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Scientific Integrity and Social Responsibility: The Role of Academies of Sciences

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Trust in science

Trust is the most important pillar on which science rests. Colleagues should be able to rely on the honesty of a researcher; honesty in describing the phenomena (s)he observes, in reporting how these have been analysed and interpreted, and in proper referring to other publications in the field. This applies also - and perhaps more so - to society in general. Users and interested parties (clients, patients, businesses, and social institutions) are far less able to verify the correctness and the quality of the conclusions and insights that the researcher presents than fellow researchers. If other scientists and the public at large can no longer give this trust, this would sooner or later mean the end of the usefulness and relevance of science.

How does science currently fare in respect of trust and acceptability? The latest results of the Eurobarometer (2005), a European survey of attitudes and opinions, showed a disturbing finding: many Europeans consider themselves poorly informed on issues concerning science and technology, resulting, as is suggested, in a more sceptical perception of science and technology. This is particularly found among women, older people and those with a lower level of education. Many people express even fear of scientists, whose high degree of knowledge may make them too powerful. They also harbour concern that scientific research could cross ethical boundaries, which is difficult to control. At the same time they want scientists to work freely without the fear of risks and potential dangers slowing them down, since they believe that scientific progress will be beneficial for their present and future life.

Here we encounter the well known paradox (see also Drenth, 1999): On the one hand people expect science to solve most of the current and future problems and to improve their living conditions. There is much -

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even to the point of irresponsible - trust in science. Damage to the ozone layer? depletion of fossil energy? reduction of the biodiversity? illnesses as a result of smoking, drinking, unsafe sex.....? Science will present a solution, is often the carelessness incurring, but misplaced optimistic thought.

On the other hand, we also encounter an increasing scepticism. This manifests itself in the increasing interest that various pseudo-scientific theories, such as astrology, psychokinetics, neurolinguistic programming and telepathy enjoy, as well as in the growing popularity of unscientific, sometimes occult, practices such as reincarnation therapy, homeopathy, laying on of hands and hypnosis. Alarmingly, paranormal observations of UFOs, aliens and extra-terrestrials, corn circle makers and voices of the dead, too, are taken seriously by many. Even anti-scientific sounds are only too often heard from newspapers and other media, with scientific researchers being depicted as sly Mephistos or Frankensteins who eagerly and disrespectfully tinker with the secrets of life through their cloning or genetic manipulation.

Many of these negative attitudes and sentiments are fed, in part, by fear; fear of a lack of control over the possible effects of scientific developments: nuclear waste, environmental deprivation, the horrific consequences of genetic modification, emerging dangerous viruses and bacteria, loss of liberty and privacy through ICT developments, and fear, perhaps also, of a dominant scienticism and secularisation, and deprivation of religion and spirituality.

Not all criticism is objectionable. Some of the captious questions posed to present day scientists are amenable to reason and need careful attention. Are scientists always aware of the potential and/or ethical consequences of their research, especially when this is applied and used by others? Are scientific practitioners capable of judiciously dealing with new-found knowledge? Have scientists sufficiently freed themselves of unwanted intrusion of influence? Have they protected research subjects against the infliction of unacceptable harm and exposure to unacceptable risks? Questions and criticisms like these cannot be arrogantly ignored by science. If not given serious attention, they may erode the axiomatic quality of science and even pose a threat to science as an intellectual endeavour. Moreover, since these attitudes may influence the general public, they may also have an unfortunate effect on the willingness of political leaders to reserve the necessary funds for innovative and frontier research. It goes without saying that public

opinion, the sentiments of voters and the tone of the media debate largely determine the boundaries imposed on scientific practice at the beginning of the 21st century. And, as said, these sentiments are unmistakably more sceptical and negative than in the past.

