Standards for Ethics and Responsibility in Science:

An analysis and evaluation of their content, background and function

by

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Contents

Acknowledgements

The present document is one of ICSU's contributions to the follow-up to the World Conference of Science organised jointly by ICSU and UNESCO in Budapest, 1999, that was requested in the *Declaration on Science and the Use of Scientific Knowledge* adopted by the end of the conference. The theme of national and international ethical standards regulating scientific research is vast, and the document was therefore originally planned to be a joint-authorship venture. Reality proved different, and in the end it was mainly written by an individual author, with all the limitations that this entails.

Realising that ICSU expects this contribution to be internationally representative, I have done my best to go beyond my own Northern European academic and cultural background, and take other, notably non-western, perspectives into account. Detailed comments from IUBS' Bioethics Committee on a previous draft of the document were particularly helpful in this regard. Numerous other colleagues have provided valuable ideas, material, and comments on the text in its different stages. I would especially like to thank José María Cantú, Hu Qiheng and Vivian Weil from the SCRES committee, Carol Corillon and Peter Warren from the SCFCS committee, Gérard Toulouse (ENS), Geoffrey Carr (The Economist) and Alberto Casco (University of Gothenburg) for their contributions and friendly support.

Introduction

This project grew out of early consultations concerning the preparations for the World Science Conference (Budapest, Hungary 26 June – 1 July 1999) arranged by UNESCO and ICSU. The conference document "Science Agenda – A Framework for Action" states under 3.2 Ethical Issues, point 71: "The ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instil in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), in co-operation with ICSU's Standing Committee on Responsibility and Ethics in Science (SCRES), have a special responsibility to follow up on this issue."

The present project analysing standards for ethics and responsibility in science under given perspectives is ICSU's initial contribution to this task.

Since the Second World War, a great number of ethical standards have been developed to protect science and society from misconduct in scientific research, such as abusive experimentation, fraudulent research reports, professional jealousy or rivalry, or misuse of scientific funding. Various scientific unions, associations, academies, universities and other science related institutions have adopted ethical standards revealing a wide variety in form and content. Some of them rest on general principles of ethical conduct and responsibility; others refer to professional duties specific to disciplines.

Yet the introduction of ethics in science is controversial. Asking scientists to be socially responsible in their capacity as scientists can be dangerous, some suggest, because this would implicitly be to give power to a group who are neither trained nor competent to exert it. That, however, is equally the point of those in favour of introducing ethics into the scientific realm, who want to include the study of ethics in the scientific education with the purpose of increasing future scientists' ethical competence. Such studies should partly focus on the *nature and functions of ethical standards in science*, and that is the general theme of the present document.

The primary focus in this project is *public* and *written* ethical standards for science. The basic task from SCRES' point of view is to analyse actual or possible written normative statements. A discussion whether to express these in an oath or a pledge for science (a suggestion made at the World Science Conference) may follow but cannot precede that task. The developments of codes and guidelines are in some sense primary to those of oaths and pledges. If you swear an oath, you do this by reference to a *previous acceptance* of some practical ethical principle the endorsement of which entails regulated actions. Therefore, the initial task must be to develop ethical guidelines for scientific research and to state these in codes regulating action. Whether or not it is thereafter decided that these codes should be expressed in pledges or oaths, is perhaps a cultural rather than a scientific/philosophical matter.

Pursuing this line of investigation, SCRES has collected 115 standards, listed here in Appendix (i). The collection includes 39 international standards and 76 national standards representing 23 countries on 6 continents. The standards are of different types, and these are conceptually distinguished in Appendix (ii). In a simple manner they are empirically organised in Appendix (iii). The text describing this material comprises two main parts:

(1) 'Contexts of Formulation' discusses the contexts in which the perceived need to formulate standards arises, whom they concern, why they should be formulated, their nature, function and means of implementation.

(2) 'Comparative Analyses of ICSU Statements and Related Standards' compares ethical standards from the list in Appendix (i) related to ICSU's Statements on freedom and responsibility in science, animal welfare and science in the Internet era.

It must be noted that any ethical standard for science must be formulated as a part of a larger *social-political dialogue*. Numerous political, financial and social problems underlie discussions of ethics in science, and there are corresponding difficulties related to formulating effective ethical guidelines. According to SCRES' analyses, the ethical standards compared are relatively similar in their recommendations for what is considered to be appropriate individual conduct (honesty, conscientiousness, giving due credit, and so on). They are considerably more diverging on themes related to the societal structures in which they are formulated, and in which the problems they address occur. Notably, there is a profound gap between the issues conceived to be most urgent if we compare the developed and the developing countries.

The Conclusion offers a summary account of the most important similarities versus differences between the standards that have emerged from the preceding discussions. It will be argued that some of the ethical standards express international agreement over common norms the further development of which would be valuable both within and beyond the scientific communities.

This conclusion should be regarded as a *starting-point* and not as a final destination. The aim in this project is to lay a useful ground for further inquiries, and if this can inspire further studies, or be an aid in the development of new codes, then this aim shall have been achieved. Two main recommendations shall be made:

I. The formulation of an ICSU statement on the responsibility of science.

II. The adoption of new ethical standards by individual ICSU members who do not as yet have such standards.

SCRES also considers the formulation of a universal scientific oath an interesting project for which the present project analysing ethical standards in science might be a useful beginning.

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1. Contexts of Formulation

1.1 Introduction

Much of the investment in science in this century has been motivated by wars (World Wars I & II, the Cold War, and numerous other military interventions). This use of human and financial resources is one factor that has helped focus the attention on ethics in science, and it is clear that since the Second World War, the interest in ethics in science has increased tremendously. Another factor is the discovery of concrete abuses of power in scientific experimentation, such as the experimentation carried out by the Nazi doctors, the sterilisation of retarded or otherwise unwanted citizens in Sweden, the fatal radiation experiments in the United States, or various scandals involving disclosures of fraud, falsification of research material, or other forms of scientific misconduct. “Once the spotlight fell on research practice it became clear that unacceptable procedures were very widespread. There were experiments being carried out in many other countries as well which failed to look after the participants. The ethical issues of research and scientific practice are now firmly on the agenda”[1]. A great number of ethical standards (codes, guidelines, oaths, declarations, conventions, etc.) have since been developed to protect both human and non-human research subjects from inhuman experimentation, and to protect science and society from fraudulent research reports or other kinds of misconduct in scientific research triggered, for example, by professional jealousy or rivalry.

However, the introduction of ethics in science is a continuously controversial topic. Not all scientists welcome this relative newcomer on their arena, even though some consider it a long-due companion. The traditional position of the majority of scientists has been (very simply phrased) that they were seekers of objective truth who shall not be "meddling with Divinity, Metaphysics, Moralls, Politicks, Grammar, Rhetorick, or Logick"[2]. In modern terms: science should not as such deal with any subjective matters, notably those related to religion, politics, ethics or social responsibility. Seeking and finding facts and theories was supposed to be the scientists' task. In contrast, the applications of this knowledge in society

[1] Jane Pritchard (1998, p. 528).

[2] This quote, fetched from Robert Hooke's proposal for the Statutes of the English Royal Society in 1663, is a favourite quote of writers in the field of ethics in science to express the essence of the traditional view.

were not considered to be scientists' responsibility, but the responsibility of politicians, or other parties concerned.

A frequent illustration of this dispute is the development of the atom bomb and the subsequent decision actually to use it on Hiroshima on 6 August 1945. Were the scientists partly responsible for this disaster, or were only politicians and the military to blame? Was the petition that sixty-seven scientists wrote to President Truman (that never reached him) begging for restraint sufficient to exempt them from responsibility, or do they share this by virtue of having provided the ultimate decision-makers with the necessary tools for such extraordinary destruction? Edward Teller, who refused to sign the petition, wrote in a letter to Leo Szilard: "…I have no hope of clearing my conscience. The things we are working on are so terrible that no amount of protesting or fiddling with politics will save our souls…"[3].

By virtue of dealing essentially with human interests, ethical debate has long been banished from traditional science by its norms of 'disinterestedness' and 'objectivity'[4]. As John Ziman (1998) writes: "In pursuit of complete "objectivity" – admittedly a major virtue – the norm [of disinterestedness] rules that all research results should be conducted, presented, and discussed quite impersonally, as if produced by androids or angels...this "no ethics" principle is not just an obsolete model that can be uninstalled by a keystroke. It is an integral part of a complex cultural form."

Asking scientists to be socially responsible in their capacity as scientists (i.e. over and above their responsibilities as private individuals or citizens) can even be dangerous, suggests Lewis Wolpert (1992/93, p. 170):

> There is, in fact, a grave danger in asking scientists to be more socially responsible - the history of eugenics alone illustrates at least some of the dangers. Asking scientists to be socially responsible, other than by being cautious in areas where there are social implications, would implicitly be to give power to a group who are neither trained nor competent to exert it.

Arguably, a group that has sufficient intelligence to help carry through the industrial revolution, develop the atom bomb, explore space, and map the human genome could also be taught ethics and social responsibility. And that is precisely the point of those in favour of

[3] Lewis Wolpert (1992) discusses these events in his Chapter 8, on Moral and Immoral Science. We should in this context note (as was suggested to me by Vivian Weil) that some atomic scientists were affected by outcomes they had produced and in response founded the Bulletin of the Atomic Scientists to sustain normative discussion.

[4] Cf. Robert Merton (1973).

introducing ethics into science: they (we) want to include the study of ethics in the scientific education with the hope and purpose of *increasing future scientists' ethical awareness* and ability to think clearly about intricate – and often emotionally loaded – ethical problems.

It is indeed true that problems of ethics and social responsibility are not easily dealt with but require special skills and knowledge. This is not innate knowledge, but requires training, as a part of one's education. If there is a danger in asking scientists to be socially responsible because they have been the opposite before (as the "history of eugenics alone illustrates") and know not how to behave differently, then it is probably high time to teach them this. Granted, it is difficult, but then again, so is science.

The ethical tradition in science can possibly be traced back through history to a compatriot preceding Hooke, to the founder of modern English science: Francis Bacon. To Bacon, science was more than an academic quest for knowledge; it was a systematic study aiming for mastery over nature with the purpose of enabling human beings to improve their life on earth. Bacon was a champion for science on a large and lavishly funded scale because he believed that science could be useful. In his utopia described in *New Atlantis* (1624) there is a college called Solomon's House "dedicated to the study of the works and creatures of God" with a vision of science and scientific pursuits that include reference to human conditions, perforce subjective. The French Encyclopedist Diderot explained Bacon's genius by the fact that "when it was impossible to write a history of what men knew, he drew up the map of what they had to learn". Knowing how to deal with problems of ethics and social responsibility in science would have formed a part of that map. Solomon's House in New Atlantis was to *serve* the society in which it operated – and in the third millennium they would probably offer helpful courses on ethics in science in order better to achieve this goal.

These studies should partly focus on the nature and functions of ethical standards to regulate scientific research and on the arguments for and against formulating them. The purpose of the present section is to describe and discuss aspects of the controversy surrounding the introduction of ethics into science with special focus on the formulation of ethical standards to regulate scientific research. Why do some scientists fear this type of regulation? Why are some opposed to it, whilst others see it as a necessary development towards a more enlightened world? The boundaries of this debate extend beyond our present scope, and the aim is therefore the relatively modest one of outlining the primary areas of discussion summarising some of the main arguments suggested.

1.2 Varieties of Referents: Identifying the Parties Concerned

A presentation of agents and other parties that standards of ethics in science concern.

Many scientists have resisted the introduction of ethics into science for fear of the prospect of having to mantle full responsibility of the manners in which other people decide to use their results – decisions over which they do not necessarily, and perhaps even rarely, have any influence. Numerous pursuits in science would probably come to a rapid halt if this were the case. However, it is not and should not be the case that any single group is exclusively responsible for the acquisition and use of scientific knowledge. *Division of responsibility* is a key issue that must clearly be settled if individual scientists are to feel free and comfortable (whilst responsible) in their enterprise.

The subjects[5] *directly* concerned by the ethical standards formulated to regulate scientific research – i.e., those that are supposed to obey them – are the individual scientists, obviously, but also scientific institutions; academies, unions, associations, universities, etc.[6]. When a standard is binding for a given group it articulates a *co-operative practice* for all the members of that group. This practice may relate to individual moral qualities (such as honesty, conscientiousness, and integrity[7]) or to the group's social relationship, e.g., to the state, or to bodies providing or offering financial support. (The group may assert social duties, political neutrality and incorruptible academic freedom, or its codes may require a different approach). Generally, it is important to distinguish between *individual* and *communal* perspectives. Clearly, the individual scientist cannot be held responsible for any and all applications of her or his research in a broader communal context. There is an equilibrium to be found between individual and communal responsibility. As Mark Frankel (1989, p. 110) writes:

> …promoting ethical conduct does not, and should not, have to be solely the responsibility of the individual … The professional group, as a more visible, more stable, and more enduring entity, has a collective moral responsibility that is non-distributive; that is, a responsibility borne by the profession as a whole independent of the ethical posture of its individual members.

[5] The term "subject" might be confusing because of its ambiguity. The meaning in which I use it here could perhaps be captured by the term "agent"; however, the latter term suggests activity, which is not necessarily appropriate. Another possible term is "party" but that is no less ambiguous.

[6] The contexts of formulation, adoption, and application will be discussed in greater detail in 1.4.

[7] Qualities related to individual characteristics are similar between standards of distinct disciplines and different countries. As our subsequent comparative analyses will reveal, the main differences lie – as one might expect - in political, financial and social attitudes rather than in those concerned with the individual scientists' morality.

Furthermore, the individual scientist acts in a *variety of roles* that need to be distinguished, for each carries different (not necessarily compatible) responsibilities and the relevant codes of conduct will vary accordingly. In particular, we may note the difference between the scientist *qua* researcher, author of reports, social consultant, political tool or advisor, and advocate/witness. The arguments for and against the development of ethical standards to regulate scientific research to be discussed in the next section will illustrate situations of conflict that may arise from this multiplicity of distinct, and not necessarily compatible, roles.

However, ethical standards *indirectly* concern subjects beyond the scientific spheres. They are formulated to satisfy various interest groups other than the scientific communities, notably, the public and its politically elected representatives. These interests might in many cases coincide, but they do not do so always. In this context it is important to observe that standards are formulated in different spirits by the scientific organisations. Sometimes they are proposed with a genuine wish to safeguard ethical or other values; however, other times they are rather to be seen as "tactical moves in controversies with outside groups"[8].

Public trust in the integrity of science is vital to science to ensure societal support, and also in part because participation, e.g., in statistical enquiries or experiments, is based upon informed consent for which trust is a normal prerequisite. The attitudes of media are relevant in that context: horror-scenarios that may be selling but lack scientific basis, or reports that create false hopes about a particular research area's putative applications and uses damage research by undermining public trust. In large parts of the media, the image of science and engineering conveyed to the public oscillates between few spectacular achievements (like the Mars mission) and frequent disputes among different experts on possible harms of the techno-scientific advances (like biotechnology). Science-journalists and scientists share the responsibility of providing the public with reasonable, intelligible accounts of scientific development, accounts that can form the basis of trust and understanding.

Of course, the establishment of (at least minimal) trust is equally important for the public, who must be able to trust scientific communications (for example, that a certain product or animal is safe to eat, even though it has been genetically modified, or given nutrients it would not normally eat). To give but one important illustration, the public expects the relevant scientific communities to "avoid unethical exploitation of their professional status by endorsement of misleading or fraudulent advertising or product certification…[and to]

[8] Corinne Gibb (1976, p. 242).

protect the public interest in the wholesomeness and safety of any food and drink with which they are concerned"[9]. Scientists oscillating between radically opposed views in short temporal sequences damages their reputation and decreases public trust. Recent scandals concerning the so-called 'mad cow disease' illustrates this with all undesired clarity, when scientists who assured people that meat from animals infected by bovine spongiform encephalopathy was safe to eat were subsequently forced to admit that the meat could be deadly.

In a relationship of trust between scientists and the general public[10], "the collectivization of appropriate norms and their transmission to individual practitioners are the cornerstones"[11]. The public places its trust not only with individual scientists but also in scientific institutions[12]. Individual scientists are trusted largely "because the exercise of professional discretion at the individual level is governed by rules which are prescribed and enforced by the group"[13]. Accordingly, the ethical standards which scientific institutions develop are important both to the institutions themselves, and to the individual scientists operating in them.

These standards serving to regulate scientific research also offer a common ground for the diverse interest groups to meet, exchange ideas, highlight differences and similarities in interests, and – above all, perhaps: *inform* the discussions in a way that can develop mutual understanding and trust. However, this happy state presupposes that the standards are formulated well (not superficially, nor vacuously) involving open discussions and sincere intents. Otherwise they may have the direct opposite effect: by appearing fake, superficial, or "strategic" they would lower trust in scientific integrity and do further damage to the reputation of science in social contexts. As the following section will show, there are arguments both for and against formulation of ethical standards in science, considerations that serve either as a warning or as a recommendation. The ethical image is a two-edged sword: it is only good if it is very good; otherwise it can appear as a veil behind which true intentions are concealed.

[9] Guideline 7 and 8 of the International Union of Food Science and Technology's (IUFoST) Guidelines of Professional Behaviour.
[10] This distinction is not a very neat one: we should bear in mind if we use it that every scientist is part of the 'general public' and a layperson in other fields than her or his own.
[11] Alan Wolfson, Michael Trebilcock, and Carolyn Tuohy (1980, p. 192).
[12] It was suggested to me by the IUBS Bioethics Committee that there is concrete data measuring trust showing individuals are trusted significantly more than organisations.
[13] Carolyn Tuohy and Alan Wolfson (1977, p. 67).

