Address of Prof. Matthias Kleiner (President of the German Research Foundation, DFG) on the occasion of the ICSU General Assembly in Rom, 27.09.2011

Integrated Science
Research Across Borders

Dear
Prof. Profumo
Prof. Bréchignac
Prof. Lee
Dear distinguished guests, friends, Ladies and Gentlemen

The 11th of March 2011 was a day which will be remembered for a long time – worldwide, but particularly in Japan. In the wake of the Tohoku earthquake with a magnitude of 9.0 on the Richter scale, a gigantic tsunami struck parts of the Japanese east coast. Not only did it lead to disastrous destruction and many casualties, it also caused the loss of control over the Fukushima-Dai-ichi nuclear power plant and subsequent radioactive contamination of densely populated land around it.

It instantly demonstrated that even – or even more so? – in a highly organized, industrialized country disasters can strike and lead to uncontrollable situations.

In Germany, it induced a renewed discussion about the future of the nuclear industry. As a consequence, the German Chancellor Angela Merkel established the independent *German Ethics Commission for a Safe Energy Supply* composed of representatives from politics, industry, clergy, civil society and science. It addressed the task of balancing reasons for and against a continued utilization of nuclear energy in Germany as well as calculating chances and challenges of alternatives in the energy sector. Although a comparable failure as it occurred in Fukushima is improbable in Germany, the incident has raised questions about limits, infinity and finiteness and what we can and should take responsibility for on the one hand – and what, on the other hand, is beyond human capacity. Fukushima confronted us with the vulnerability of modern and highly developed society and our restricted power.

Among experts the opinions on how to deal with threats which for example the deployment of nuclear power includes cover a range from adaptation to mitigation. Also, the German commission followed this line of thought. Its recommendation to discontinue the use of nuclear energy in favor of regenerative alternatives is – of course – discussed controversially with the perception of this decision ranging from courageous to irresponsible.
Whatever the opinion on that topic may be, it certainly shows that a society is willing to leave its comfort zone and to cut back in favor of safety and the Earth's future – no matter if the threat is anthropogenic or natural. The process and the decision also indicate that the political scene has started to realize that integrated scientific questions require integrated approaches to address them. This holds true not only for many forms of technological or medical progress, but likewise for societies' interaction with their natural environment, resources and the manifold consequences of global change.

Numerous scientists have provided evidence that population growth and our economic success are increasingly challenging the resilience of the planet. Human activities start to breach the buffering capacity of the Earth. We have to become aware more and more that infinite growth is impossible within a finite system.

We, from our side as scientists, cannot and must not ignore these developments. We need to respond by generating scientific evidence, developing alternatives to our current growth path, establishing a social dialogue and creating politics for a sustainable use of our planet. In short:
We need a constant dialogue between science and society – an approach which has been propagated for some time now. Former ICSU President Jane Lubchenko argued in favor of a new social contract for science as early as 1998. Judging from the developments since that time, one can only underline the importance of this idea. Such an understanding is needed more than ever.

Science has neither national nor thematic limits and ICSU represents a living example for this universality of science. It fosters international research collaboration by sponsoring scientific programs generating policy relevant information. Particularly the latter aspect gains significance in view of continuous population growth which demands the conversion of more and more of the Earth's natural habitats, thereby threatening its own stability. One may well argue that global environmental challenges are in essence a social predicament.

Consequently, future discussions on the environment should not be confined to the point of view that the environment is a natural domain, excluding human life. Humans are an integral part of the biosphere and alter it just through their existence, needs and behavior – may it be for better or worse.
Nobel Laureate of Chemistry Paul Crutzen already recognized this more than 10 years ago and coined the term "Anthropocene" – separating our present time since the industrial revolution from earlier geological periods. With this term he intended to depict the current geological period as considerably different from earlier periods. The "geology of humankind" will leave long lasting footprints, some of which may even be irrevocable on the Earth's surface.

If one has understood this interrelationship, it seems logical that the Grand Challenges of humankind associated with global environmental change (e.g. climate change, food security, biodiversity etc.) call for an integrated approach of research and the consultation and acknowledgement of expertise from all faculties: The humanities, social and natural sciences to co-design international research programs capable to come up with sound scientific results which are applicable in policy decision-making processes.

If this can be achieved by the scientific community, then science will become an even more integral and more important part of the societal discourse aiming at what almost 20 years ago in the Rio conference was termed "sustainable development".
In this way the rich treasure of knowledge of scientists can help to support responsible decisions for the future development of the planet.

During the last two decades the awareness of both environment and its need for protection has unfolded more and more effect on the societal and political understanding in Germany. Consequently, Germany's Chancellor Angela Merkel made clear during the G8 summit in Heiligendamm in 2007 that the country would be committed to do its share to reduce global change as much as possible. Numerous research programs have been launched by German ministries and funding organizations to pursue this objective.

Many years ago already, DFG established a National Committee on Global Change Research which has been actively promoting integrative research nationally and internationally ever since. It is also integrative in its structure as reflects its composition of members who represent the four global environmental change programs. Other commissions like the DFG senate commission for biodiversity research and scientific advisory boards of the German parliament and government have also called for international, cooperative and integrated research programs.