Academies of sciences and humanities and other scientific organisations and agencies have to give this issue of public opinions and sentiments with respect to the impact and societal consequences of science and technology a higher priority than they have done in the past. Fortunately we see various signs that these insights start to break through. For instance, the European Commission, in its proposals for FP7, intends to further public awareness through the dissemination of scientific information, an honest dialogue with the general public, the promoting of a scientific and educational culture in Europe, and placing responsible science at the centre of policy making. These actions are considered to have a high Community added value and to be important stimuli for the greater acceptance of science by society.

The FP7 proposal envisages 'Science in Society' actions taking place along three lines: (1) the embedding of the theme throughout the 7th Framework Programme (through the introduction of social/ethical themes and communication strategies in the content and operation of the FP's various components), (2) defining of and focussing on a number of core themes at the interface of science and ethics, and (3) the co-ordination of national programmes and policies tailored to social/ethical issues in science and technology.

ALLEA considers this a fruitful and effective approach. It particularly wants to emphasise the importance of embedding a social/ethical view in regular projects and programmes. The objectives of ensuring public confidence in European research and its applications, of strengthening the scientific workforce and providing better career opportunities in science, and of developing trust in and appreciation of science through various policy-related initiatives and well monitored communication can best be achieved through the integration of 'science in society' throughout the 7th Framework Programme, and not (only) by focussing on underpinning research with a dedicated budget, although the latter can, of course, be ill spared. ALLEA welcomes the over-proportional increment of the budget reserved for this purpose. Given the projected ambitions and the growing importance of science and society's new partnership in Europe, it considers this development fully justified.

Communication

It is here that insufficient and unfair communication about research and its results come home to roost. Important is here the honest and fair communication about results of scientific research. Some researchers focus too emphatically on the policy and practical implementations of their research, also when this is not warranted. Other scientists give their opinion on political and social issues wrongfully suggesting that their words have a scientific justification; there may not be empirical evidence available or not at their disposal (for instance, because it is not their field of expertise). Again others claim too much success and promise too quick results, in order to acquire financial support for their research, to get public honour, or to secure an appointment or promotion. Sometimes the public is simply misled for political reasons: the general and unjustified resistance against genetically modified food, or against nuclear fission are cases in point. Scientists should never let themselves be misused for political purposes. It can be defended that wrong communication about research is always harmful. It creates too much hope (particularly in medical research), and sometimes unjust fear (technological and information developments). And, if the research results fall short and fail to accede the claims, they boomerang for science in general.

There is another problem that has to be discussed with respect to the communication of scientific results to the general public and decision-makers. With respect to many and often pressing questions and problems in society much of our knowledge is probabilistic, uncertain and contingent, because of either *ontic* (really existing in the world out there) or *epistemic* (insufficient and lacking knowledge) uncertainties or both. And it is a serious mistake to communicate this 'probabilistic' knowledge to the public and to policy makers as if we were certain about the insights and conclusions. We see the negative effects if we do: confusion and suspicion at the cost of the credibility of scientific research.

On the other hand it is sometimes also reprehensible for the researchers to duck away from their responsibility and to indulge in their almost natural inclination to refrain from speaking while waiting for more conclusive evidence. Sometimes inaction is not neutral and risk-free at all. This is certainly true if we deal with irreversible effects, such as mergers of organizations, promising but risky investments, environ-

mental problems such as global warming, the effects of CO_2 emission, etc. In other words, decision-making based on educated guesses and 'precise imprecision' is sometimes better than decision making by default or not at all.

Anyway, it has become clear that scientists must develop abilities to communicate their findings and ideas with policy makers at all levels and with the public at large. The public needs to be informed how and why their taxes are being spent. As a recent ESF report (2003) states: "Given that the public sector is the principal sponsor of research there is an increasing onus on all of us to devote more time to explaining, listening and debating". This issue is also of great concern to Academies of Sciences and Humanities, and, for that matter, for associations of such academies, like All European Academies (ALLEA). ALLEA has, therefore, created a Working Group on 'Science and the Media' with the task to advise ALLEA and its member Academies on the question how to deal with this increasingly important aspect of the work of scientists and scholars: the proper communication with the general public through the various types of media, each with its own singularity and each requiring a specific approach.