1.3 Ten Types of Ethical Argument: Pro et Contra Standards[14]

An argumentative analysis of the debate for and against standards of ethics in science

Below follows a catalogue[15] of 10 types of argument that have been put forward concerning the (positive or negative) value of adopting ethical standards regulating scientific research:

1. Argument of analyticity
2. Argument of inconsistency
3. Argument of autonomy
4. Argument of ethical awareness
5. Argument of hypocrisy
6. Argument of legalism
7. Argument of social responsibility
8. Argument of publicity
9. Argument of professional security
10. Argument of professional control

Since the (positive or negative) value of such standards presupposes the possibility of formulating them sensibly in the first place, two arguments primarily concerned with logical/conceptual rationality come first on this list (though we may note that the discussion of them may also involve other, e.g., normative, aspects). They are followed by three arguments concerned with the general psychological value for the individual scientist. Thereafter, three arguments focusing on the possible functions of ethical standards in relation to society are discussed. Lastly, two arguments highlighting the value of ethical standards in the professions are presented. The arguments will be illustrated with standards from the list in Appendix (i).

[14] An abbreviated version in French of this discussion is published in Kathinka Evers (2001) (4) and forthcoming in Kathinka Evers (2002) (6).

[15] The list does not purport to be exhaustive, nor does the discussion of each individual argument. The aim in this section is the relatively modest one of outlining the primary areas of discussion summarising some of the main arguments suggested.

(1) Argument of analyticity

'The more content a principle has, the narrower is its extension, and vice versa; a principle's extension reduces its content. Accordingly, substantial ethical standards must have a proportionally narrow scope if they are to avoid vacuity.'

Discussion

One important aspect of ethical standards that is problematic although it appears self-evident is that an ethical standard requires *substance* in order to carry conviction. Without genuine substance the code, or the oath, etc. risks functioning or appearing as a veil of moral pretence. The less substantial a standard is, the more pompous and even fake it risks appearing, and this will deter in particular people who take ethics seriously from wanting to adopt the standard, or from taking it seriously. However, providing ethical standards with substance is difficult in pluralistic contexts. The question is: given the plurality that reigns within ethics as a result of different cultural backgrounds, political or economic systems, religious or other ideologies, levels of development, etc., is it possible to find international norms that combine broad acceptance (international or interdisciplinary) with substance in their formulation?

A major challenge here consists in finding a proper *balance between content and universality.* On the one hand, if the candidates for endorsing a suggested principle are too narrowly delineated, their specification is carried so far as to enable the guideline only to reach the already converted. On the other hand, if the candidature is too broad, then there is reason to suspect that the price has been a damaging loss of substance by watering down the guideline to suit a larger number of clients. For whilst truly universal ethics is a utopia, ethics that raises no objections anywhere is perforce void of content.

This particular dilemma, which can be called *the trap of analyticity*[16], arises from a well-known principle of logic balancing content against extension: the more content a principle has, the narrower is its extension, and vice versa; a principle's extension reduces its content.

[16] Cf. Kathinka Evers (2000). It is not uncommon in ideological/normative contexts to find positions being watered down in order to suit a larger number of candidates (such as voters), or formulated in such a way that their validity, truth, or reasonableness becomes self-evident or analytical: 'We should strive to find the best solution'; 'The strategy might have certain advantages, but possible risks cannot strictly be ruled out'. Occasionally, the emptiness is intentional and a part of a general strategy. In that case, the balance is rather a tool than a trap: it functions as a veil behind which true intentions or ideas can be concealed.

One could try to argue that no one would deny a principle like "It is wrong to kill, except…", or "Don't lie, except…" The problem for that line of argument is that so long as the exceptions remain unspecified the principle is incomplete and open to the charge of analyticity. If any specification that meets objection is explained away as an exception to the rule, then the suggested principle becomes irrefutable and valid by definition (hence analytical). On the other hand, if the principle is substantiated by determined non-exceptions, then it is both open to and likely to meet opposition from some party, and consequently enjoy only limited endorsement. This problem obviously increases in proportion to the complexity of the context.

To illustrate, SCRES' activities (e.g., the present analysis of ethical standards regulating scientific research) should be done in close co-operation with all members of ICSU. The multifariousness of this communication makes it fruitful, but it also increases the difficulties involved in formulating normative statements that all parties agree upon. It is not impossible to formulate wide-ranging norms. Ethical guidelines have been developed to regulate activities within various scientific disciplines and some of these go beyond the national perspective; e.g., the ban on human experimentation without informed consent. However, the success varies. For example, in 1996 ICSU issued a statement of principles for use of non-human animals in research and education that very narrowly manages to avoid the trap of analyticity described above. ICSU "reaffirms the scientific community's responsibility to establish its own mechanisms to evaluate the necessity and conduct of animal experimentation. Further, ICSU affirms that all research on animals should be designed taking into consideration its relevance to the improvement of human and animal health and welfare, and to the advancement of knowledge for the good of society". This is not entirely insubstantial, but without further specifications (the entire statement is less than 200 words long) the openness of interpretation is not all too reassuring for the animals (nor, perhaps, for the scientists concerned)[17].

In contrast, ICSU's statement on scientific freedom is comparatively more solid, affirming concretely "the right and freedom of scientists to associate in international scientific activity without regard to such factors as citizenship, religion, creed, political stance, ethnic origin, race, colour, language, age or sex" not permitting "any of its activities to be disturbed by statements or actions of a political nature"[18].

[17] Cf. 2.3.
[18] Cf. 2.2.

The argument of analyticity is primarily directed to attempts to formulate ethical standards in broadly international and/or interdisciplinary contexts. The project of formulating universal ethics in any field (be it science, politics, religion, or any other) is deeply problematic from both logical and empirical points of view. It is difficult to find a norm that might gain cross-cultural international acceptance and yet remain substantial. This, however, is to be seen as a challenge rather than as a defeat. Should scientific communities internationally sincerely try to formulate an ethical code regulating the scientific enterprise on a broad international front, this would presumably give rise to many valuable discussions providing new knowledge and enriching exchange of ideas. And a 'smallest common denominator' can perhaps be found (*is* found in all modesty in this document – cf. the Conclusion). Therefore, such an informed follow-up to the present project can be fruitful even if it does not yield a 'global ethics' for science of any noteworthy substance.

(2) Argument of inconsistency

'Ethical standards typically express a number of different values, not all of which need be consistent with one another. Such normative inconsistency is detrimental to the project of formulating effective codes of ethics in science.' [19]

Discussion

The inconsistency that may exist between – or even within - ethical guidelines arises from the *complexity* of norms. A guideline, or an oath, will typically be complex and express a number of ethical values, some of which are regarded as more peripheral than others.

The problem here is not only the fact that inconsistency might occur within a complex system, or the fact that a norm may have different positions in different systems, but also that when values conflict within a system there may not always be a superior principle deciding between them.

Numerous standards in SCRES' list can be used to illustrate this dilemma, especially the ones that are ambitiously detailed, e.g., the 1998 Proposals for Safeguarding Good Scientific Practice of *Deutsche Forschungsgemeinschaft*, or the Cuban *Codigo sobre la etica profesional de los trabajadores de la ciencia*.

[19] Cf., e.g., Heinz Luegenbiehl (1983).

Their excellence in terms of complexity, substance and level of specification actually increases their risk of placing the scientist in situations of conflict (e.g., between the interest of the professional group and the possible interests of society, or the scientist's individual moral conscience). This fact is, of course, no objections against the codes, nor is it a reason to escape the dilemma by using vague and weak formulations.

Ethical 'inconsistency' in the sense of admitting the possibility of norm conflict need not be detrimental. It is not necessarily problematic, in so far as ethical systems are not rigid and the idea of a clear hierarchy of principles settling all disputes is actually unworkable in any complex system of rules. However, it can be problematic, and the possibility needs to be taken into account. The problem of seemingly insoluble norm-conflicts can be labelled *the norm trap*[20]. A norm trap is, e.g., so-called 'tragic choices' where there is a norm-conflict in which each possible outcome is negative under different aspects and there is no 'super-norm' to assist in the choice. A classic example is the occasional conflict between the duty to be truthful and the duty to be merciful, or the duties connected to different roles, e.g., one's duty as a professional that may conflict with one's duty as a citizen.

Another version of the norm trap that can be problematic for the formulation of ethical standards relates to the principle that 'ought' implies 'can', that a person cannot have duties that are impossible to fulfil. This is illustrated by strong interpretations of the Christian doctrine of the original sin: humans are expected to act rightly and, when they do not, admit their guilt and desert of punishment. However, by virtue of being human, they suffer from the original sin and are unable to act rightly, because that sin influences all their actions. The individual cannot win; no matter how she acts, she will not be acquitted (a much debated problem in Lutheran Protestantism) [21].

Harris et.al. (1995) point out that codes of ethics should not be followed as strict recipes for decision-making but rather be seen as expressions of ethical considerations that each individual should bear in mind. However, there are many different types of codes, some of which may be stricter than others.

[20] Cf. Kathinka Evers (2000).

[21] Another example is suggested by Göran Collste (1998) where he describes how normative conflicts may arise between so-called "decision support systems for diabetes care" (expert systems with knowledge base and decision functions to assist diagnostic problems) and the physician's personal experience. In the absence of a norm deciding which expertise the medical personnel should follow a no-win situation could arise, where the decision-maker is blamed for any mistake, regardless of his or her choice of authority.

(3) Argument of autonomy

Version 1: 'Ethical guidelines may by virtue of their collective nature pose a threat to the individual's moral autonomy'

Version 2: 'The public's demand for accountability threatens the professions' pursuit of autonomy'[22]

Discussion

Ad 1. When an individual enters into a profession, she or he enters into a moral community in which the members "are distinguished as individuals and as a group by widely shared goals, beliefs about the values of those goals…about the appropriate means for achieving them, and about the kinds of relations which in general should prevail among themselves and in many cases between themselves and others"[23]. The profession "becomes a major normative reference group whose norms, values, and definitions of appropriate conduct serve as guides by which the individual practitioner organizes and performs his own work"[24].

The mere existence of collective professional norms, such as a code of professional conduct, does not in itself contradict the classical stoic demand for ultimate individual autonomy. That question will only emerge when there is an apparent conflict between the code and the individual conscience (referred to in the previous discussion of Argument 2). For example, many professional codes contain a provision that the member must not do anything to bring the profession into disrepute[25]. This could cause a conflict between what the individual professional might conceive to be a duty to the profession and a duty to follow her or his own conscience (a conflict that is illustrated by whistle-blowing, for example).

However, a professional ethical standard, such as a code of ethics, might be useful by virtue of offering guidelines even though the possibility of such conflicts is there. According to Michael Davis (1998), codes of ethics should be understood as useful conventions between professionals:

[22] Autonomy is the capacity for self-government. Agents are autonomous to the extent that they govern their own actions. This basic meaning of autonomy is the same for different kinds of agent (e.g., individual, or group) even though the contexts may differ.

[23] Paul Camenish (1983, p. 48).

[24] Ronald Pavalko (1971, p. 100).

[25] Cf. e.g. The Code of Ethics of IACP (International Academy of Compunding Pharmacists), or the Guidelines of Professional Behaviour of IUFoST (International Union of Food Science and Technology) in SCRES' List of Standards.

> The code is to protect each professional from certain pressures (for example, the pressure to cut corners to save money) by making it reasonably likely...that most other members of the profession will *not* take advantage of her good conduct. A code protects members of a profession from certain consequences of competition. A code is a solution to a coordination problem.

How a conflict between an individual professional and the codes of her or his profession can be resolved must be determined in each situation individually, as it arises. It does not seem reasonable to determine on principle, once and for all, that either one or the other should exceptionlessly be the ultimate authority in moral conflicts. Some standards stress the autonomous moral reflection. For example, the Scientist's Code of Ethics of 1998 of the Latvian Academy of Sciences and Council of Science states: "In the situation when the principles of scientist ethics contradict with other generally accepted ethical values, the scientist should make a choice on the basis of his own moral reflection".

Ad 2. The relationship between science and society is one of mutual dependence the exact nature of which is an ongoing process of negotiation. Whilst it is reasonable to accept that scientists must to some extent be independent in their pursuits of knowledge, it is equally reasonable to accept that the society in which these pursuits are made requests some benefits from them. In exchange for public funding, scientists are committed to contributing to finding solutions to the most pressing problems in society today. Investment in science is predicated upon the expectation of some return to society. As Mark Frankel (1989, p.110) formulates it:

> Society's granting of power and privilege to the professions is premised on their willingness and ability to contribute to social well-being and to conduct their affairs in a manner consistent with broader social values…Autonomy has never been a one-way street and is never granted absolutely and irrevocably.

It seems to me that scientists' acceptance of social responsibility (a topic to which we shall return in Argument 7 below) can serve to increase their power and support their autonomy. To the extent that a relationship of mutual dependence exists between science and society, science benefits from accepting accountability and the need to contribute, e.g., by receiving in return increased political, financial, and public support and trust. The latter strengthens science and increases its capacity for autonomous pursuits. Lack of support and – not least – lack of trust could be correspondingly harmful.

This is one reason why many scientists worry about what they perceive to be a deteriorating public perception of science[26]. For example, if scientists refuse to acknowledge the need ethically to regulate scientific research someone else might do it for them, and 'regulate' these pursuits far more restrictively (to the possible detriment also to society)[27].

Professional autonomy "correctly understood", writes Paul Camenish (1983, p. 45), "is not a right of the profession but is a societally granted privilege, and…as such, its proper use becomes a moral duty". Fulfilment of this moral duty can, however, enhance professional autonomy, because, rightly understood, these two should not be interpreted as a pair in conflict but as mutually supportive.

In other words, an ethical standard, such as a code or a guideline understood as a convention between professionals and a solution to a co-ordination problem, could make perfectly good sense to an autonomous individual. She or he may willingly accept the collective norm, whilst reserving the ultimate right autonomously to decide how to deal with conflicts when such arise. Respect for individual autonomy is not an argument against formulating codes of conducts or other collective ethical standards in professional or other contexts, and it is certainly not an automatic license for an individual to act irresponsibly in relation to professional duties. Quite the reverse, individual autonomy is often a token of strong moral integrity and courage, both of which characterise a morally conscious and responsible person.

On the communal level, scientific autonomy is not incompatible with accountability and willingness to contribute to social needs. Autonomy and (individual or communal) responsibility are not only compatible but can, if properly exercised, be mutually supportive.

(4) Argument of ethical awareness

'Explicit ethical standards such as a code of conduct, an oath or a pledge, can serve to increase the individual's ethical awareness.'

Discussion

Those favourable to the introduction of ethics into the scientific enterprise often argue that the formulation of ethical standards increases awareness of the problems at hand. For example, Joseph Rotblat (1999) says:

[26] Cf. e.g. Joshua Jortner (1995). The public perception of science is further discussed in Argument 8.
[27] Cf. Rosemary Chalke, Mark Frankel & Sallie Chafer (1980, p. 2).

> There is also a need for an ethical code of conduct for individual scientists, particularly for young scientists at the start of their career. Some sort of oath, or pledge, should be taken by them at their graduation, like the Hippocratic oath for medical graduates.

Within the 'pro ethics' camp there is some divergence amongst scientists concerning what the most important focus for science in the area of formulating ethical standards should be. Some call for an oath for scientists to be developed, because they feel that such a ceremony might serve to make individuals more aware of the ethical principles to which the oath would appeal. Arguably, a code or a guideline might stand a greater risk of being ignored unless it is made explicit in a ceremony in which one enters, so to speak, a 'society of honour'. In reply, Harris et. al. (1995) have pointed out that even if a code is not regularly consulted, it does not follow that it is entirely ignored. This is true, but it is also true that a ceremony might nevertheless increase the awareness of the code in question. Presumably, the ceremony is, at least in many cases, preceded by a fairly serious analysis of the promise one is about to make. For example, the Student Pugwash Pledge posits very tangible limitations on the type of employment the student is 'allowed' by the Pledge to seek. If the student in the end is tempted to accept such employment even though (s)he made the pledge not to do so, awareness of the problem being present is arguably a positive point even in this situation.

In contrast, others are worried that the swearing of an oath can make ethics seem optional, since an oath concerns only those who swear it. This particular problem might perhaps be avoided if all members of a given group are *obliged* to swear the oath in order to enter that 'society of honour'. The objection could then been raised that this image is antiquated, but that is a question of values. Furthermore, the obligation could be seen to reduce the individual's personal moral investment in the act of swearing[28]. Either way, whichever kind of ethical standards we choose to formulate (e.g., codes of conduct, oaths, or pledges), they will only increase ethical awareness if the individual who is supposed to obey or follow them actually *contemplates* the problems they refer to. The formulation of ethical standards will only have the effect of increasing awareness of the problems at hand if discussion and analyses are involved on the individual level[29].

[28] Cf. e.g. Daniel Sulmasy (1999).

[29] This is one of the questions posed in the question scheme of 1.4: whether and how the messages in the standards posited by scientific institutions actually reach their intended audience.

The different situations denoted by the standards should be explicitly assessed and evaluated by the individual scientist who is supposed to obey them, and the subsequent decision (not) to follow the ethical standards should be made consciously, succeeding rational contemplation. This is one important aspect of the transition to a "culture of evaluation" which Gérard Toulouse (2000) calls for:

> Historical experience shows that an impunity culture develops in science whenever some people or structures are left beyond evaluation. (For instance, in Europe, many science Academies have become fossils…escaping external review, due to a legacy of prestige or power, they are trapped into an impunity culture.) Transition to a culture of evaluation implies reciprocal shifts of attitudes, among evaluators and among evaluated. In the best of perspectives, no longer a priori feared and resisted, evaluation will become sought for and perceived as help for evolution.