An increasing number of scientific experts ask for a new *Social Contract for Sustainability* and a remodeling of economies and societies towards sustainability. Civil society, politicians and scientists need to join forces in order to develop ways in the coming decades to establish low-carbon societies. In this context even a new approach to research may be necessary. The *German Advisory Council on Global Change* suggests the establishment of new research disciplines – *transformation research* and *transformative research*. Transformation research will particularly investigate the future challenges of transformation, whereas transformative research actively **advances** transformation.

With this in mind, the demand for an alteration of the incentive system for scientists is required and interdisciplinary transformation research needs to be specifically supported next to disciplinary research, which – of course – will remain the basis for all integrative research. Since such an approach is of limited value if it is conducted in a single country, it is indispensible to get globally active scientists and scientific organizations involved.

As you all know, the international scientific communities have seen the need to foster this development. Consequently, ICSU, ISSC as well as the Belmont Forum – a network of major funding agencies – have initiated a visioning process which is intended to develop interdisciplinary international research programs. For this purpose funding organizations as well as governments need to provide funding for the required research.

DFG is one of the largest independent funding organizations for all disciplines worldwide and is involved in these developments of integrative global change research. Consequently, DFG welcomes closer cooperation with international partners.

In the past, we have supported the secretariats of various ICSU programs as well as several of their research projects within the framework of our normal funding structure. As a result of the ICSU visioning process we anticipate that programs will be adjusted to better cater for the desired integrative projects. For such integrative international research programs substantial additional funding will be required.
In recent years, the DFG has gained experience with various forms of joint funding, for example, with partners from the G8 countries for specific topics based on the lead agency principle. Similar activities have been in place for a number of years in cooperation with several European countries. We will be happy to include other partners in future schemes.

Based on observations from the international science community and on our own experience, I think that we need a social-ecological understanding that encompasses social and environmental justice as well as a long term uninterrupted provision of ecosystem services rooted in sustainability.

To establish such an understanding in society, results of integrated research may provide the required evidence to include it into our value system. Thus, more policy makers could integrate the numerous possibilities of sustainable ecosystems and the long term benefit of such endeavors in their long-term decision making.

However, in order to draw the attention of political leaders, we – the scientists – have to be more daring ourselves.
It is not enough to conduct good or even excellent research and publish it in very specific, but to the common public hardly accessible journals. We also need to do research – trans- and interdisciplinary research – which in an innovative fashion provides knowledge that helps societies find answers for the problems of global environmental change. Results from such studies need to be translated into strong recommendations for decision makers and thereafter appropriately translated into political action.

Not all scholars consider this aspect to be a responsibility of scientists. And from a purist point of view this may indeed not be the case. My own research field of production technology is a vivid example.

One class of experts focuses upon a deep understanding of the interrelationship of various parameters in a complex production process, with the goal to optimize it. Others concentrate on completely novel production processes and evaluate the advantages of such an approach. In any case, we need both, optimization and innovation. And as an engineer I might add: Application of scientific results confirms that “the proof of the pudding is in the eating”.

With regard to the idea of science as an important force alongside politics and economics, one has to abandon the purist path at times in order to allow innovation which builds a broad scientific knowledge base for complex policy decision processes.

Ladies and Gentlemen, to request action towards our shared goal is one thing, but to go in for something ourselves is another one. What can be done in practice and in the short term to advance this idea? ICSU and its international partners are in a process of coming up with some concrete measures to structure international research programs in such a way that they can provide for the future needs of global environmental change research. Funders are part of that process and will have to contribute in an appropriate way in the design and implementation phase.

In order to assist this process, I am happy to announce the financial sponsorship of a workshop by DFG on *Integrated Global Change Research: Co-designing knowledge across scientific field, national borders and user groups* to be conducted in early 2012 in Berlin. It will be jointly organized by the German National Committee on Global Change Research together with ICSU, ISSC and ESSP.
Although only a minor step, it will hopefully contribute towards a better integration of science among disciplines but also into society.

The workshop should help to understand in more depth how 'integration' can be achieved in a meaningful way and how to better position knowledge from the scientific community (and other stakeholders) to help decision-makers and society cope with emerging challenges and to optimise opportunities for a more sustainable future.

To underline our firm conviction of the significance of co-design, interdisciplinary research holds, and to ensure its promotion and continuity, I also want to announce that – starting from next year – DFG will provide for the next three years funding for an annual „DFG-ICSU-ISSC Young Scientist International Networking-Conferences on Integrated Science" for young researchers to meet the leading scientists in the field of global sustainability research. The financial resources will be made available to ICSU together with its partner ISSC to design truly interdisciplinary events, where integrated science can be filled with life. The idea is to provide a venue for scientific exchange and creativity for experts from anywhere in the world for a period of one week and relieve the international participants of the financial burden to finance their participation. Each year different aspects of research on sustainability could be explored in detail.
Evolving cooperative research ideas may find their way into a national funding process or could be continued under the umbrella of international funding schemes as outlined above. Although this is just a small contribution, it may spark new integrated research which otherwise may be less likely to eventuate and can lead to a closer linkage of the junior and senior scientific community active in the area.

Although this would already be a great achievement, we hope for more. If a sufficient number of scientists can exchange ideas and think about what needs to be changed in the science system, such networking events may well help to add momentum towards more sustainable development in the future.

This is and doubtlessly should remain our common primary goal.

Thank you.