It would be, however, too easy and deficient, to interpret all ethics issues in science in terms of (mis)communication. There are substantial problems related to the essence of the scientific endeavour or to the integrity of the scientist. Let us have a further look into the nature of the connection between science and ethics.

External social/ethical problems in science

In an earlier publication, I made the distinction between external and internal social/ethical problems (Drenth, 2002). The former category refers to questions of the social/ethical context as well as the consequences of scientific research. Questions such as the following arise:

- What is the justification for the choice of a research topic? Is what we intend to investigate, worth knowing? This question is a matter of the researcher's personal preference and values, but, as said, in many cases also of importance to the taxpayers or sponsors.
- Is the scientific research truly independent of sponsors, employers, clients or other interested parties? We know that scientific research should be independent and free from any external pressure or influence.

But all too often - and this is especially true for sponsored or contract research - there is an overriding temptation to avoid biting the hand that feeds.
- To what extent is the researcher responsible for what is done with the results? Research results can be used for better or for worse. They can turn into a blessing for individuals or society, but there are also many cases in which researchers sadly observe their research being abused by colleagues, practitioners, or the media.
- Are there cases in which ethical objections to certain implications of research, or certain consequences of new insights are becoming too strong? Sometimes scientific and technological developments' progression is faster than the reflection required on their societal and moral implications. In the medical field cloning, genetic cancer research, embryonic stem cell research, xenotransplantation and others are cases in point.

An interesting question is whether governments or science organisations (funding agencies or academies) should opt for 'no go' decisions with respect to certain subjects or fields of investigation. In discussing the constraints to be imposed on science, I would like to assert that in general it would be inappropriate to refrain from doing research for fear that it might be abused or be irresponsibly applied. This would almost certainly mean the end of all research, because nearly all scientific results are, in principle, open to wilful abuse. An additional problem related to constraining research on the grounds of potentially undesirable or dangerous consequences, is that such consequences are not always easy to foresee, especially in fundamental and innovative research. After all, one of the characteristic features of such research is that its results cannot be predicted or charted beforehand. Surprise is typical of creativity and serendipity.

It is further important to realise that any discussion of the constraints to be imposed on research is fraught with danger. History abounds with examples (Galileo, More, Spinoza, Lysenko) of science having been repressed because its research results did not find favour with the ruling ideologists, or did not serve the economic or political authorities' interests, or were opposed to the interests of (sometimes wholly respectable) movements and action groups, such as feminism, the anti-discrimination movement, environmental activists, and the freedom movement.

Of course, there are cases for which 'no go' decisions would be regarded incontestable by all scientists and scholars. Cases in which unacceptable damage is inflicted upon the object of research (people, animals, nature, culture), or cases in which the nature or consequences of the research would be in conflict with basic human values (including human dignity, informed consent, human rights, equality and non-discrimination)

Maybe more room has to be made for 'slow go' decisions. These would apply in cases where scientific or technological developments are out of step with the ethical reflection on their impact and consequences. The research could be temporarily suspended until the ethical implications have been subjected to public discussion, and reasonable consensus is reached (see McLaren, 1999).

Internal ethical problems

Internal ethical problems all refer to scientists' improper behaviour. This category encompasses:
- improper or imprudent behaviour with respect to subjects of experimentation, such as the insufficient protection of privacy or anonymity, neglecting to obtain informed consent, discrimination, improper treatment of experimental animals etc.
- improper dealing with the general public and the media, including too positive and too optimistic reporting of research results, which would create too much unjustified hope, especially in medical research;
- disregarding rules of 'good practice', such as undeserved authorship, improper citation, no sequence of authors according to contribution, or alphabetical order if contributions are equal, violating the rule to avoid conflict of interests (in a review task for publication or subsidy) etc.
- manipulation of data or interpretation, including fraud (fabrication or falsification of data), deceit (deliberate violation of methodological requirements (sampling, statistical techniques) so as to create a false confirmation of hypotheses, or otherwise biased results), and
- infringement of intellectual property rights, such as plagiarism, or pinching of a colleague's discovery, or a student's idea.