One of the most effective ways to ensure this transition is probably to include courses on ethics in the scientific education thus preparing the future scientist for the ethical analyses to which her or his work might give rise.

(5) Argument of hypocrisy

'The mere utterance of a pledge, or the formal acceptance of a code (e.g., when signing a contract of employment), carries little guarantee of its subsequent application. Particularly honest individuals might be reluctant to swear or adopt one for that very reason.'

Discussion

Saying 'I promise…', or 'I shall…', constitutes a performative commitment but does not ensure that this commitment actually be fulfilled. Signing a contract of employment at, say, a university or with a research group, may constitute a commitment to obey any written codes of conduct posited in that context, but these might be interpreted in widely different ways offering a broad spectrum of individual variations to suit diverse purposes. No code is self-interpreting, but any set of guidelines or rules requires interpretation. This combination of multiple possible interpretation and multiple possible intent could be taken to constitute an argument against the formulation of written standards of ethics in science.

In order to be acceptable to a large and often diverse group of people, the code (or oath, etc.) cannot safeguard itself against all devious interpretations but must be somewhat vaguely formulated (cf. Argument (1) above). In principle, a person can promise, or vouch to obey these standards whilst intending to do nothing of the kind, or in fact later not do so independently of the original intent – and get away with this. If such hypocrisy cannot be dealt with properly the standard might just as well (or better) not be posited at all, by a critical line of argument.

We may note that it is in particular honest people with a strong feeling of moral integrity who would be reluctant to accept a standard that stands in obvious risk of serving the wrong purpose.[30]

The point is reminiscent of the problem of analyticity referred to in Argument 1 above: if an ethical standard is to be an effective moral instrument, it must set tangible, substantial limits on what actions it allows, a demand that will recur in our subsequent discussions.[31]

A well-formulated standard could enjoy respect – but if it is not followed, and its breach is ignored, this respect may diminish. A standard can give the impression of being seriously intended – or it can appear as a strategic device or a veil behind which true intentions are concealed. As I said before, ethics is a two-edged sword, and the effects of ethical standards are not all good. Jane Pritchard (1998, p. 530) draws attention to some ways in which an ethical code can have important negative functions (the italics are mine):

> It should not be assumed that all the functions are positive. One negative function of codes is that, rather than improving standards of practice, they may actually serve to reduce them. This could happen in two ways. Firstly, if the code is adopted in a superficial way, for example as a marketing tool in order to give the impression that a business intends to behave morally, it may be treated with contempt… *The code, by misleading people about the managers' intentions, makes the situation worse than had it never been adopted at all.*

[30] It is important not to confuse hypocrisy with pluralism. Many Nazi doctors supposedly swore the Hippocratic Oath and then committed what others have since condemned as the most atrocious crimes – acts (that we call crimes) which by many of them were conceived as a moral duty. In my view, that is the ultimate horror of many crimes against humanity, revealed so clearly by movements provoked by fanatic ideologies, such as the Catholic Medieval Inquisition, or the 20th century Nazi rule. In the name of God, the Leader, or some principle considered sacred, people have tried to exterminate whole races, silence all dissidents, subordinate a gender, or a class, whilst purporting that these were 'acts of virtue'. We have modern illustrations, regrettably, e.g. the cruel treatment of women in Taliban Afghanistan.

[31] For example, in the discussion on animal welfare (2.3.), where certain standards allow animal experimentation when 'necessary', with scant specification concerning when that is so.

Bad ethics is worse than no ethics at all. A standard (a code, an oath, etc.) is only good if it is very good, otherwise it should preferably be notable by its absence. Superficiality, vacuity hypocrisy, corruption and impunity are five of the main pitfalls in applied ethics, of which the context of formulating standards for scientific research is a particular instance.

A second function that Pritchard – more controversially - suggests as negative for the code is when the code is sincere but so detailed that it rather appears like a complicated legislation to be followed rigorously. "As such the provisions of the code are not treated as guidelines which ought to be followed but as laws which must be followed, allowing no room for professional discretion".[32]

On this account, a code should be regarded as having a moral but not a legal structure, morality should not be confused with law, and a code should constitute a weak but not a strong prescription[33].

This line of thought is reminiscent of the principle referred to in Argument (2), that duty presupposes possibility, which similarly introduces the theme of implementation and the idea that the level of difficulty involved in following a norm must be reasonable and related to a principle of proportionality. Rules must not be formulated so as to render their application impossible, or so difficult that the stakes become too high. There has to be a reasonable balance between the efforts required to follow the rule and the expected results (or, as we might say, between theory/practice). The problem here, which can be called '*the executive trap*'[34] arises when a formally correct rule is practically inapplicable (one version of which would be by raising inconsistent demands). The question of sanctions (legal, ethical, or other) when a rule is not followed arises in this context (e.g., if the breach of a rule that is practically impossible to follow is connected with sanctions).

(6) Argument of legalism

'Ethics should not be confused with law: the detailed and rigorous structure of legislation is not a suitable model for ethical systems.'

[32] Another problem with a very detailed standard, suggested to me by Vivian Weil and Michael Davis, is that it can lead people to assume that anything not included in the list is permitted.

[33] Roughly, a weak prescription gives an advice whereas a strong prescription issues an order. In legal terminology, a weak prescription is an *optional rule* that suggests what we *should* do in given circumstances, whilst the strong prescription is an *imperative rule* informing us what we *must* do in certain contexts, cf. Appendix (ii, p. III).

[34] This trap and the ones described in the first two arguments are described in greater detail in Kathinka Evers (2001) (3) & (5).

Discussion

Evoking the ancient Confucian idea that morality must not be confused with law, John Ladd (1983) argues that codes of ethics serve no purpose. Ethics, says Ladd, should be open-ended and reflective; not confined to the boundaries of codes. Such a confinement would invite confusion of ethics with law. Professionals, such as scientists, do not, according to Ladd, have any moral obligations over and above those that they have as private individuals, or moral persons. As a consequence, codes of ethics are superfluous.

Depending on how it is interpreted, this last view may appear directly to contradict the view that professionals become accountable for their actions in proportion to the impact of their work on human society (cf. Argument 7 below). If Ladd means that professional belonging is *never* as such morally relevant, then there seems to be a conflict of values between him and the latter position. If, however, Ladd means that professional belonging per se *need* not introduce special moral duties, his position might admit that some professions *do*, e.g., because of their social/natural impact.

Either way, one can admit the moral relevance of professional belonging whilst being reluctant to letting ethical standards resemble laws, bearing the openness of standards to interpretation and revision in mind.

In practice, an oath, a code, or another type of ethical standard, could easily be ignored unless some type of sanction backs it up, and if easily ignored it would hardly induce respect. If you accept a standard and then act contrary to it, something (many would say) "has to happen". But what type of sanctions should be introduced and by whom? Should there for example be legal sanctions? Should law enforce morality? Or should science be self-regulatory? Scientists' attempts to formulate codes of ethics regulating their activities can be seen as an endeavour to take the lead in this area and impose rules for themselves – lest someone else does it for them, which may not be ideal from their own point of view (or, for that matter, from society's).

Introducing legal aspects in the ethical arena is controversial. Elisabeth Rynning (1997) argues that jurists' participation in ethical committees ought to be obligatory – as it is in Sweden where animal research is concerned[35]. She writes (my translation):

[35] Cf. 2.3.

> It is interesting to note that jurists' participation in the Swedish ethical committees on animal experimentation is obligatory: the rights of animals are (unlike the human rights) in the context of experimentation protected by Swedish law. This should be extended to human experimentation as well, for without regular legal scrutiny of planned human research projects, there is an obvious risk of unethical, and perhaps even unlawful, research being carried out.

Her position is rejected by Lars Jacobsson (1997), who argues that voluntary scrutiny is preferable to obligatory, legal control, mainly because (with reference to legal practice generally) there is no reason to believe that the results would be similar across the country.

Most of the standards in the list provided in the present document are voluntary, and not connected with law in other terms than compatibility (which some of the standards explicitly request). An exception would be the conventions in the countries that have ratified them[36].

Most of them do not either connect with sanctions or means of enforcement but are purely voluntary (cf. 1.4).

Our present scope does not permit the type of discussion that this interesting issue merits; however, two points can be made briefly. First, it appears to me that the presence of legal experts in ethics committees can be very valuable *even if* the scrutiny should only be voluntary. For the relations between standards of ethics and national or international legislation can be extremely complicated, and the latter structures are rarely known by laypeople. Understanding of many complex issues in the area of science and ethics, such as, for example, gene patenting, requires knowledge of the relevant laws, economic systems and other relevant social structures in addition to genetic scientific expertise and philosophical argumentation. The ideal ethics committee would consist of diverse professional representatives, including legal experts as well as scientists and philosophers.

Secondly, law and morality are closely related, and what is a law today was in many instances a moral notion before it was considered sufficiently important to be legally enacted, and earlier still it was perhaps not regarded a value at all. For example, physical violence within the family was in many European cultures not long ago regarded as a private matter, but attitudes changed and it became more and more generally deplored morally, until at last it became legally prohibited. Animals were once considered to be soulless automata without feelings, until moral attitudes changed with increasing knowledge, and their relative welfare eventually became legally protected in many countries. The point being that the moral

[36] E.g. the conventions listed of the Council of Europe.

principles that are considered most important in a given society are typically amongst those that are posited as laws in that same society. The possibility that there are ethical principles in the realm of science that will become important to the extent of meriting additional legal weight should not off-hand be dismissed.

(7) Argument of social responsibility

Pro-version: 'Professionals become accountable for their actions in proportions to the impact of their work on society.'

Contra-version: 'Professionals, such as scientists, do not have any moral obligations over and above those that they have as private individuals, or moral persons.'

Discussion

Science and technology are major forces of socio-economic change. They empower humankind to change its social and natural environment at a breathtaking speed. As an integral part of this process, science carries serious responsibility. The question is: are scientists prepared to accept it?

"Scientific knowledge", says Lubchenco (1997), "is urgently needed to provide the understanding for individuals and institutions to make informed policy and management decisions and to provide the basis for new technologies". However, she questions whether the scientific enterprise:

> …is prepared for the…crucial and daunting challenges that lie in our immediate future. The answer that I must give is "no". I assert that the immediate and real challenges facing us have not been fully appreciated nor properly acknowledged by the community of scientists whose responsibility it is, and will be, to meet them.

The reluctance amongst some scientists to acknowledge the importance of ethics in science and their (as well as their institutions') share of this responsibility (over and above their civil or private responsibilities) is by no means a universal attitude. Amongst many, Joseph Rotblat (1999) seriously condemns this "no ethics" principle as positively immoral:

> To me, such an amoral attitude is immoral, as it eschews responsibility for one's actions. There is much campaigning for human rights, but much less for their duties. I believe that each of us should be accountable for our deeds, and this should apply particularly to scientists, because of the great impact of their work on human society.

The traditionally individualistic and socially secluded quest for 'objective knowledge' is today being replaced by project-oriented teamwork science that needs to justify itself in terms of potential human consequences. This gives science an explicit ethical dimension that cannot be ignored. And, in many cases it is far from ignored.

"My view of the situation of scientists in the contemporary world", writes Andrei Sakharov (1981, pp. 25-6), "has convinced me that they have special professional and social responsibilities… We all share the responsibility to work for the full realization of the results of scientific research in a world where most people's lives have become more difficult, where so many are threatened by hunger, premature illness and untimely death. But scientists and scholars cannot fail to think about the dangers stemming from uncontrolled progress, from unregulated industrial development and especially from military applications of scientific achievements".

One perspective that stands in urgent need of immediate attention concerns the situation of the developing countries as compared to industrialised nations. Some authors argue that the benefits of modern science have largely gone to a minority that scarcely exceeds 20% of the world's total population (mainly white Europeans settled within or outside Europe). The other 80% have benefited only marginally from scientific advances. Arguably, it is a misuse of science if such gross inequities exist. Furthermore, the ideas of copy-right and patents can also be seen as a product of European intellectual and economic tradition, and the rules evolved by the World Trade Organisation may seem unfair when they compel practitioners of traditional knowledge to incur great expense fighting patent battles in the U.S.A. and Europe[37].

A statement on this global perspective is issued in the Declaration of Guadalajara[38]:

[37] Cf. Srinivasan, M. R (2000).
[38] Issued in the city of Guadalajara, on July 15 1998, within the framework of the International Summer University "Science and Life".

> In the name of the independence of science and of its calling to the genuine service to the whole of humanity, we reject scientific research subservient to the designs and interests of the powerful. The greatest ill of humanity is the increasingly growing inequality among peoples. While undernourishment is still assailing certain regions of our planet, bulimia and anorexia cause suffering to people in other regions; while life expectancy in Africa is only fifty-five years, in Europe it is above seventy-five years. We believe that the overcoming of these and all the other inequalities must constitute the top priority of scientific work and of the funds destined to it.

Whether or not we agree with this call for justice, and the view that science can or should be helpful to achieve it, we must admit that this is not a universal position amongst decision-makers or "the powerful". If it were, the sustainable biosphere would perhaps seem less remote, and the social inequalities be far less tragic.

What social responsibility and justice imply is, however, subject to quite different interpretations. 'Social responsibility' may be taken to mean a number of different things, depending on, among other things, our cultural and economic-political frameworks. When we suggest that science should be socially responsible, we relate science to the interests of society. In order to be informative, this reference has to be more specific. For the substance of 'social responsibility' will vary profoundly depending on what *type* of society we talk about. Distinct societies have different interests, do not set the same priorities, and accordingly assess responsibility varyingly. The concept 'justice' is very differently conceived or defined in, say, the egalitarian democracy as opposed to the 'democrature',[39] or in the neoliberal capitalist society as compared to the social-democratic capitalist state[40].

To illustrate, the notion of social responsibility in the United States is strongly limited by the values of individual freedom, and of the policy of minimising state intervention in social affairs, including such things as health care that is largely covered by private insurance. This stands in sharp contrast to countries such as Sweden, New Zealand or France, where collective solidarity is widely considered to be a foundation of civilised society, thus giving the concept of social responsibility a correspondingly broader interpretation.

[39] This expression was coined by the writer Eduardo Galeano to denote purely formal democracies that have no democratic substance (e.g. in terms of universal access to minimal basic living standards, education or health care).

[40] That is to say, it is not simply the case on all accounts that one society is just, or equal, whereas the other is not at all, or less so, but rather that they have different views on what these terms *mean*. The conceptions of justice and equality vary, politically as well as philosophically. Cf. Kathinka Evers (1997)&(1999).

It is perhaps not surprising, therefore, that the strongest critics of imposing a social conscience on science, and the greatest challenges that such a conscience would meet often come from societies in which collective solidarity is not a fundamental feature. Advocates of a socially responsible science must beware of naïvely believing in superficial similarities (e.g., a shared use of verbal expressions) and take profound divergences in interpretations of key terms ('freedom', 'justice', 'social responsibility', 'equality', 'sustainability', etc.) into careful and well-informed consideration[41].

(8) Argument of publicity

'Codes of ethics (or other ethical standards) adopted by a scientific community serve a purpose of publicity and openness. They constitute a concrete document that is open to public scrutiny and assessment, and as such it also offers a possible basis for public trust.'

Discussion

Wolpert (1992, p. 152) suggests that the (only) "obligations that they [scientists] have as scientists as distinct from their responsibility as citizens" is to "inform the public about the possible implications of their work and, particularly where sensitive social issues arise, they must be clear about the reliability of their studies".

Whether or not these obligations are jointly exhaustive as Wolpert suggests, they do in themselves constitute a substantial code of conduct, and if applied they would be an excellent source of public evaluation. This is one of the most important functions that Mark Frankel (1989, p. 111) ascribes to codes of ethics:

> As a visible pronouncement of a profession's self-proclaimed role and values, a code can function as a basis for the public's expectations and evaluation of professional performance, thus serving as a mechanism for holding the profession and individual professionals accountable.

Of course, as described already in the discussion of Argument 5, the opposite effect could also occur, if the codes are conceived by the public as a political device[42], or if the public debate appears dishonest. Andrei Sakharov (1981, pp. 25-6) argues in a similar spirit to Wolpert in this regard:

[41] Cf. 2.2.

[42] Cf. e.g. E. Schattschneider (1960).

> Unfortunately, despite the urgent and serious nature of the issues at stake, such [public] discussions are often uninformed, prejudiced or politicized, and sometimes simply dishonest. Experts, therefore, are under an obligation to subject these problems to unbiased and searching examination, making all socially significant information available to the public in direct first-hand form, and not just in filtered versions.

The quality of the information that reaches the public is, as stated earlier, of utmost importance to all parties concerned: the mutual relationship of dependence between science and society requires mutual trust and understanding in order to be beneficial. The image that the public has of science is closely connected to public access to scientific development. Only scientists – or scientifically informed journalists - can distribute relevant information directly and intelligibly, and they have, it seems, a responsibility to do so.

If they do not, the social image of science is likely to deteriorate further. In large parts of the world, people already do not conceive of science as being essentially a benefactor of humanity, nor do they readily associate science with the classical quest to develop a more enlightened civilisation. Trust in the ethical integrity and responsibility of scientists is declining and partly replaced by suspicion and fear of abuses of various kinds. Joshua Jortner (1995, P. 162) complains that "too often today the general public when they think of chemistry or physics think of toxic waste dumps and cancer-causing chemicals and radiation. The public does not think of the many advances that science has given to mankind, for example, the continuing lengthening of life expectancy"[43].

As the world-wide demand for research grows whilst the available funds are tightened, competition amongst scientists increases and new alliances are formed. In the pursuit of the advancement of knowledge and the creation of new technologies, traditional institutions of science look for new ways to organise and market their activities.

