sick, or afraid – the economy would become crippled, electrical power would flicker out, and food and medical supplies would fail to move. Over month or perhaps years, millions might perish, with whole families dying and no one to memorialize them. ..... Is such scenario possible? ..... No intelligence agency, no matter how astute, and no military, no matter how powerful and dedicated, can assure that a few technicians of middling skill using a few thousand dollars worth of readily available equipment in a small and apparently innocuous setting cannot mount a first-order biological attack. Unfortunately, the permutations are so various that the research establishment as now constituted cannot set up lines of investigation to anticipate even a small proportion of them."

There are at least four aspects of this article which are remarkable, plus one sentence which seems to me far out – I like to challenge my students to find out what I mean by this …

From the other side of the Atlantic, I was excited to find a tantalizingly promising, general view of the situation in Robert Cooper's (former adviser to Tony Blair) Preface to his book "*Breaking the Nations*:

Order and Chaos in the 21st Century":

> "*The spread of the technology of mass destruction represents a potentially massive redistribution of power away from the advanced industrial (and democratic) states towards smaller states that may be less stable and have less of a stake in an orderly world; or more dramatically still, it may represent a redistribution of power away from the state itself and towards individuals, that is to say terrorists or criminals. If proliferation were to take place in this fashion it would be not only the Western governments that would be losing control, but all those people who have an interest in an orderly world.*
> 		*…. Emancipation, diversity, global communication – all these things that promise an age of riches and creativity – could also bring a nightmare in which states lose control of the means of violence and people lose control of their futures. Civilization and order rests on the control of violence: if it becomes uncontrollable there will be no order and no civilization.*
> 		*The three essays in this collection are indirect reflection from different angles on this situation and on what can be done about it.*"

Unfortunately and inexplicably, the essays which follow this promising Preface do not really address the problem at all …

[16] The US reaction to the 2003 speech of Dr. Mahathir Mohammad, then Prime Minister of Malaysia, is an example of the profound misunderstanding of the issues by the media and politicians – see an essay at www.phys.washington.edu/users/vladi/sts/BriefTour.doc

An Initiative on Science and Human Security.

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SUMMARY

At the recent conference on "*Human Security Research: Achievements, Limitations and Future Directions*" at Bristol, we agreed that many important and urgent issues of Science, Technology and Society are not being adequately studied by the current research in Human Security. The proposed Initiative aims at strengthening this critical area.

Modern science is an awesome, exciting adventure. In our understanding of Nature (science), and in the application of that understanding (technology), we are acquiring powers that will soon become truly god-like. The range of potential benefits is mind-boggling. Progress in Physics, Nanotechnology, Molecular biology, Computer science and other disciplines has already transformed the material conditions of human existence, and the implications for the future are truly exciting. It may be possible to eliminate many if not most diseases, extend human life, solve the energy problem, solve the poverty problem, and address the environmental concerns and other material problems of the Human Condition.

At the same time, many thinkers have pointed out the ever-increasing gap between the cumulative, exponential progress in science and technology on the one hand, and on the other hand, the lack of comparable progress in our ability to use our new technological tools thoughtfully and responsibly. This gap cannot keep increasing forever. Albert Einstein expressed his concern when he said: "*The release of atom power has changed everything except our way of thinking*" and one can only imagine what he would say today. Some people think that we might be in the process of acquiring powers that we should not have, and that catastrophic consequences are not only possible, but probable or even inevitable. The key, and novel, aspect of this is the possibility of *global harm being produced by individuals or small groups of individuals* – up to now, this was the domain of large entities such as

nation-states.

        In this project, we will investigate the multiple and fundamental interconnections between modern science, technology and Human Security. We will also explore the premise that an informed, educated citizen ought to know enough about science to be able to appreciate the enormous potential benefits, as well as the possible dangers, which science represents, and the implications of this premise for our schools and Universities. In some sense, our approach broadens the concept of Human Security and addresses the needs of Humanity Security as well.

        In order to perform this task, we will assemble an international, highly interdisciplinary – or rather: transdisciplinary – team including practicing physicists, biologists and other "hard" scientists, as well as political scientists, philosophers and other representatives of the Humanities. This represents a new approach to some very fundamental, difficult and urgent problems, and the details on the choice of specific topics and on the methods to be used, will emerge as we go along.

        Some initial thoughts include:

1)   Strengthening of the education on the issues of Science, Technology and Society.
a)   We believe that there will be strong demand for graduates with competency both in a specific scientific discipline, as well as in the political science, international affairs or other branches of the Humanities.
b)   At the same time, it may be difficult but not quixotic to start working on instituting a requirement that *every University graduate* should have at least one course on foresight in Science and Society.
2)   Considerations of the balance between maximizing the benefits to Human Security, and minimizing the risk which Science and Technology brings. Studies of the metrics used to quantify the benefits, and of the risk assessment methods.
3)   Case studies of specific scenarios, especially of defensive and preventative measures against intentional acts, accidents, unintended consequences and natural catastrophes.
4)   Reform and strengthening of International Law, to be commensurate with the power of modern Science and Technology. This is probably the most crucial problem to solve. We note that this does not in any way advocate instituting any form of a "world government". Still, considering the current obsession of the United States, China, Russia and others with unrestricted national sovereignty, any meaningful reform may also be the most difficult problem to deal with.
5)   Even more generally, it will be one of the main tasks of the project to figure out how to deal with the "democratization of science" mentioned above, which gives enormous power to individuals. Preventing catastrophic misuse of these new powers, without sacrificing the benefits which widely-available science and technology can bring, may require a re-thinking of some very fundamental societal arrangements and concepts.
6)   Even if we take all possible precautions (which is unlikely, and probably would be unwise) we are sure to experience violent upheavals. Since after such an event rational thought will be in short supply, it is necessary to think about dealing with these problems ahead of time.

General Notes:

[ ] One particular byproduct of this effort, valuable on its own, should be to find and improve common language between scientists and Human Security scholars

[ ] Another general goal will be to improve public understanding of the issues: avoiding excessive reliance on technological solutions to problems caused by technology in the first place, while guarding against unjustified fears and mistrust of Science and Technology.

[ ] We believe that the general spirit of such a collaboration should be an emphasis on foresight, and on systematic and patient search for unintended consequences of all human actions (and inactions).

[ ] Overall, the project should have a high academic level, but participants should not enclose themselves in an "ivory tower". The ultimate result of better understanding of the issues should include *specific policy recommendations*.

[ ] Perhaps the most important aspect of this Proposal is not the list of particular topics, but the *new mindset* emphasizing the recognition of the challenge in front of us, and advocating close collaboration between Sciences and Humanities to deal with the challenge.

Obviously, the ambitious goals of this vision will not be accomplished by one think tank or two, in a year or two. However, the issues of proper use of Science and Technology are fundamental and urgent, and it is hoped that this Initiative will inspire a significant number of scholars and scientists to contribute, on a broad and international basis.