Of course, not all violations are equally serious. The manipulation of data is the most severe of these violations, but there is also variance within the categories. Fabrication of data is more serious than 'rounding

off', or making use of a too small sample, while plagiarising substantial pieces of text is more reprehensible than pinching an idea from a conversation between colleagues.

Hard data on the occurrence of misconduct are rare and also difficult to obtain. Part of the problem is that it is not always easy to draw a clear line between unacceptable and (still somewhat) acceptable behaviour. Where lies the boundary between experimental 'proof' based on a too small sample and the illustration of an argument with 'case' data? Or between plagiarism and careless citation? Was an incorrect, but 'favourable', statistical technique truly chosen deliberately? Is it selective use of evidence, or a different methodology, or even another paradigm?

The number of reported cases in scientific and public media is, however, growing, and for instance *Nature* has revealed a alarming number of cases of misconduct in the last few years. 'Fraud booms worldwide' headlines *Times Higher* 5 August 2005. And even more disturbing is the fear that far more fiddling with research data occurs unnoticed, a fear that does not, unfortunately, seem unfounded. Three years ago, an issue of *Nature* (vol. 418, 8 August 2002) discussed a report that the American Institute of Medicine (IOM) had just released and that specifically dealt with scientific integrity and scientific misconduct. The IOM also noted that fully-fledged cases of scientific misconduct are rare, but that smaller lapses often go unnoticed: fudging a control here, deleting a messy data point there. But the IOM warned that what might appear to be minor violations of integrity, will have bad long-term consequences. It called for research institutions to take a more active role in creating an environment in which misconduct will not occur.

Causes of misconduct include pressure from powerful institutions or persons (governmental or church leaders), economic and financial motives (lending an ear to industrial sponsors, the risks associated with contract research), and the scientists or scholars' ambitions and vanity. Given the pressure on researchers to produce publishable output and to show (preferably spectacular) results, a present-day growth of misconduct is certainly more than likely.

As far as the prevention of misconduct is concerned, one may consider corrective measures (punitive measures, sanctions), or preventive measures (procedures, regulations, precepts, whistleblowers,

ombuds-persons), but most important is the development and fostering of a scientific conscience, and a proper sense of values and standards.

What role do Academies play

What role could academies of sciences and humanities and umbrella academy organisations, such as the All European Academies, play in this matter? After all, academies have an important advisory role. Moreover, the ethical issues in general, and most certainly the problems concerning scientific misconduct, are of real concern to the academies. Also the ESF envisaged an important role for academies in the formulation of scientific codes and in initiating the discussions on good scientific practice (ESF, 2002).

At ALLEA's General Assembly in Prague in 2000, I reported on a modest survey of ALLEA members that addressed these problems. Four questions were asked: Is scientific misconduct a serious and growing problem in your country? Is there a formal procedure or protocol to deal with these problems in your country (the role of the Academy?)? Is there a need for a prescriptive code of ethical conduct, or good manners in science? What role could ALLEA play in these matters?

The reactions varied, but in general scientific misconduct was seen as a growing concern. Often there was no official procedure or protocol, and the leadership of the relevant institute handled the matter. Sometimes academies were involved in an advisory or evaluative capacity. The general reaction to the question on the need for a code of conduct was affirmative; in certain cases such a code was already available. Almost all ALLEA members (with the exception of one or two who only acknowledge the problem as a country-specific matter and not a universal one) welcomed the idea of ALLEA taking some initiative or role in the further development or promotion of a 'code for good manners in science' in Europe.

Many academies have already developed such a prescriptive set of rules, a code of conduct and/or a procedure for handling reported cases of misconduct. The NAS publication *On being a scientist* (1995, 2nd ed.) is both well known and well written. In 1998, the *Deutsche Forschungsgemeinschaft* issued Proposals for safeguarding good scientific practice as a reaction to a disturbing case of collective fraud.