The laws of the marketplace seem sometimes to overshadow the more traditional values and norms of the scientific enterprise and academic research institutions. For the critics of science, this development signifies a gloomy vision of a demoralised and socially irresponsible science. For them, science has become the willing servant of those who are in power. Some even consider scientific rationality as the paradigm for a de-humanised way of thinking, devoid of commitment and value, for example, Paul Feyerabend (1975, p. 6):

[43] Arguably (at least on some accounts), the situation would have been different if science had increased the life expectancy of a larger *proportion* of 'mankind'.

> My criticism of modern science is that it inhibits freedom of thought. If the reason is that it has found the truth and now follows it then I would say that there are better things than first finding and then following such a monster.

The general public in many parts of our world does not readily associate science with the role of being a voice for or a benefactor of the public. This part has largely been taken over by NGOs and special interest groups. Trust in the positive mission of science does not come easily, and amongst active politicians one will likewise find many who nourish a deep scepticism towards the contributions science can make to a responsible design of policy. Substantial codes of ethics (or other ethical standards) adopted and ostensibly applied by a scientific community would consequently, by constituting a concrete document that is open to public scrutiny and assessment, offer a very important basis for public information and trust.

(9) Argument of professional security

'Ethical standards can offer practical guidance and advice to scientists in difficult, e.g., novel situations. The standards can express the accumulated experience of other professionals in the field, and suggest solutions to matters of uncertainty.'

Discussion

In situations that are novel to the individual scientist, the standards can inform the decision process by reflecting the *cumulative professional experience*. The cumulative aspects are important in this context. There are "consequences that are cumulatively best, but unlikely to be achieved by individual well-intended agents acting on their own"[44]. A code of ethics or conduct "can draw on the underlying but shared morality of the group members"[45].

This experience of joint ventures with shared ideals and values can help increase the ties within the community and strengthen professional allegiance. In difficult cases it can also increase the individual's feeling of professional security because she or he has the support of the group.

(10) Argument of professional control

'Ethical standards can offer practical guidance on how to solve disputes among scientists and can also deter people from acting dishonestly or otherwise unethically, e.g., by being connected to sanctions.'

[44] Cf. Alan Goldman (1980, p. 23).

Discussion

A system of ethical standards can create a monitoring device in which each individual scientist has a responsibility to respect the norms posited by the group collectively and report those who fail to respect them[46]. When disputes between scientists arise explicit ethical standards, such as a code of conduct, can be helpful in so far as they include aspects of the dispute in question. They offer an intersubjective reference that may serve "as a basis for adjudicating disputes among members of the profession or between members and outsiders"[47].

To illustrate[48], members of the Society for American Archaeology (SAA) who in the 1950s found themselves increasingly working as consultants to industry and involved in the "culture resource management industry" expressed concern that "the nonacademically associated members of the community were not subject to any form of peer review"[49].

In order to deal with this problem, the SAA proposed in 1974 "to adopt a detailed code of professional conduct and establish a procedure for certifying professional archaeologists backed by a formal grievance procedure for calling colleagues to account who do not meet minimal standards for training, professional performance, and managerial practice."[50]

When the SAA Executive Board rejected the proposal, its proponents established an independent society of their own, Society for Professional Archaeologists (SOPA), and adopted the only detailed code of conduct that exists for archaeologists in North America. They also instituted a registry of professional archaeologists and a grievance procedure for reviewing violations of professional standards that has functioned effectively for over twenty years[51].

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[45] Jane Pritchard (1998, p. 528).
[46] For better or for worse: for better at least when the breach risks having serious consequences, but the line between whistleblowers and 'squeals' can be delicate at times.
[47] Mark Frankel (1989, p. 112)
[48] I borrow this illustration from Alison Wylie (1998, p. 4).
[49] Charles McGimsey (1995, p. 11).
[50] Alison Wylie (1998, p. 5).
[51] Cf. Charles McGimsey (1995, pp. 12-13), Ned Woodall (1993) and Ernestine Green (1995).

1.4 Empirical Circumstances: Goals & Motives & Implementation

An empirical analysis of contexts of formulation and mechanisms of implementation

In what actual circumstances does the perceived need to formulate ethical standards for science arise? What factors have actually triggered such projects? Why are the standards formulated initially, and for what reason are they subsequently amended (if at all)? What is their impact? How are standards adopted, communicated and enforced within the organisations that have them? Are there explicit sanctions connected to breaches of the standards? Would it be advisable to supplement the existing codes by a universal pledge across all science?

In order to obtain information about the collected standards' motives, contexts of formulation and mechanisms of implementation, SCRES sent out a question scheme to its contacts (members of ICSU, primarily), printed below.

We shall now discuss the questions raised in this question scheme, and by way of doing so, offer a summary of the replies received[52]. The discussion also includes suggestions (to be further elaborated in subsequent analyses) of some general analytic dimensions found in the codes collected, notably in terms of their main points of difference versus similarity.

[52] These will not be presented in statistical charts, because the number of replies is not sufficiently significant to allow that type of structuring. The empirical material collected serves as a source from which relevant notions are fetched, and on which the discussions focus. However, lacking a statistically significant amount of material, the text does not purport to offer any solidly based exhaustive and large-scale empirical account of the practices of scientific communities. Rather, it is a limited description of those aspects that have been conveyed by the replies received.

QUESTION SCHEME:

I. WHY? (Origin and circumstances)

1. When did the idea to formulate a code (or other standard) of ethics arise?
2. What circumstances triggered the project: Scandal? Problem? General interest?
3. Was there any pro-et-contra discussion concerning the purpose of adopting such a standard – and what was the purpose?
4. When was the standard actually adopted?

II. WHO? (Agents and subjects)

1. Who (individual or group) suggested that a standard be adopted?
2. Who was in charge of its formulation / its adoption?
3. What was the reason for their subsequent amendment (if amended)?
4. Who is supposed to follow it?

III. HOW? (Status and implementation)

1. What is the status of the standard: how is it implemented?
2. Are there any mechanisms of enforcement (e.g., sanctions)?
3. How do you reach the intended audience/subjects: are they aware of its existence? Do they respect it?
4. How effective are these standards in conveying ethical responsibilities to scientists?

General question:

Do you believe that there is a common ground between the codes of various disciplines and organisations that allows for a universal ethical pledge across all science? Would it in your opinion be advisable to supplement the existing codes by such a universal pledge?

I. WHY? (Origin and circumstances)

When did the idea to formulate a code (or other standard) of ethics arise? What circumstances triggered the project: Scandal? Problem? General interest? Was there any pro-et-contra discussion concerning the purpose of adopting such a standard - and what was the purpose? When was the standard actually adopted?

The interest to formulate ethical standards to regulate scientific research has arisen in a broad variety of empirical circumstances ranging from the presence of a general academic interest, or general concern, to concrete events like scandals of fraud and other forms of scientific misconduct; or problematic realities, such as economic crises, ecological declines, warfare, or epidemic illnesses. Studying these diverse circumstances, we find that a number of different *types of factors* have triggered projects of developing ethical standards in science:

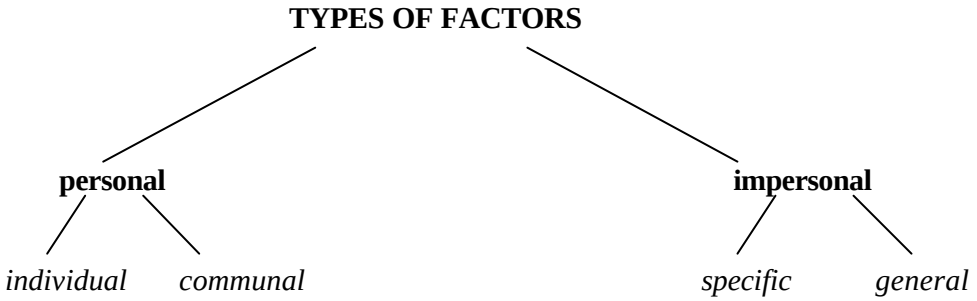

Fig.1. Figure showing types of factors that have triggered projects of formulating standards of ethics in science.

Some factors are *personal* (by which is simply meant that they are directly person-related) whilst others are *impersonal* (i.e. not person-related). Of course, in some sense, all factors are person-related somewhere along the line, since all science is conducted by persons and ethics is also essentially a person-related enterprise. That a factor is labelled 'non-personal' does not imply that the context is void of persons, but serves to highlight where the *weight* of the perceived problem provoking the interest lies as well as its level of generality. The distinction is intended as a simple tool. Both types of factors are illustrated below.

The *personal misconduct* of an individual or a group within the scientific communities has triggered many projects of formulating ethical standards. For example, the Proposals for Safeguarding Good Scientific Practice made by the *Deutsche Forschungsgemeinschaft*

(DFG), or procedures for handling such cases that were adopted by the University College London (UCL):

> Following a lengthy investigation of a serious case of research misconduct in scientific research, I [Registrar of UCL] decided that the College should have a formal procedure for handling cases of research misconduct (there had not been a procedure before); indeed some research funding bodies were requiring that universities to which they provided funding should have such procedures.

Within the personal domain one must separate *individual* factors, such as individual misbehaviour that concerns one person's attitudes or conduct, from *communal* factors that involve more than one person, e.g., faults committed by research teams[53]. Scientific research is not exclusively (nor even primarily) an individual pursuit, but is largely conducted by teams, and there are instances of misconduct committed either by individuals or by teams. As stated earlier (in 1.2) it is generally important to distinguish between individual and communal perspectives. The individual scientist cannot be held responsible for any and all applications of her or his research in a broader communal context, and an equilibrium must therefore be found between individual and communal responsibility. The distinction between individual and communal offences is one aspect of this equilibrium.

To illustrate personal factors, the International Union of Geodesy and Geophysics (IUGG) replied to Question I that in their case the interest in formulating ethical standards arose from personal factors of both individual and communal kinds:

> a. Mostly when some individuals would show up at an eruption in a developing country, skim the data, put down the local scientists, rush home and publish.
> b. There were also situations of serious bickering within teams responsible for monitoring eruptions.

Each of these factors can be more or less abstract or concrete. Those that triggered IUGG's code-project referred to concrete, specific problems, such as competition between scientists, or acts of poor judgement:

[53] In the distinction between individual and communal perspectives (virtues, offences, responsibilities, etc.) we find some important analytic dimensions of the content of standards that concern types and degrees of difference versus similarity between the standards collected. In brief: individual virtues seem less controversial than the communal, or social characteristics recommended. This will be further discussed in Chapter 2.

> Mostly where multiple teams were competing rather than cooperating on eruption observations and confusing the civil defence authorities and public. Also some cases where bad judgement led to death and injury-caught in an eruption.

Moving now to illustrate some impersonal factors, these can, for example, constitute an appeal to situations that are *potentially dangerous* due to the rapid advancement of scientific knowledge, e.g., problems arising from sudden breakthroughs in science. This concern is illustrated in the reply we received from China Association of Science and Technology (CAST). For them, the idea to formulate a code of ethics arose from both personal and impersonal factors, such as when they detected:

> …disgusting conduct of someone within the scientific community … bad behaviour of a certain scientific body which may disrupt ethical norms … dangers arising from scientific breakthroughs and the big gap in recognition of them

In the last statement, this reply goes beyond the scientists' personal misconduct and introduces the theme of impersonal dangers arising from scientific breakthroughs.

The impersonal factors are more or less *general* or *specific*. An example of an impersonal general factor would be a *general interest* in a topic as such. In the case of the International Union of Food Science and Technology (IUFoST), for instance, we were informed that the project to formulate codes within this Union was triggered neither by any particular scandal, nor by specific perceived problems, but by general interest accompanied by relevant knowledge:

> …general interest, and familiarity with the Code of Professional Conduct and its accompanying Professional Conduct Guidelines adopted in 1975 by the UK-based Institute of Food Science and Technology (IFST).

Similarly, general interest rather than any particular incident or scandal inspired the Royal Society of New Zealand to formulate a code of professional standards and ethics with the purpose "to begin to confront scientists and technologists with their responsibilities across their communities as well as within their own disciplines".

Another general factor that frequently provokes ethical concerns relates to the fact mentioned above that science and technology are major forces of socio-economic change and empower humankind to change its social and natural environment at a breathtaking speed. We

need scientific knowledge to provide the understanding necessary to make informed policy and management decisions and to provide the basis for new technologies; however, it is questionable whether the scientific communities are properly prepared for these challenges. In view of the general problems that we (and all other forms of life on the planet) face today, there is ample cause for concern. Many codes have been formulated in response to this type of general concern[54].

More specific worries arise from breakthroughs in *specific areas of science*, such as the human genome project (HUGO), or the development of new computer techniques enabling mankind to conduct cyber wars (cf. 2.4), or scientific research into the use of toxic materials (e.g., deleted uranium or atomic waste) in bombs, or developments within food science and technology.

These may have both abstract and concrete expressions, as, for example, in UNESCO's Declaration on the Human Genome. On the one hand, article 1 of this Declaration evokes rather abstract images when it speaks of a shared "unity of the human family", of a human "inherent dignity" and of the genome as "the heritage of humanity". On the other hand, the Declaration is also quite concrete, e.g., in article 19, where it affirms the importance of international co-operation enabling:

> iii) developing countries to benefit from the achievements of scientific and technological research so that their use in favour of economic and social progress can be to the benefit of all;

Problems of economic and social progress are amongst the more serious concrete circumstances that provoke ethical concerns in research, to which numerous ethical standards draw attention. For example, it is considerably more interesting from a financial point of view for scientists to focus their research on welfare-related problems, such as obesity, and struggle to find 'the fattening gene' rather than studying poverty-related illnesses, such as leprosy, or malaria. In the meantime, around 2 0000 000 people (almost all of them extremely poor and half of them children) die of malaria every year[55], whilst funds are being diverted to the economically more rewarding study, notably of genomes. This has provoked irritation

[54] E.g. the Chiang Mai Declaration (WHO et.al).
[55] According to the most recent information that the author received from *Médecins Sans Frontières*, 500 millions of people are touched by the decease, and a child dies of the disease every thirty seconds.

amongst many scientists, who are worried about this blatant lack of compassion and solidarity. A member of SCRES, José María Cantú (2001) severely criticises this[56]:

> Thus an economic problem with deep social consequences emerges: even though it may not be voluntary, the search for economic gains from the human genome research presently provokes a silent 'paupericide', that is to say, the poor have ever lesser access to high quality medical services. This will be further accentuated in the new therapies that hold promises of revolutionising health care, but only at great cost.

Amongst the standards in our list, the Guadalajara Declaration serves to illustrate a call for a change in this state of affairs.

Economic structures have very close and multifarious connections to ethical issues in science. The problem of justifying the (any form of) distribution of material and human capital emerges in many different contexts. To give another example, an increased interest in codes of ethics was triggered in Cuba by the economic crisis in the early 1990s. The Cuban code strongly emphasises social solidarity and individual altruism for the benefit of the larger whole in the fight against underdevelopment. It also calls for action against the "robbery of brains" by developed countries from developing countries: i.e., when developed countries aided by their economic strength are able to attract highly educated professionals from developing countries without any compensation to the latter, even though these have borne all the costs for the education of the individual in question. This is a concern that Cuba shares with many scientifically advanced but economically less developed countries, such as India and (potentially) with Eastern European countries, if they join the European Union[57]. It is a highly complex problem that concerns many different types of freedom, interests, and notions of justice (see further 2.2).

Moving to an ideologically very different context, perceived threats from religious groups have provoked American scientists in AAAS to formulate resolutions against 'creationism' purporting to have scientific foundations[58]. This type worry would be out of the question in Cuba, or in most western European countries, like Sweden or France, where orthodox religious groups are kept firmly away from education politics. The question of

[56] In 'Un paupericidio silencioso' article & interview by Patricia Vega in *Lunes en la Ciencia*, February 19, 2001. Author's translation.
[57] That membership would give citizens the possibility of freely seeking employment in other EU countries.
[58] The resolution does not oppose the right to believe that some godhead created the universe, but only the legitimacy in claiming any scientific evidence for this metaphysical faith.

creationism simply does not arise in the politics of education in these countries, and the ethical standards that are formulated in academic communities need accordingly make no mention of it.

Thus, in these selected illustrations of different empirical circumstances of formulation of ethical standards for science, we see how the standards *mirror the reality* in which scientists who formulate them operate. Their contents reflect the threats and problems that exist (or are perceived to exist) in their respective environments, which constitute the circumstances in which the standards are formulated. Accordingly, the replies that we received differ mostly to the extent that they reflect these diversified realities, whereas they agree in greater measure in so far as they refer to abstract moral qualities requested by the individuals that operate in these environments. In other words, *context-dependence* is one factor that makes the virtues requested in the standards differ: both in the choice of virtues emphasised and in the interpretation of these virtues. Having here introduced this point, we shall often return to it in the subsequent sections of this document. One of the aims that we set for ourselves in the outset of this project was to analyse how ethical standards resemble or differ from one another, and all observations that are relevant to this issue will therefore be tied together in what will hopefully be an informative and coherent account in the Conclusion.

Another question posed in the Question-scheme was whether there had been any *pro-et-contra discussion* concerning the purpose of adopting such a standard. Was there any opposition to the idea?

At the UCL, "There was no opposition to the introduction of these procedures and documents." The reply of CAST showed a slight touch of scepticism, at least in principle: "There might be debate about the purpose of adopting such a standard: whether the scientific community and scientists are middle-school students whose behaviour has to be constrained or bound by some rules?" Within IUFoST:

> There was general agreement that something along these lines was desirable, but discussion about whether a body like IUFoST, not an organization of individual members but an organization of adhering national bodies (some of which were themselves national committees with several national adhering bodies), could produce a code enforceable on individuals. After some discussion a consensus developed that what we were producing was not an enforceable Code, but what was eventually called a "Guidelines of Professional Behaviour", and was intended as a guide to individuals and a model for those national adhering bodies lacking a Code (or wishing to improve an existing one). At the IUFoST General Assembly …, the

> only point of contention was whether to use "shall" or "should" in the text ("should" because it was unenforceable by IUFoST, or "shall" because its provisions could then be adopted verbatim by an adhering body). A large majority voted for "shall".

In the replies received we have not been told of any overt opposition to the idea of formulating ethical standards to regulate scientific research; however, in the previous section several argument expressing scepticism towards the legitimacy of introducing ethics into the realm of science were considered.

As for the question when the standards in SCRES' collection were adopted, most of the standards are quite recent: few date back earlier than the 1970s.[59]

II. WHO? (Agents and subjects)

Who (individual or group) suggested that a standard be adopted? Who was in charge of its formulation / its adoption? What was the reason for their subsequent amendment (if amended)? Who is supposed to follow it?

We received various replies to the first of these questions: *from whom* the suggestion that a standard be adopted originated. Suggestions had come from *institutions* like the Ministry of Education and Research, academic associations, societies, committees and organisations, or from an individual *person* in a position of authority, such as the President or the Registrar of a University or College.

With respect to who was in charge of its formulation / its adoption, the replies also varied between having assigned both tasks to a group of individuals, e.g., the presidium of a scientific association, to assigning the formulation to one individual and the adoption to a group. The former procedure was followed by, e.g., The Norwegian National Committee for Research Ethics in the Social Sciences and the Humanities, (NESH) whose 12 members formulated and adopted the standards. The latter procedure was followed, for example, at UCL:

> I [Martin Butcher, Registrar] drafted a procedure, partly based on those in use in other UK universities, and this was approved by the College's committees and is

[59] We have not tried to be historically representative in our collection, but an excellent survey of older, historic, or ancient medical codes and oaths can be found in Veatch, Robert M.: 1995, 'Medical Codes and Oaths', in Reich, WT, ed. *Encyclopedia of Bioethics*, 2nd edn, pp. 1419-1435. New York: Macmillan.

> now in force. It was also agreed that there should be guidelines for responsible practice in research, and again with the help of colleagues, I drafted a document which was approved for implementation across the College.

In other cases, individual persons were in principal charge both of the formulation and of the adoption of the standards. This was the procedure of IUFoST, amongst others:

> Formulation and drafting were done by John Hawthorn assisted by Ralph Blanchfield who, as the then President and Hon Secretary respectively of the IFST, had been the prime movers in 1974-75 of the development and launch of the IFST Code of Professional Conduct and its accompanying Professional Conduct Guidelines. Richard Hall, Chairman of the IUFoST Constitution Committee was in charge of the adoption of the Guidelines.

Regarding the question what the reason was for the standards subsequent amendment (if amended), most of the replies that we have so far received said that the standards have not been subsequently amended. The material in our possession is presently too limited to enable us to attempt any fuller reply to the possible or customary nature of such amendments. In contrast, we were better informed concerning the question of who is supposed to *follow* these standards. The following selection of replies (with author's italics) captures the alternatives given:

CAST: "In cases of CAS and CAE, *all academicians* are supposed to follow it."

IUFoST: "Indirectly, the *members of those national adhering bodies* that adopt and enforce Codes of Conduct based on it. It is *hoped that individual food scientists will use it as a guide* to their behaviour."

UCL: "These procedures are now College policy and form part of our Academic Manual which is our comprehensive collation of the College's quality assurance procedures. *All academic staff and research students* are subject to these procedures."

NESH: *"Every researcher within the relevant subject fields*. The guidelines cover research in all respects, including its place in society, protection of persons, groups and social institutions, the individual researcher and the research society, contract research and research mediation."
University of Ulm (UU): "In the case of the University the members of the institutions are supposed to follow the rules. In the case of the DFG the rules are part of the funding conditions."

III. HOW? (Status and implementation)

What is the status of the standard: how is it implemented? Are there any mechanisms of enforcement (e.g., sanctions)? How do you reach the intended audience/subjects: are they aware of its existence? Do they respect it? How effective are these standards in conveying ethical responsibilities to scientists?

How are ethical standards implemented? There are different methods of doing so that are connected to varying types of sanctions.

To begin with, there are the *laws* of the country in which the research is conducted. Legal sanctions are connected to a breach of the laws, and most of the standards (if not all of them) agree to follow their national legislation. (The status of international legislation is more complicated, especially so long as there is no international court to settle disputes.) The responsibility of making sure that the laws are followed is a matter for the police and appropriate jurisdiction, and not primarily for the scientific communities themselves.

Within the scientific communities there are, outside the realm of national legislation, the ethical standards that whilst they supposedly agree with the laws also require other kinds of behaviour in terms of ethical correctness. With respect to these standards, the scientific communities are largely self-regulatory: they decide themselves to what extent a standard should be purely voluntary and, say, enforced only by peer pressure[60], or obligatory and connected to more potent types of sanctions. The latter type could be an official reprimand, suspension of membership in a given group for a limited period, or expulsion for life[61]. That would depend on the seriousness of the offence committed.

Funding institutions, like research councils or similar organisations, have the possibility of financial regulations and often these institutions are aided by ethics committees that

[60] This is the case within ICSU and within many members of ICSU, such as IUGG or IUFosT.

scrutinise alleged problems from the point of view of the relevant standards. Withdrawal of financial support is an effective sanction against a researcher, or a research group, and also refusal to publish result obtained by unethical methods, in those cases where publication is relevant. (This is not always the case, for instance in industrial, e.g., pharmaceutical research financed by the industry itself.) As a rule, the ethics committees have no enforcement authority, only advisory functions, but the funding institutions could decide, for example, only to fund projects that have been given a clear sign by the ethics committee after proper scrutiny. Unofficial punitive reactions within scientific communities in response to discovered misconduct are also worth mentioning in the context: the loss of reputation or the loss of collegial respect can be a very serious effect even if it may not properly be labelled 'sanction'.

Judging from the replies received, it appears that there are relatively few (discovered and/or admitted) offences against the standards. Does that mean that there is a high level of awareness of them?

The replies to our question how knowledge of the standards was spread were relatively homogenous. The standards are being distributed for free for the asking, or are a standard item on reading lists at several teaching and research institutions (universities and high schools). They are distributed to all adhering bodies, or members, and the full text is on the relevant website. (The list of standards contains references to these websites.) They are published in a professional journal or member journal, and in the information provided to members of the association.

How effective these standards are in conveying ethical responsibilities to scientists is something that is difficult to measure; a fact that was pointed out to us in many replies. It seems that overall most of the members in these scientific groups agree with the standards, but there is little or no direct evidence of how effectively they influence the actual behaviour of scientists. If there has been a decrease in misconduct some areas, it is hard to know whether this is due to the effectiveness of these standards or to other factors without carrying out a thorough investigation in its own right.

Thus we arrive at our last and general question:

D*o you believe that there is a common ground between the codes of various disciplines and organisations that allows for a universal ethical pledge across all science? Would it in your opinion be advisable to supplement the existing codes by such a universal pledge?*

[61] As in the case of, e.g. the Code of Conduct of the Computer Society of South Africa (CSSA).

The following selection covers the replies received (with author's italics) ranging from the positive to the negative:

NESH: *"Yes, there is common ground*, because there are obviously many similarities between how scientific thinking happens in the different subject fields. Very few natural scientists would seriously doubt that a social or humanist researcher is doing science within their respective fields. Research internal guidelines/codes comprising honesty, respect for others' work, etc. are probably honored as a matter of course, and has been so traditionally without the aid of written guidelines. The guidelines issued by NESH do already situate research at large in the general community. Guidelines avoiding this larger perspective should be conceived as a specific supplement in a larger body of normative research theory.

CAST: *Yes, we should be able to find out such a common ground*. We need a universal ethical pledge across all disciplines of sciences, approved world-wide. It will be a very important supplement to the existing codes.

IUFoST: *Probably, if shorn of discipline-specifics*. Such a pledge is presumably envisaged as a science parallel to the medical profession's Hippocratic Oath, which has not been all that effective in preventing professional misconduct among medical practitioners. The adoption of a pledge would have two purposes: altruistic (undertaking by the individual scientist to behave ethically); and public relations (persuading a public increasingly suspicious and distrustful of science that scientists bind themselves to behave ethically). Whether a universal pledge would significantly serve either of those purposes is open to question. Perhaps the best course would be to attempt a first draft, and discuss the question in relation to the draft rather than in the abstract.

UCL: *"It is difficult to answer* your General question. This is a matter better addressed by scientists themselves, I believe."

IUGG: *"Probably not* - different disciplines have their own cultures, standards, ways of doing things."

As stated in the Introduction, SCRES considers the formulation of a universal scientific oath an interesting project for which the present project analysing ethical standards in science might be a useful beginning. However, it must be noted that any ethical standard for science must be formulated as a part of a larger *social-political dialogue.* As we have seen (and will discuss further in the following chapter), numerous political, financial and social problems underlie discussions of ethics in science, and there are corresponding difficulties related to formulating effective ethical guidelines. A universal scientific oath can be ethically genuine and effective only in so far as it is based on deep and detailed studies in which these problems are clearly addressed.

1.5 Summary

Since the Second World War, a great number of ethical standards have been developed to protect science and society from misconduct in scientific research, such as abusive experimentation, or fraudulent research reports. Yet the introduction of ethics in science is controversial. Asking scientists to be socially responsible in their capacity as scientists can be dangerous, some suggest, because this would implicitly be to give power to a group who are neither trained nor competent to exert it. That, however, is equally the point of those in favour of introducing ethics into the scientific realm, who want to include the study of ethics in the scientific education with the purpose of increasing future scientists' ethical competence. Such studies should partly focus on the nature and functions of ethical standards in science.

10 types of argument have here been put forward concerning the (positive or negative) value of adopting ethical standards regulating scientific research in terms of: analyticity, inconsistency, autonomy, ethical awareness, hypocrisy versus integrity, legalism, social responsibility, publicity, professional security and professional control.

What conclusions can be drawn from these discussions?

Very simply phrased, I think that we can justifiably conclude that what the arguments purportedly directed against the formulation of ethical standards for science manage to show, is not that such standards should not be formulated at all, but that they must be formulated with great care and integrity. Superficiality, vacuity, hypocrisy, corruption and impunity are five of the main pitfalls in applied ethics, of which the context of formulating standards for scientific research is one particular instance.

In order to have positive effects, ethical standards must be based on sound foundations of relevant information, and normative and consequential analyses. Furthermore, when scientific communities endeavour to formulate ethical standards they must do so in an open context involving discussions also with groups beyond their profession. For such standards are not only the concern of scientists and scientific communities, but also of the public and their representatives.

The perceived need to formulate ethical standards for science arises in a variety of circumstances. Amongst the factors that have actually triggered such projects we find both personal ones, such as (individual or communal) misconduct, and impersonal ones; notably, general interest or concerns. Within the organisations that have posited standards, distinct groups have adopted them, e.g., the presidium of a scientific organisation or a research ethical committee. The standards are primarily communicated by mail (free for the asking), through publication in a professional journal or member journal/newsletter, or via the website. They are largely enforced in a self-regulatory manner: by peer pressure when the standard is purely voluntary, or by explicit sanctions when they are more obligatory (e.g., official reprimands, suspension of membership in a given group, or withdrawn funding).

Within a national perspective, the relationship between ethical codes for science and, for example, educational strategies and laws are relevant to establish. In international contexts this is equally important, but considerably more difficult. Already within Europe there are profound cultural disparities in the attitudes towards 'acceptable' behaviour in science, and these differences appear to deepen when distinct continents are compared. Nevertheless, there seems to be a need for international agreements in many ethical issues, such as socio-economic development, sustainability of natural resources, world peace, quality of life, equity between nations, the correct handling of scientific data, problems in cyberspace, proper treatment of experimental subjects, giving due credit, and so on. It is therefore worthwhile to investigate if it is possible to can find a 'smallest common denominator' that might form a foundation for international agreement. In that context it will be of interest to draw comparisons to the UN Charter.

2. Comparative Analyses of ICSU Statements and Related Standards

2.1 Introduction

2.2 Freedom and Responsibility in Science

Main challenges for science in the 21st century

2.3 Animal Welfare

Scientific perspectives on the use of non-human animals in research

2.4 Science in the Internet Era

An engine for global development or for increased inequality?

(Chapter authored by the SCRES committee.)

2.5 Summary

2.1 Introduction

In the preceding chapter, we discussed the contexts of formulating ethical standards for science. In the present chapter we shall compare the standards that have been adopted within specific areas. Our leading theme is: what do the standards collected have in common? In what important ways can they be seen to differ? Can a smallest common denominator be found between them?

The 115 standards in SCRES' collection address a large number of ethical issues, not all of which can be treated in a document of the present scope. Space and time impose strict limits and a consequent obligation to be selective. The choice has here been made to focus these analyses on subjects corresponding to ICSU's Statements in SCRES' list[62]:

(1) *Freedom and responsibility in science*. In 1989, ICSU issued a Statement on Freedom in the Conduct of Science that emphasised the urgency of international scientific co-operation for the benefit of humanity. Numerous other ethical standards for science have been formulated concerning the freedom as well as the responsibility of scientific pursuits. Notably, the text on the global responsibility of science that was adopted at the World Conference on Science organised jointly by ICSU and UNESCO in Budapest, 1999: the Declaration on Science and the Use of Scientific Knowledge. In this section, we shall discuss various norms of freedom and responsibility as they come to expression in the ethical standards collected here with a focus on international relations. Starting with the concept of scientific freedom, the barriers and perceived problems within that perspective will subsequently be compared to the most urgent aspects of responsibility that scientists are presently conceived to face.

(2) *Animal welfare*. Attitudes towards non-human animals have been the subject of extensive debates in the last decades within science, agriculture, the food industry, and in business and society at large. The traditional view that only humans can be moral subjects and enjoy the protection of having rights has been challenged under a number of distinct aspects: scientific, philosophical, ethical and legal. This comes to notable expression in the principles and guidelines that have been adopted to regulate scientific research involving animal experimentation. ICSU issued a Statement of Principles for Use of Animals in Research and Education in 1996 that will here be compared to other relevant standards in SCRES' list.

[62] A fourth statement on gene patenting will not here be discussed because it is presently subject to revisions.

(3) *Science in the Internet era*. The revolution in information technology (IT) has grand potentials but also great risks, not least in terms of the dependence the advances have created. Many difficult problems of scientific ethics arise from the rapid development of IT, some of which will be addressed in 2.4. In 1988, a committee of the UN General Assembly called upon all Member States to help develop "international principles that would enhance information security and combat information terrorism and criminality". In 2000, ICSU and CODATA (the ICSU Committee on Data for Science and Technology) issued A Set of Principles for Science in the Internet Era expressing the opinion that for scientific and educational purposes data access should continuously follow the policy of public sharing.

2.2 Freedom and Responsibility in Science

The pursuit of knowledge has throughout human history been closely linked to a need for courage and integrity, notably, the courage to carry new ideas across ideological boundaries and the integrity to resist temptations to gain fame by unsound methods. A possibly less powerful but no less faithful companion has been the desire to pursue knowledge not only for its own sake, but also in the aim of producing a better world and of improving the living conditions of those who inhabit it. The quest for intellectual freedom and the sense of social responsibility in using this freedom can be regarded as two sides of the same coin, in analogy to the notions of rights and duties.

Numerous ethical standards for science have been formulated concerning the freedom and the responsibility of scientific pursuits (sometimes conjointly). In this section, we shall discuss various norms of freedom and responsibility as they come to expression in the ethical standards collected here with a focus on international relations. Starting with the concept of scientific freedom, the barriers and perceived problems within that perspective will subsequently be compared to the most urgent aspects of responsibility that scientists are presently conceived to face.

Clearly, such large and challenging topics would require considerably more spatio-temporal scope than that available here. My aim is therefore simply to point to some of the main issues that scientists have to deal with concerning their freedoms and responsibilities in order to gain a better grasp of what the notions of 'scientific freedom' and 'scientific responsibility' actually mean and imply.

Origins of limits for scientific freedom will first be described as a background to an account of actual limits that have been imposed. These limits will thereafter be contrasted to concerns regarding scientific responsibility, and evaluated through that comparison.

A. SCIENTIFIC FREEDOM

Historically, the liberty to think freely has been a hard fought-for goal. Casting a glance back in history, one can distinguish various origins of limits to academic freedom, notably: *orthodox religions*; *political ideologies*; *state interests*, and *free-market ideologies aimed at short-term profit*. There are also limits generated *internally*, e.g.[63], issues of academic respectability, fashion in topics considered worthy of research, the influence of dominant personalities, or the role of authority within science[64].

These origins are of course not exhaustive, and we should note that although they are distinguishable they often stand closely related. Elements in them overlap and can be found in the same historical periods and contexts.

The orthodox religious institutions are classical foes of enlightened thought. Religion and science form an ill matched couple[65], to the extent that whilst one is based on faith in independence of reason, the other has logical thought as its essential hallmark. The personal faith of the individual professional is a private concern; however, when religion is institutionalised and combined with economic and political power, a threat against the latter is not unlikely to emerge. For example, during the reign of Christianity in Europe most philosophically critical or scientifically advanced views were regarded as 'heretic' and severely punished, often by death. Pioneer minds like Copernicus, Galileo and Spinoza ran no negligible risk in propounding their theories about the 'true' nature of the Universe.

Today the situation, especially in Europe, is far less tense and dramatic than it once was, even though the most intense resistance to certain scientific advances can still be found in religious circles. To illustrate, the discussions surrounding the development of contraceptives, abortion-techniques, genetic manipulation, or (human) cloning all reveal how some religious creeds continue to stand opposed to scientific development under certain religiously sensitive

[63] These examples were suggested to me by Peter Warren.