In December 2000, the European Science Foundation issued a policy briefing on this issue under the title Good scientific practice in research and scholarship in which, among others, it was recommended that:
- National academies should draw up national codes of good scientific practice in research and scholarship where these do not yet exist; and
- National academies should initiate discussions on the most appropriate national approach to procedures for investigating allegations of scientific misconduct, whether by means of an independent national body, formal procedures at each university and research institution, or by other means.

It should be clear that this does not only concern purely national problems, although culture and traditions, as well as legislation may have an influence on the way these problems are handled in practice. The issues in question are, however, generic and universal, and also need an international approach. This is why I have urged (intermediate) international Associations of Academies, such as ALLEA, USNAS, the Federation of Asian Scientific Academies of Science, the African Academy of Science and others to become actively involved in the co-ordination of the various approaches undertaken nationally in co-operation with world-wide organisations such as IAP, ICSU, TWAS and UNESCO. In fact, they can play a role by specifically:
- placing the issue of misconduct on the agenda;
- providing individual national academies with information and advice,
- co-ordinating national activities internationally with a view to alignment around common principles (although not disregarding differences of opinions and legal traditions between states), and
- dealing with misconduct in international research projects.

In this vein, ALLEA has tried to take up responsibility for the co-ordination at a European level, without this implying that uniform rules and procedures need to be developed for all European countries. ALLEA (2003) adapted a recommendation by the Royal Netherlands Academy of Arts and Sciences (*Notitie wetenschappelijke integriteit*, KNAW, 2001), translated it into English and has offered this *Memorandum on Scientific Integrity* for the perusal of all ALLEA's member academies. This Memorandum urges the founding of a National Committee for Scientific Integrity (NCSI) that can serve as an advisory board, or a science court of appeal when the (primarily responsible) institute or university's settlement in respect of the violation of scientific integrity is found to be unacceptable to one of the relevant parties.

In The Netherlands, such a body (LOWI) has been founded by the Royal Academy in close consultation with the National Science Foundation (NWO) and the Association of Universities (VSNU). It is not ALLEA's intention to have other European countries copy this formula exactly, but by offering this model, it aims to stimulate the discussion on the most desirable approach and to point out the potential helpful role that Academies of Science could play. Furthermore, it aims, if possible, to co-ordinate a European approach to the phenomenon of scientific misconduct that can be so detrimental to science.

References

ALLEA, KNAW, NWO, VSNU, (2003). *Memorandum on scientific integrity*. Amsterdam: ALLEA/KNAW.

Drenth, P.J.D. (1999). Science where do we draw the line? *European Review*, *7*, 239-246.

Drenth, P.J.D. (2002). International science and fair-play practices. *Science and Engineering Ethics*, *8*, 5-11.

Eurobarometer Reports (2005). http://europa.eu.int/comm/public_ opinion/ index_en.htm

European Science Foundation (2002). *Good scientific practice in research and scholarship.* ESF Policy Briefing.

Koninklijke Nederlandse Akademie van Wetenschappen, Verenigde Samenwerkende Nederlandse Universiteiten, Nederlandse Organisatie van Wetenschappelijk Onderzoek (2001). *Notitie wetenschappelijke integriteit: over normen van wetenschappelijk onderzoek en een Landelijk Orgaan voor Wetenschappelijke Integriteit.* Amsterdam: KNAW.

McLaren, A. (1999). The ethical dilemma: The living world. In P.J.D. Drenth, J.E. Fenstad & J.D. Schiereck (Eds), *European science and scientists between freedom and responsibility* (pp. 101-107). Luxembourg: Office for Official Publications of the European Communities

National Academy of Sciences, National Academy of Engineering, Institute of Medicine (1995). *On being a scientist; responsible conduct in research.* Washington D.C.: Nat. Ac. Press.