[64] An example suggested to me by Geoff Carr, who stresses the potentially limiting role of authority within science itself: it can be tough going to challenge orthodox opinion, particularly when that opinion is aligned with the funding agencies.

[65] There are many religious scientists, of course, but they are often religious in areas whereof their science does not speak. For example, there are probably few biologists who believe in the Roman Catholic dogma of Virgin Birth. Likewise, there are religious institutions that support scientific developments; however, historically they form a minority and it is questionable whether they are properly called 'orthodox'. There is no obvious essential conflict between liberal religious institutions and enlightened thought.

aspects (for better or for worse, depending on one's position)[66].

The religious theme is not dominant in our collection of standards. No standard expresses allegiance to any particular religious creed. However, some standards in our list have been formulated in a society where there is a perceived need to assert the *religious independence* of science[67]. Other standards warn scientists "not to participate in, or support in any way, pseudo-sciences or ignorant or superstitious activities in any form", and say that "[p]seudoscience and activities based on superstition should be opposed."[68] (In the cultural context of the latter standard, religion is classified as a subclass of superstitions.)

Political ideologies have also raised barriers for scientific pursuits. The 20th century was a period of strong political visions on which political ideologies were construed that came to rule countries on every continent. Some of these political ideologies impose more or less strict limits on the scientific knowledge that is considered acceptable or desirable to pursue. Furthermore, rules are sometimes imposed that restrict scientists' free circulation, as well as that of scientific material and data.

Numerous standards in our list express *allegiance to distinct political ideologies*, for example, by recommending that the individual scientists, or other people in positions of responsibility, be faithful to, or serve the purposes of democracy[69], communism[70], socialism[71], or of other ideologies, such as pacifism[72], or patriotism[73]. The same standards simultaneously assert their intellectual freedom, or "academic democracy"[74], e.g.:

> The agreement fosters unity, cooperation and academic democracy as encapsulated in the saying "Let a hundred schools of thought contend".

Hence there are many politically imposed ideological limitations on scientific pursuits that they could not (consistently) accept. We shall return to this issue in greater detail below, in

[66] One can, of course, also oppose these developments for non-religious reasons.
[67] E.g., the Resolution on the Theory of Creation in Science Curricula issued by the American Association for the Advancement of Science in 1997.
[68] 'Some Opinions on the Code of Conduct for Scientific and Technological Personnel', Article 1, and 'An Agreement on Scientific and Technological Periodicals Reached by National Learned Societies', Article 1, China.
[69] E.g. the Code of Conduct for Persons in Position of Responsibility, South Africa. Cf. Proposed Charter for a South African National Ethics Advisory Committee on Science and Technology (SANEACST)
[70] E.g. 'Some Opinions on the Code of Conduct for Scientific and Technological Personnel', China.
[71] E.g. the Code of Professional Ethics in Science, Cuba.
[72] E.g. the Student Pugwash Pledge, or the Russell-Einstein Manifesto.
[73] E.g. the Science Policy of the Academy of Sciences of the Czech Republic.
[74] 'An Agreement on for Scientific and Technological Periodicals Reached by National Learned Societies', Article 1, China.

the discussion of the concrete ways in which scientific activities have been limited.

State interests have limited the freedom of science under a number of different aspects, e.g., in terms of industrial, national and military development. Science has been used to strengthen territories (principalities, kingdoms, and, in modern history, States), and research was often directed to satisfy the political interests of the territory, e.g., the State. Research that developed the State's military and economic power has been liberally funded in many countries and a nationalist support of industry developed during the 19th and 20th centuries when science became increasingly dependent on the States' national interests[75].

This interest was largely of a military nature. A quick look at the leading technological branches today (such as computer technology, biotechnology, optics, aviation industry, the development of micro-chips or the production of new materials) reveals that research in central parts of these areas began with military purposes but later (in part) developed into civilian production. One reason why countries focus their attention increasingly on the use of science is that competition between countries and their industries increasingly occurs on the economic front. To the extent that countries depend on their industries for employment, taxation-income and military defence, it is not uncommon for their governments to try and influence research institutions and universities to adapt their research to the industrial needs of the country and its major companies. It is presumably natural that governments encourage research in fields that particularly interest them. Scientists may have the right to investigate anything within their means, but that does not mean that they also have the right to the means to investigate anything they choose. However, the described dependence has occasionally led countries to try and prevent the circulation of scientists, knowledge, or scientific material for reasons of national security. This has obviously restricted the freedom of the individual scientists, e.g., in terms of the freedom of scientific publication, or circulation. (The Cold War serves to illustrate this.)

The present globalisation process has considerably weakened the political and economic power of the National State. The economy of industrial countries is increasingly based on the production of knowledge rather than physical products[76]. Today, large parts of that knowledge

[75] A possible argument against the view that science traditionally used to be conducted in an 'ivory tower' unconcerned with human affairs is that science has always been so important to national development that it would scarcely have been allowed not to be socially useful, thus directed towards beneficial results, cf. below. For example, Galilei pointed out to patrons the security advantages of telescopes.

[76] The production of physical products is increasingly 'outsourced' (a technical term that approximately means 'moved') to countries with low-cost salaries. Countries with high-cost salaries retain the production of knowledge and the companies' central offices, if they have any (Nike, for example, leaves all physical production to sub-contractors). Cf., e.g., W. Ruigkrok & R. van Tulder (1995), and M. H. Best (1990).

are produced within the private sectors. In the interest of more or less unlimited profit, the exploitation of knowledge is increasingly being privatised, notably through patent laws. Funds are being directed towards areas of research that are expected to yield maximal profit, rather than directing it toward areas that would, for instance, be in the maximal interest of society. The problem is also that the globally dominant politico-economic systems are strongly directed towards short-term profit in order to satisfy the stock-markets demands, which means that scientists funded by profit-oriented agencies come under an obligation to produce rapid and regular results. Since an increasing portion of research funds come from this type of source, more and more scientists find themselves under that strain. The consequences in terms of social (not to say global) responsibility are quite serious, as SCRES has previously pointed out (2000, p. 134):

> As the world-wide demand for research grows whilst the available funds are tightened, competition amongst scientists increases and new alliances are formed…The laws of the marketplace seem sometimes to overshadow the more traditional values and norms of the scientific enterprise. For the critics of science, this development signifies a gloomy vision of a demoralised and socially irresponsible science. For them, science has become the willing servant of those who are in power, and scientific rationality the paradigm for a de-humanised way of thinking, devoid of commitment and value…Many active politicians nourish a deep scepticism towards the contributions science can make to a responsible design of policy.

So, through its influence upon the direction of science towards profit-producing research (often within a short-term perspective), the unlimited profit-orientation of the so-called 'free-market ideology' poses threats both to scientific freedom, and to scientific responsibility.

ICSU opposes *the privatisation of scientific knowledge*, its *profit-orientation unconditioned by global human needs*[77], as well as any form of *ideological discrimination* of scientific pursuits. In 1989, ICSU issued a *Statement on Freedom in the Conduct of Science*. This statement focused largely on international scientific co-operation for the benefit of humanity, the universality of science, free access to scientific data, free circulation of scientists and the right freely to participate in the scientific enterprise without any form of discrimination due to "such factors as citizenship, religion, creed, political stance, ethnic

[77] Arguably, free markets can only work by fulfilling human needs, to the extent that they need willing buyers. The problem is that this only serves the needs of those who can pay, and that is not the global majority.

origin, race, colour, language, age or sex".

ICSU has a long-standing history in seeking to protect and promote awareness of the rights and fundamental freedoms of scientists in their scientific pursuits. Since its creation in 1931 (when its predecessor, the International Research Council, was dissolved because of discrimination against scientists from certain countries), ICSU has pursued a *policy of non-discrimination*. In 1958, ICSU passed a general resolution on political non-discrimination affirming "the right of the scientists of any country or territory to adhere to or associate with international scientific activity without regard to race, religion or political philosophy". In 1963, this resolution was reaffirmed in a resolution on the free circulation of scientists where the Council vouched to "take all measures within its powers to ensure the fundamental right of participation, without any political discrimination, of the representatives of every member of ICSU and of invited observers".

In 1963, ICSU also created the Standing Committee on Freedom in the Conduct of Science (SCFCS) with the mandate to safeguard and promote the free circulation of scientists[78]. Their goal is to promote:

- freedom to pursue science and to publish the results
- freedom to communicate among scientists and to disseminate scientific information
- freedom of movement of scientific materials

ICSU describes itself as a *non-political* organisation: "ICSU has a well-established non-political tradition which is central to its character and operations, and it does not permit any of its activities to be disturbed by statements or actions of a political nature." Accordingly, these goals must be achieved without advocating any particular form of political governance.[79]

Having described some main origins of, or motives for positing limits to scientific freedom and introduced ICSU's basic stand-points in this domain, the question must now be raised: what exactly does scientific freedom *mean*? What does it concretely *imply*?

A practical approach to replying might be to look at some of the *actual limits* that have been imposed – or that could be imposed – upon this freedom. Different kinds of limits[80] have been imposed on the freedom of science, e.g.:

(i) limits on knowledge *per se* (knowledge that is *in itself* considered undesirable)

(ii) limits in terms of *topic priority* (some topics are considered more *important* than

[78] Full information and advice to organisers of international scientific meetings is found in the Handbook of the SCFCS entitled *Universality of Science*, available from the ICSU secretariat. SCRES and SCFCS have close connections and hold parallel annual meetings.

[79] The possibility of meeting this demand is questioned further below.

[80] This list does not purport to be exhaustive.

others)

(iii) limits in the choice of *methods* (some methods are *ruled out*)

(iv) limits in the *applications* of the scientific knowledge acquired (rules are imposed for the *use* of scientific knowledge)

(v) limits in *access to and use of scientific knowledge* (the use of knowledge is guarded by limited groups, e.g., privatised and patented)

(vi) limits in the *circulation of scientists* (scientists are prevented from leaving or visiting a given country)

(vii) limits for the *conduct of scientists* (rules for proper behaviour are posited)

I shall here provide a brief account of some central aspects on these types of limits that directly concern the standards in our list.

(i) Totalitarian ideologies (political or religious) typically posit rules for ideas that are allowed versus ideas that are forbidden *by virtue of their very nature*. The allegedly 'subversive' ideas are sometimes of a scientific nature[81]. Ethical standards for science tend to oppose such limits on knowledge *per se*[82]. None of the standards here collected accept any explicit limitations of type (i) on intellectual freedom. This means that, within our list, we may appear to be justified in positing a 'smallest common denominator' in the standards' unanimous defence of freedom of knowledge *per se* – a version of *scientific free-thought*, one could say.

However, the logic of this can be questioned, as well as the depth of that agreement. For, as said above, numerous standards simultaneously express allegiance to diverse political ideologies. Accordingly, these standards inherit a profound disparity in their views on politically loaded aspects of scientific freedom and knowledge. And, to my knowledge, all political systems (social or liberal democracy, socialism, communism, etc.) impose some rules for 'acceptable' pursuit of knowledge, for example, in blocking research aimed at developing eugenics, racism, certain forms of weaponry, social equity, or knowledge that is conceived to pose a threat to the state. In other words, *socio-political interests limit the defended freedom of scientific pursuits*. Ipso facto, the 'smallest common denominator' that we are justified in positing in this regard is conditioned by socio-political interests. (The nature and justification of these interests is further considered in the discussion of scientific responsibility below.)

(ii) Scientists are rarely free to decide for themselves what knowledge to pursue. *Topic*

[81] For example, theories that conflict with official party ideology, or ruling religious doctrines.

[82] Cf., e.g., the UNESCO Recommendation on the Status of scientific researchers adopted by the General Conference in 1974; the Declaration on Science and the Use of Scientific Knowledge adopted by the World Conference on Science 1999; INES Appeal to Engineers and Scientists of 1995; the Code of Conduct of

priority is both politically motivated and context-dependent. Scientific freedom is limited by the availability of (private or public) funds, and funding agencies will naturally choose to sponsor the research from which they expect most benefit. This choice will largely be determined by economic and socio-political realities. For example, poor countries have less possibility than rich countries to sponsor basic research but tend to focus more on applied research within specific 'acute' areas. Different concerns come to expression in our list: ecology and sustainable development [83], poverty[84], illnesses[85], peace[86], knowledge for progress[87], responsibility to future generations,[88] and public access to scientific data[89], to mention some.

In terms of topic priority, some of the greatest dividing gaps are found between rich and poor countries, between countries governed by socially orientated versus privately orientated political systems, or countries governed by a strong state versus those run by free-market principles. As we have seen, problems of economic and social progress are amongst the more serious concrete circumstances that provoke ethical concerns in research, to which numerous ethical standards draw attention. For example, it is arguably not ethically satisfactory (although obviously interesting from a financial point of view) for scientists to focus their research on welfare-related problems, such as obesity, and struggle to find 'the fattening gene' rather than to study poverty-related illnesses, such as malaria, from which a child supposedly dies every thirty seconds[90]. On the other hand, within some (liberal) ideological frameworks, that choice is defended in the name of academic freedom.

(iii) Views on *acceptable methods* for obtaining scientific knowledge also vary greatly. The use of animals in research will illustrate that in section 2.3. If we here use the discussions on human experimentation as example, we see that different groups are considered 'dispensable' is different societies, and treated accordingly. Great gaps will here be found between religious

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Academicians of the Chinese Academy of Engineering of 1998; and ICSU's Statement on Freedom in the Conduct of Science issued in 1989.

[83] E.g., the Code of Professional Standards and Ethics of the Royal Society of New Zealand, 1999, The Chiang Mai Declaration: Saving Lives by Saving Plants adopted 1988 by WHO/IUCN/WWF, and The Manila Declaration Concerning The Ethical Utilisation of Asian Biological Resources, 1992.

[84] E.g., the Declaration on Science and the Use of Scientific Knowledge adopted by the World Conference on Science 1999 and the Guadalajara Declaration, 1998.

[85] E.g., the Philippine Code of Ethics of the Board of Medicine, or the Declaration on Science and the Use of Scientific Knowledge, the World Conference on Science 1999.

[86] E.g., the The Russell-Einstein Manifesto Issued in London, 1955, the Student Pugwash pledge 1995, and the Uppsala Code of Ethics, 1984.

[87] E.g., the Declaration on Science and the Use of Scientific Knowledge, the World Conference on Science 1999.

[88] E.g., the Code of Ethics developed by the Agricultural Institute of Canada, 1997, and the UNESCO Declaration on the Responsibilities of the Present Generation Towards Future Generations, 1997.

[89] E.g., A Set of Principles for Science in the Internet Era Prepared by the ICSU/CODATA, 2000.

[90] Cf. 1.4.

and secular states, or between other, differently class-divided societies (there seems to be no example of the class-less kind). As a rule, citizens on the lower end of the social hierarchy run a greater risk of abuse than those above. Generally, citizens enjoy better protection against abuse in secular countries with a high standard of living; however, socially weak humans have occasionally been treated with the utmost cruelty in all societies or political systems. For example, they have been used without their informed consent in harmful medical experiments, or forcibly sterilised[91]. There are also differences between how people are treated in their own countries versus in other parts of the world. It is not uncommon for developed countries to have strong laws protecting their own citizens whilst allowing, or even supporting companies (e.g., pharmaceutical companies) in performing experiments in countries with a less rigid legal system in order to gain economic profit and knowledge otherwise unavailable by those methods (cf. below). The most famous standards that pose strict limits for this type of scientific freedom are the Declaration of Helsinki (1964) and the Nuremberg Code (1949).

(iv) How scientific knowledge should be *applied* or *used* is also a subject of, not least political and economic, controversy. Ethical standards frequently address questions of *distributions of benefits*.[92] On some accounts, modern science has benefited a minority of the world's total population whereas the majority has benefited only marginally from scientific advances. On the other hand, it is not self-evident that science has benefited such a small proportion of the world's population: the Green Revolution[93], the hydrological and engineering advances exploited by China, and the elimination of small-pox can be advanced to modify that view[94]. The actual benefits for developing countries of the Green Revolution have been seriously questioned[95], and cannot simply be assumed. It would be relevant for this inquiry to enter that discussion, but it is beyond our scope to do so in the way that it deserves. Therefore, we must remain hypothetical: to the extent that the benefits of science are distributed unequally across the globe, this is arguably a misuse of science. It is important to bear in mind that such inequity is largely a result of political decisions.

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[91] E.g., in Sweden, cf. 1.1.

[92] E.g., the Declaration on Science and the Use of Scientific Knowledge adopted by the World Conference on Science 1999, ICSU Statement on Freedom in the Conduct of Science 1989, and the International Network of Engineers and Scientists' (INES) Appeal to Engineers and Scientists for Global Responsibility, 1995.

[93] The overseas extension of the American agricultural system that is high-technology, energy-intensive food system in which agribusiness corporations dominate all links of the production chain, from seeds, fertilizers, pesticides and machinery to food processing and marketing. This system replaced traditional family agriculture in the USA during and after World War II.

[94] Examples suggested to me by Peter Warren.

[95] E.g., India's former Minister of Agriculture, Mohan Ram (1974).

To begin with, it partly stems from the devastating historical consequences of the colonial exploitation "whereby the imperialist powers drained the wealth of older civilisations. Large-scale loss of livelihood occurred as a result of the destruction of productive enterprises, once mass production had been ushered in by the industrial revolution" (Srinivasan (2000)). Today, argues Srinivasan, "unequal terms of trade, lack of access to modern technology and absence of skill and training are preventing the developing countries' march to progress." Repayments of foreign debts with large parts of the BNP should be added to that list. The ideas of copy-right and patents can also be seen as a product of European intellectual tradition, and the rules evolved by the World Trade Organisation as unfair when they compel practitioners of traditional knowledge to incur great expense fighting patent battles in the U.S.A. and Europe. Thus international rules for scientific enterprise concerning the use of scientific knowledge can entail serious practical restrictions for scientists (e.g., through the loss of important parts of their funds to fight legal battles).[96]

In a truly Baconian spirit, ICSU, and many of ICSU's members, maintain that science should be at the service of all mankind and benefit humanity *as a whole*. That is a view that today stands most seriously challenged by the market ideology that has come to dominate the globalisation process in the world. One extremely important aspect of the use and benefit of scientific development concern access to scientific data. The laws of the marketplace seem not least to overshadow the traditional value of knowledge as a public commodity.

(v) A traditional academic position (or ideal – perhaps one that was never genuinely realised) is that knowledge should be *public*. The results of scientific research should be accessible for all other scientists interested in pursuing research in the same domain, or to any other individual with an interest in the field. This has been an axiom in the conceptual framework of the freedom of thought, and ICSU argues strongly for free access to scientific knowledge:

> As the intrinsic nature of science is universal, its success depends on co-operation, interaction and exchange, often beyond national boundaries. Therefore, ICSU strongly supports the principle that scientists must have free access to each other and to scientific data and information. It is only through such access that international scientific co-operation flourishes and science thus progresses.

To be sure, access to scientific knowledge has always been conditioned by various interests (of the state, for example, in its struggle to develop its industry and military capacity and

[96] An outstandingly informative – if not the most recent – account of the creation of the third world is given by Stavrianos (1981).

ascertain an internationally strong diplomatic position). However, the threats that emerge from market principles, e.g., through patent laws, are formidable and may well exceed all previous threats to the publicity of knowledge ever to have been posed (cf. also the discussion of Internet, 2.4).

(vi) One aspect of access to knowledge is access to the knowing subject: as ICSU states, scientists have an interest in being free to cross borders and co-operate internationally. However, governments sometimes impose rules that restrict scientists' *geographic circulation*. These can be motivated by political ideologies, as, for instance, the difficulties for scientists to move across the 'iron curtain' during the Cold War era illustrate, or by the interests of states to safeguard their benefits from investments in scientific education.[97]

ICSU maintains that any form of political bias or discrimination hinders free communication and exchange of ideas and information and ipso facto impedes scientific progress which is dependent on collective efforts. Indeed, the individual scientist's freedom of circulation and communication is not only of great value to the scientist him-or herself, but also to the scientific community and to the success of the scientific enterprise.

On the other hand, unlimited freedom of circulation can pose a very serious problem to the society in which the scientist has received her or his education. Developed countries aided by their economic strength are able to attract highly educated professionals from developing countries. To my knowledge, this is normally done without any compensation to the latter, even though these have borne most of the costs for the education of the individual in question[98]. This is a serious concern of many scientifically advanced but economically less developed countries, such as India, Cuba and (potentially) of Eastern European countries, if they join the European Union and their citizens are given the possibility of freely seeking employment in other EU countries. As mentioned above, in 1.4, the Cuban code calls for action against what it calls this "robbery of brains" by developed countries from developing countries.

(The developed countries also compete with each other to attract competence, e.g., with high salaries and low taxation. Thus some developed countries therefore have a similar problem with the so-called 'brain drain', when their academics seek employment in foreign

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[97] Companies do not have the same power to influence their employees' physical movements, but can include provisions in the contracts of employment preventing the individual from pursuing research in the same area elsewhere. Thus the company prevents knowledge from leaving its area of control.

[98] Even though many scientists develop their expertise at foreign universities, the country of origin still stands for the main costs of the total education.

countries. However, the effects of the loss of scientific capacity are not comparable because the ability to attract competence remains far more advanced, and the general economic situation infinitely more secure.)

This dilemma, which poses the individual's freedom of circulation against the acute necessity of developing countries to fight against their underdevelopment and retain their scientific expertise, is a highly complex problem that involves many different types of freedom, interests, and notions of justice. It cannot easily be solved, but the type of solution that seems prima facie most promising (if one wants to satisfy both sides as much as possible) would be to develop a *system of compensation*. This compensation could combine *economic* compensation for the money lost to the country in educating a person from whose knowledge the country will not benefit, with *scientific* compensation in terms of offering a share of (or access to, or use of) scientific knowledge gained elsewhere (assuming that there are enough scientists left in the country to receive it). A prerequisite for developing such a system would be a thorough analysis of the key concepts 'freedom' versus 'development' and of arguments both for or against compensation combining views from different political spectra.

(vii) Limits on scientific research are also posed in terms of the *responsible conduct* of individual scientists. Scientific knowledge is not to be pursued 'catch-as-catch-can', but there are rules to be observed – here, as well as in all other human affairs.

All people have responsibilities, as private individuals, as citizens, and sometimes as professionals. These different kinds of responsibilities intertwine in a complex and certainly not always consistent system of norms, duties and rights. The responsibilities of scientists can roughly be divided into *internal* responsibilities related to their conduct towards their discipline, their profession and colleagues, and *external* responsibilities related to the impact of their research upon society. Limits on scientific freedom as rules for scientists' personal conduct are of the former kind. (All the other limits primarily concern the latter kind.)

Concerning these internal responsibilities, the standards in our list show a remarkable (if not surprising) degree of similarity. The "core values" suggested by The American National Academy of Science stand virtually unchallenged, so far as I can find: honesty, scepticism, fairness, collegiality, and openness. They can be complemented – or perhaps rather subdivided – and contextually analysed, but these five values capture an important part of what is conceived to be the essence of proper conduct for scientists in all societies and all disciplines. These are amongst the qualities that I referred to in 1.4 as *sine-qua-non* qualities: without them, scientific pursuits in teamwork would scarcely be possible, and it is highly doubtful that science could advance at all if its proponents were dishonest, gullible, unfair,

disloyal and secretive.

If this is true, then we have a second 'smallest common denominator' (in addition to the 'defence of scientific free-thought conditioned by socio-political interests' suggested above): a cluster of qualities required of the responsible scientist in her or his relations to the discipline, profession and colleagues.

It is important to identify these "core values" of individual virtues, and it is certainly nice to know (or to believe with some justification) that they are more or less universally acknowledged (if not always actually lived by). However, three reservations should be made. First, that the result is relatively banal: 'Do not lie', 'Do not believe things without reason', 'Do not steal', etc., are hardly new human rules for conduct. Nor are they *unspecified* (or contextualised) particularly culture-relative: versions of them appear in almost all societies as a basis for social life. It is therefore not surprising that they appear in the context of scientific pursuits in most countries.

Secondly, however, if we challenge them to be more *specific* and apply them to reality, we may find greater differences than first expected: Should we *never* withhold information from colleagues? How about split loyalties – to the profession, to the funding agency, to the State, to the Party, to (perceived) Truth, etc., how should such conflicts be solved? Clearly, norms conflict, loyalties conflict, values form complicated and partly inconsistent hierarchies, and problems are solved by different methods and standards. Therefore, it is important to realise that it is *the unspecified terms* (such as 'honesty') that are broadly, maybe universally agreed upon. The more that they are specified, e.g., fleshed out with concrete applications in different contexts, increasingly diverging opinions are likely to ensue (for example, concerning with whom the main loyalty lies).

Thirdly, whilst it is indeed important for scientists to discuss their internal responsibilities, to identify the virtues agreed upon, and to analyse how their contextual applications may sometimes cause disagreements, we should beware of focusing the ethics of science too much on internal responsibilities. Otherwise, we risk creating a new 'ivory tower' in which scientists discuss their responsibilities towards each other, largely ignoring their broader and far more challenging responsibilities towards society at large.

On that note of warning our discussion now enters the realm of scientific responsibility.

B. SCIENTIFIC RESPONSIBILITY

Scientific development is a mixed blessing. On the one hand, scientific and technological advances have resulted in great benefits for humankind. On the other hand, these benefits are distributed on our globe with profound inequality; "scientific advances…have contributed to social imbalance or exclusion"[99]. Furthermore, "scientific progress has made it possible to manufacture sophisticated weapons…of mass destruction" and has "also led to environmental degradation and technological disasters"[100]. Consequently, scientific freedom is also a mixed blessing: the development of science must be *controlled* and *directed*.

The question is, *who* should direct it, *how*, and *whereto*?

There was a time (supposedly) when scientists could work like extra-terrestrials in supreme isolation from human affairs and rest content in their conviction that truth was their sole legitimate aim. That, at least, is a picture frequently painted of traditional science. Whether or not that traditional 'ivory tower' was really as isolated from society as the image suggests, science and technology have today "become such integral parts of society that scientists can no longer isolate themselves from societal concerns"[101]:

> Even scientists conducting the most fundamental research need to be aware that their work can ultimately have a great impact on society. Construction of the atomic bomb and the development of recombinant DNA – events that grew out of basic research on the nucleus of the atom and investigations of certain bacterial enzymes, respectively – are two examples of how seemingly arcane areas of science can have tremendous societal consequences [pp. 20-1].

The interest in science's ethical and societal dimensions increased dramatically after the Second World War, the horrors of which, it was felt, should not be repeated. Numerous ethical standards for science were formulated, and ethics committees were established in many countries to give advice on science policy.

In 1996, ICSU decided to complement its activities concerning scientific freedom with activities concerning scientific responsibility and established a Standing Committee on Responsibility and Ethics in Science (SCRES) [102]. The main objectives of the Committee are:

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[99] The Declaration on Science and the Use of Scientific Knowledge adopted by the World Conference on Science 1999, 3§.
[100] Ibid.
[101] On Being a Scientist: Responsible Conduct in Research, The American National Academy of Science, 1995.
[102] UNESCO later established a World Commission on the Ethics of Scientific Knowledge and Technology (COMEST) for similar purposes. SCRES and COMEST liaise, e.g. in the preparations for the Session 11 on ethics (Forum 1) at the World Conference on Science, 1999.

- to act as a focus within ICSU and with outside partners for questions pertaining to scientific responsibility;
- to clarify issues of moral principle which affect the choice of policies for scientific research;
- to raise awareness of important ethical issues among scientists, policy makers and the public.

ICSU has not (yet) issued any general statement on scientific responsibility similar to that on scientific freedom. One of the main recommendations that SCRES makes in this document is that ICSU formulate such a statement and henceforth pursue the related goals with the same vigour as it has pursued those pertaining to scientific freedom (cf. the Conclusion). The contents of that Statement would partly be given by logical inference from the other ICSU Statements (to ensure consistency amongst them). Partly, it would be given by the very substantial text on the global responsibility of science that was adopted at the World Conference on Science organised jointly by ICSU and UNESCO in Budapest, 1999: the *Declaration on Science and the Use of Scientific Knowledge* (hereafter abbreviated 'the WCS Declaration').

This conference aimed at a fuller understanding of the global responsibilities of science in view of the formidable challenges that human civilisation faces in the beginning of the third millennium[103]. The WCS Declaration primarily focuses on what I above called "external" responsibilities, i.e. on duties that stretch *beyond* the scientific communities, and opens by stating:

> The sciences should be at the service of humanity as a whole, and should contribute to providing everyone with a deeper understanding of nature and society, a better quality of life and a sustainable and healthy environment for present and future generations. [1§]

More specifically[104], the WCS Declaration calls for *directing the funds for science* to ensure, on a global front:

- a reduction of the resources allocated to the development of new weapons (3§)
- the (partial) conversion of military production and research facilities to civilian use (3§)

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[103] The author is aware of the culture-relativity of this expression. Regrettably, there are no doubt other Western biases in this document, e.g., euro-centricity in the choice of ideas quoted. These biases should be regarded as a sign of the author's limited knowledge and not as an intentional expression of values.
[104] The list gives only a selection amongst the most important recommendations; there are many others.

- sustainable human development including poverty alleviation (11§)
- improved human health and social care (12§)
- respect of the human rights (39§)

Scientific research should thus accept as an important part of its external responsibility to use its funds (its economic as well as its human capital) in the aim of safeguarding fundamental human interests, such as *peace*, *sustainable development*, *social equity*, and *respect of human rights*. All of these recommendations find broad support amongst the standards in our list.

ICSU, we saw above, "has a well-established non-political tradition which is central to its character and operations", and accordingly, these ideals must be achieved without political bias. But is that possible? Many would say that the idea of 'non-political social responsibility' is absurd, that recommending things like arms reduction and social equity, far from being 'non-political', constitutes political dynamite. Therefore, a question that must be raised is: *Can social responsibility, e.g., of the sciences, be strictly politically neutral?* A closer scrutiny of the human right discourse might help us in replying. (The reply to be suggested is a firm "no".)

After the end of the Second World War in 1945, the United Nations (UN) were formed, and in 1948 UN issued the *Universal Declaration on Human Rights* that marks a milestone in the development of human civilisation. Many ethical standards in our list express adherence to this Declaration that stands as one of the most important modern documents on intellectual, emotional and material human rights ever to have been formulated.

The concept of human rights is central to all general analyses of the freedom and responsibility of science. For example, in the defence of freedom of thought and expression, freedom of movement across borders, access to information and public services, and the responsibility to respect all the other rights posited in the UN Declaration in the broad contexts of scientific research. Numerous references to the relevant Articles in the UN Declaration will therefore be made throughout this discussion.

ICSU asserts scientists' right to certain forms of freedom with a clear reference to and endorsement of the *International Bill of Human Rights*[105] (IBHR), in which "such rights are embodied". Importantly, the ICSU Statement posits these rights as "fundamental". This is a crucial qualification, for what it actually entails is that certain rights, such as those stated in the IBHR, are *universally valid* independently of politics, religion, finance or culture.

[105] The International Bill of Human Rights includes three documents: the Universal Declaration of Human Rights (1948), the International Covenant on Civil and Political Rights, and the International Covenant on Economic, Social and Cultural Rights (1966).

Regrettably, from this human rights perspective[106], these rights are – if not per se, then certainly de facto – highly political as they stand respected or disrespected; recommended or ignored in the world today. Largely to its own detriment, and contrary to its original intents and purposes, the human rights discourse has in no small measure become *politicised*.

The politicisation of human rights or duties, freedom and responsibility is directly relevant to analyses of applied ethics in science, notably to the formulation of ethical standards for science. Simply phrased: ethics in science strives in a way to inherit the universality of science. What is ethically correct for a scientist Z working in country A should, all other relevant things being equal, also be appropriate for scientist Z working in country B, or for another scientist Q working in either country A or B. However, in so far as ethics is politicised (e.g., the norms are provided with an essential reference to certain forms of political governance) ethical standards will inherit the plurality and conflicts that exist amongst different political systems and may consequently not be valid internationally.

Perhaps this is inevitable. Maybe the idea of 'non-political applied ethics' is unrealistic. But that would be disastrous for the defence of universal human rights (including, obviously, the rights of scientists asserted by appeal to them), for the strength of their conviction lies in their absoluteness. They are presented as 'unalienable' and not as mere 'conventions'.[107]

The politicisation of human rights is also detrimental for the ethics of science as conceived, for example, in the WCS Declaration. An illustration of the former can help explain that connection.

Judging by the way that they are defended in most industrialised nations, certain human rights appear to carry considerably more weight than others do. For example, the right to vote (IBHR, Article 21.3) seems to be given much more attention by developed countries than, say, the right to live and work in decent conditions (Articles 25.1 & 23.1). Asylum into the developed world can be given to people suffering from intellectual political oppression, but is rarely (if ever) granted to those suffering from material political oppression[108].

In many instances, the human rights discourse has become a rather crude instrument by the aid which various (mostly but not exclusively democratic) regimes operate in their own political interests whilst trying to maintain a facade of defending human rights.

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[106] Objections have been raised, not least in Asia, saying that the formulation of IBHR is overtly occidental, and that it ought to be amended taking non-western values into greater account.

[107] The author belongs to those who cannot make sense of the notion of 'natural', or 'innate' human or other rights. All rights appear to me to be human constructions. Nevertheless, some human rights appear to be fundamental to any form of *civilised* society, of any 'enlightened governance', and could in that essentially normative sense be defended as 'absolute'.

[108] In view of the number of people suffering from the latter, the reasons may partly be economical.

To illustrate this strategy, we may note that amongst all the countries in North and South America there are primarily two countries that offer: (a) *effective health care* with universal coverage (reducing, for example, infant mortality close to zero); (b) *education* to all citizens (thus abolishing illiteracy); (c) *social security* to come to terms with absolute poverty, and that in addition manage to check the crime rates without resorting to exaggerated police violence or corruption: Canada and Cuba[109]. Only these countries can therefore be said to respect the corresponding IBHR Articles. In all other American countries illiteracy and relative poverty is on the increase, vast portions of the population live without any form of social security or access to either health care or education, work in degrading conditions and in perpetual fear of police violence and corruption. In some countries, such as Argentina, absolute poverty is on the increase too[110]. All these countries break the corresponding Articles – and yet, the *only* American country to be condemned by the UN Commission on Human Rights in 2001 was Cuba. The reasons were obviously political and a result of fierce lobbying from the USA. But the story does not end there: ironically, the USA later became a victim of reverse political lobbying within the human rights domain when the country was excluded from the UN Commission on Human Rights in May 2001. And some of the member-countries responsible for that election result have regimes that can hardly be said to be overly respectful of the human rights. This sinister farce is likely to continue.

That type of selective political condemnation, whomever it strikes, does serious damage to the integrity of the human rights discourse. What is particularly sad from the human rights point of view (independently of political attitudes) is that if political lobbying can actually determine what country should be condemned or not, included in the Human Rights Commission or not, the whole idea of *fundamental* human rights without political strings attached is perverted.

That is to say: ICSU's position that there are fundamental freedoms and rights that should be respected *independently* of the political regime of individual nations is lost when the human rights discourse is politicised. It is lost when, for whatever reason, *one* right (e.g., the right to vote, Article 21:3) is allowed to dominate over all *other* rights (such as the right to live decently (Article 3), the right to work under humane conditions (Article 23), or the right to receive health care (Article 25) and education (Article 26). The IBHR must be seen as an indivisible whole, a package deal, and not as a menu from which we can choose *à la Carte*

[109] Possibly also Costa Rica.

what rights we feel comfortable in respecting and what rights we prefer to ignore.

We must realise that anyone who adheres to IBHR is actually making a *strong political statement*. So, when ICSU adheres to the IBHR, whilst purporting to do so in a non-political framework, ICSU in reality adopts a highly controversial political position. And the same can be said of many of the scientific standards of ethics in our list. For example, the WCS Declaration is quite an explosive political document. To illustrate, the governments of many arms-producing countries would most likely be provoked by the suggestion not to develop further weapon technology. In asserting freedom of thought and expression we oppose dictatorial forms of military regimes, autocracies, or 'democratures'[111]. In accepting as fundamental the rights of workers to receive adequate salaries, form powerful trade unions, and have equal access to public services we oppose the free-market ideology that posits that the value of unlimited profit should not be conditioned by such socio-political rights. In asserting the rights of women to participate in the scientific communities, we oppose the Islam countries governed by the shariah. And so on, and so forth; the list can easily be continued.[112]

An important point to make here is this: a forceful declaration of strong ethical opinions about the sciences' responsibilities to humanity entails an obligation to try and *realise* these ideals. (Otherwise, silence on these topics would have been preferable.) In doing so, the same *academic rigour* must be applied to the fulfilment of those promises as otherwise to the 'purely' scientific pursuits. The option of stating these societal ethical values whilst refusing to enter into the political and economic discussions is therefore not available. So long as the majority of political governments and financial influences in the world (democratic as well as non-democratic) remain opposed to the realisation of social responsibilities that come to notable expression in the International Bill of Human Rights, *there is no such thing as non-political socially responsible ethics in science*. To try and stay clear of politics would be superficial, at best. Worse, it could be hypocritical[113]. Awareness and deep understanding of

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[110] Such measurements depend on the time-span between the relata. Relative (or, in some cases, absolute) poverty can have increased in the recent decades, and yet have decreased over centuries.

[111] A formal democracy that lacks democratic substance in terms of the citizens' participation and rights, such as adequate working conditions, general access to education or health care, etc. Cf. argument 7, 1.3.

[112] Quite possibly, every country could be provoked by some assertion of alleged human rights, even those with the most 'humane' societies. Sweden, for instance, limits the right to religious freedom in order to protect children against (by Swedish standards) fanatic parents, or animals against ritual slaughter, cf. 2.3.

[113] I do not wish to imply that every scientist must get involved in the politics of science and its use, but only that if statements on ethics and responsibility that make essential political reference are made, then these implications must be properly analysed and discussed with academic rigour.

political, social and economic realities (not least of the contrast between the declarations' ideals and these realities) are absolutely crucial to the defence or realisation of the ideals one professes. As we have seen, scientific pursuits are intimately connected to the political and economic realities in which they are undertaken, and the ethical dilemmas to which they give rise contain complex political dimensions that cannot be ignored lest the 'scientific ethics' become very unscientific indeed.

To pursue ethics of science in an unscientific, academically superficial manner is something that scientific organisations cannot allow themselves to do. The ethical standards that are adopted by the scientific communities must be the result of extensive and thorough interdisciplinary discussions. Likewise, the ethics committees that scientific organisations establish should combine a broad spectrum of knowledge. The ideal ethics committee would therefore combine scientific with ethical, legal, political and economic expertise. This joint knowledge can then be used effectively to influence political and economic realities in such a way that the ethical ideas *can* be applied. For example, to follow-up the suggestion above to establish a system of compensation to resolve the dilemma that poses the individual's freedom of circulation against the acute necessity of developing countries to fight against their underdevelopment and retain their scientific expertise, is a highly complex problem. Its solution requires extensive knowledge of economics and political science. Philosophers and scientists alone cannot solve it, nor will they unaided be able to follow up on the WCS Declaration.

I have warned against the risk of creating a new 'ivory tower', an 'ethical' one, in which scientists discuss their responsibilities towards each other, whilst avoiding their broader and far more challenging responsibilities towards the rest of the world. In fact, this would not be a 'new' ivory tower but the same 'old' one. Surely, scientists have always had numerous rules for appropriate personal conduct, and if they did not write them down in detailed (or not so detailed) codes and guidelines, this does not mean that the norms did not exist. Understood as 'internal' responsibilities, ethics in science is hardly a new phenomenon. What *is* new, relatively speaking, is the societal and global dimension. "We" (the people who wrote the WCS Declaration and many other ethical standards for science) are not knocking on the tower's door saying 'Let us come in to tell you how to behave properly!'. "We" want to place that tower with doors and windows open in the midst of society and let the third world enter.

The development of science should be controlled and directed by governments and institutions in co-operation with scientists. National and international ethics committees can play an important role as intermediaries and advisory bodies. The ethics committees can also

make sure that scientific projects are in accordance with legislation, if the mandate is given to them and they have that academic capacity. Within an international perspective, the construction of an international court could be valuable in order to ensure, for example, that projects that are considered unethical and inadmissible by national legislation are not simply moved to another country where the legislation is more permissive.

Such control and firmness of direction could make science regain some of the trust that it is often said to have lost in recent decades in the general public[114], and counteract the growing suspicion and fear of different kinds of abuses. Many people do not believe that science – for all its eloquent declarations – is, or even aims to be, a benefactor of humanity, nor do these sceptics readily associate science with the classical quest to develop a more enlightened civilisation. Corruption and impunity are such common phenomena in human affairs on all levels, that only an ignoramus could remain entirely untouched by scepticism. And it would take deep cynicism to remain undisturbed.

Concern is spreading now, with good reason. The world we are presently creating is not sustainable, and we degrade a steadily growing majority of the population to a life without either dignity or hope. This is not due to natural disasters but a result of human decisions. For most people, life on this planet little resembles the rational and humane society depicted by the philosophers of the Enlightenment, but far more the "Naturall Condition of Mankind" described by Thomas Hobbes: "solitary, poore, nasty, brutish and short"[115]. If we want to turn the tide we can – that is also a matter of human decision. Scientists can do more than most people in this regard, if they choose to direct their power thus and manage to use it jointly.

If we (earthlings) decide to find a cure for malaria we will, no doubt. If we decide not to develop more weapons of mass destruction, they will not be developed. If we decide to alleviate poverty, we can – we could even eradicate it, in principle. *If* we wish.

Ethics committees that are not actively concerned with such quests should, in my opinion, be abolished, for they will only serve to lend credibility that is a mere pretence. The main *raison d'être* of applied ethics in science, through committees or other agencies, is to help make sure (through their mandates and competence) that those who are in a position to offer even the smallest drop of hope and progress actually do so. Then, perhaps, human civilisation might go towards a new era of Enlightenment.

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[114] The lack of trust appears far greater in Europe than in Asia or the USA, possibly due to the higher level of education in Europe amongst the general population. However, we must beware of mistaking suspicion of multinational companies and governments with suspicion of scientists and science.

[115] Thomas Hobbes (1651, I:13).

2.3 Animal Welfare

Attitudes towards non-human animals have been the subject of extensive debates in the last decades within science, agriculture, the food industry, and in business and society at large. The traditional view that only humans can be moral subjects and enjoy the protection of having rights has been challenged under a number of distinct aspects: scientific, philosophical, ethical and legal. The notion of moral status is closely connected to the notions of person-hood and self-awareness and these have been fleshed out within numerous disciplines; notably, neurophysiology, neuropsychology, philosophy, zoology and psychiatry, within which there are deep theoretical divisions. Our assessments of who is a person and a moral subject, and who is not, are also largely a result of our religious and wider cultural traditions.

However, being a person is taken to be important across all human societies. If you do not consider the individual before you a person, there are likely to be fewer restraints of conscience on your behaviour towards him, her or 'it'. Partly on that basis, human beings have allowed themselves to treat what they considered 'self-less' or 'soul-less' beings, (in particular non-humans, but sometimes also underdeveloped or sick humans) as social out-casts or 'non-members'. They have treated them as mere means to almost any end, with various degrees of disregard for their sufferings. To illustrate this, Descartes did not hesitate to subject non-humans to vivisection or other excruciatingly painful experiments, for he was convinced that they were soul-less automata, unable to feel either pain or pleasure[116]. Voltaire rejected such acts and beliefs as barbarous, unlike Kant who, although he also denied the Cartesian view that non-humans are mere automata[117], declared that we have no moral duties to those who are not self-conscious.

A problem is that both humans and non-humans belong to that group[118], whilst humans traditionally tend to be, using a modern term, 'speciesists', i.e., they favour, and are especially

[116] That, at least, is the standard reading of Descartes (1649, Part 5). Cf., e.g., The Cambridge Dictionary of Philosophy 1995/96, ed. Robert Audi, p. 196, end of 1st §. Cf. also a letter Descartes wrote to Henry Moore February 5, 1649. It was pointed out to me by James Dooge (SCFCS) that the Catholic faith could admit that animals have souls, but that these cannot be immortal.

[117] For example, in *Kritik der Urteilskraft*, part 2, § 90, note 1.

[118] There are self-conscious non-humans, and humans who are, e.g., because of brain damages, not self-conscious.

reluctant to deny basic rights to, members of their own species[119]. In reality, however, both non-humans and socially weak humans have occasionally been treated with the utmost cruelty in all political systems and religious creeds. For example, they have been used without their informed consent in harmful medical experiments, or forcibly sterilised.

Trivially, how an individual is treated in a human society depends on her social status. Non-trivially, without *any* social status, she could end up as food. Would we trade, skin, kill, eat, experiment upon, or forcibly sterilise admitted *persons*? Quite possibly, we would, but hopefully with more moral qualms, or, at the very least, with greater discretion. The social importance of being a person (legally as well as morally) can hardly be overestimated.

One necessary condition of person-hood is *sentience.* Today, the sentience of non-human beings has been scientifically established to the effect that the existence of non-human intelligence and emotional life cannot rationally be denied. In so far as sentience is not a sufficient condition of person-hood, this does not entail that there are non-human persons that we are presently turning into food, clothes and experimental material. It does, however, imply that measures should be taken to protect those who are able to suffer.

In the contexts where knowledge of non-human sentience is prevalent, and accompanied by compassion and responsibility, it is commonly acknowledged that non-humans can no longer be used indiscriminately for any human purposes, as they have been in the past, and still are in many environments[120]. This comes to expression, notably, in the numerous principles and guidelines that have been posited in order to regulate scientific research involving animal experimentation and that sometimes recommend scientists to "foster animal welfare awareness within the science and technology professions and among the public"[121]. In agreement with all the standards in our selection, the Australian Code of Practice for the care and use of Animals for Scientific Purposes (Section 1) emphasises what is sometimes called 'the three Rs': the *replacement* of animals with other methods, the *reduction* in the number of animals used; and the *refinement* of techniques used to reduce the impact on animals[122].

The ability of non-humans to have preferences, feel frustration, fear and pain is clearly taken into account in these standards, e.g., when they call for all forms of discomfort to be

[119] Singer (1990, Chapter 5) offers a short history of speciesism.
[120] Singer (1990) provides thorough statistics and detailed descriptions of experimental killings and torture of intelligent non-humans performed in research in the past and in the present.
[121] Code of Professional Standards and Ethics of The Royal Society of New Zealand: Use of Animals in Research and Teaching (f).
[122] The three R's are internationally known, partly thanks to FRAME: the Fund for the Replacement of Animals in Medical Experimentation who publish a journal called ATLA (Alternatives to Laboratory Animals).

minimised, or reject the use of muscle relaxants or paralytics in place of anaesthetics[123]. (It is important to note the psychological dimensions that are included in these standards, for they do not only posit limits for the physical discomfort that may be justifiable to inflict upon sentient non-humans but also on emotional distress, such as anxiety.)

The development can also be found in comparing older and newer versions of the Helsinki Declaration. In the present version (from the 52nd WMA General Assembly, in Edinburgh, Scotland, October 2000) the Basic Principles §11-12 state that "Medical research involving human subjects must…be based on…adequate laboratory and, where appropriate, animal experimentation" and that "…the welfare of animals used for research must be respected." These two conditions, of appropriateness and respect, are recent additions and are presumably the result of increased awareness of non-human animal sentience and their consequent need for protection from 'inappropriate' abuse[124].

SCRES' list of standards comprises nine standards (statement, guidelines, code, charter, declaration, and convention) on animal research, of which 4 are international and 5 are national standards:

(1) International Council for Science (ICSU): Statement of Principles for Use of Animals in Research and Education, 1996.

(2) International Brain Research Organization (IBRO): Guidelines on the Use of Animals in Neuroscience Research, 1992.

(3) United Nations Educational, Scientific and Cultural Organization (UNESCO): Déclaration Universelle des Droits de l'Animal, 1978.

(4) Council of Europe (COE): Convention sur la protection des animaux vertébrés utilisés à des fins expérimentales ou à d'autres fins scientifiques, 1986.

(5) Charte pour une éthique de l'expérimentation animale. Projet élaboré sous l'égide du ministère de la recherche et qui devrait dans sa version définitive être approuvé notamment par l'INRA (Institut National de la Recherche Agronomique), l'INSERM (Institut National de la Santé et de la Recherche Médicale), le CEA (Commissariat à l'Énergie Atomique) et le CNRS (Centre National de la Recherche Scientifique).
(Further references: CNRS: Expérimentation animale, guide pratique, June 2000.)

[123] Cf. e.g. the Guiding Principles in the Use of Animals in Toxicology, §4-5, adopted by the Society of Toxicology (Reston, VA, USA) in July 1989, revised March 1999.

[124] The development is also apparent in the recent discussions of food security and farming that have focused not only on what type of food is safe to eat, but also on the conditions in which farm animals are kept. The media attention on the farm animals' suffering has caused a marked rise in vegetarianism, at least in Western Europe, and sharp criticism of inhuman (or, as one should perhaps say: much too human) cruelty.

(6) Swiss Academy of Medical Sciences & Swiss Academy of Sciences (SAMS/SAS): Ethical Principles and Guidelines for Scientific Experimentation on Animals.
(Supplement: Statement on the Concept of Animal Dignity.)
(7) Society of Toxicology, USA (SOT): Guiding Principles in the Use of Animals in Toxicology, 1989/1999.
(8) The Royal Society of New Zealand (RSNZ): Code of Professional Standards and Ethics: Use of Animals in Research and Teaching.
(9) National Health and Medical Research Council (NHMRC): Australian Code of Practice for the care and use of Animals for Scientific Purposes.

Clearly, these standards constitute but a small selection fetched from a far richer source. Numerically, they form but a narrow basis of discussion. However, each of them draws attention to some interesting aspect on the complex problems involved in the use of intelligent life in experimentation, and manage therefore jointly to provide substance for a worthwhile discussion of the topic. For our aim in this section (of limited scope) is not to give a quantitative description of the standards for animal research that exist in the world today, but qualitatively to analyse some of the most important values that contemporary ethical standards in this area express.

We shall begin this analysis by giving a brief individual summary of the international standards letting them form a foundation for a subsequent comparison in which references to the national standards will be made whenever relevant.

In 1978, the United Nations Educational, Scientific and Cultural Organization (UNESCO) issued a *Déclaration Universelle des Droits de l'Animal*, core values[125] of which are:

1. All animal life has equally the right to its own type of existence (free or domesticated) and to being treated with respect for its natural rights as living creature (this is incompatible with, e.g., fishing or hunting for leisure)
2. Animals must not be subjected to avoidable suffering or distress, or death; any form of cruelty or maltreatment even in death.
3. The dignity of animals should be respected in all contexts, as well as the physiology and

[125] The 'core values' suggested here are not exhaustive of virtually all values that the standards express. Some standards are quite extensive and the above 'core values' are selected because they seem the most important to our present purposes. In the case of very detailed and extensive codes covering a large area of related topics, no attempt to summarise the entirety will be made, in order to avoid unjustifiable simplification. In these cases, relevant references will be made in the comparative analyses directly.

psychology of each species.

4. Animal experimentation violates animal rights if it involves mental or physical pain or distress: alternative methods should be developed and systematically employed.
5. Actions that endanger a species, massacre of wild animals, pollution and the destruction of biotopes amount to genocide.
6. All animals should be able to become legal persons whose rights should be recognised by law and protected by representatives in governmental organisations.

In 1986, the Council of Europe (COE) posited a *Convention sur la protection des animaux vertébrés utilisés à des fins expérimentales ou à d'autres fins scientifiques* that was opened for signatures on 18 mars 1986. The convention contains a detailed report of 79 pages describing, amongst other things, general principles, the care and lodgings of animals, conduct and procedures, authorisation, breeding and supply, utilisation, education and training, and statistical information. The text is stringent and cannot be summarised without loss of cogency. References to points of particular relevance here are made in the comparative analyses below.

In 1992, the International Brain Research Organization (IBRO) issued Guidelines on the Use of Animals in Neuroscience Research core values of which are:

1. Improving health and well-being of humans and non-humans.
2. Evaluating the necessity and conduct of animal experimentation: the fundamental principle of ethical animal research is that experimental animals must not be subjected to avoidable suffering or distress. One must also minimise the number of animals used.
3. Ethical issues are best considered in relation to the complexity of the nervous system under study and the organism's apparent awareness of the environment (physical appearance or evolutionary proximity to humans are not such useful guides).
4. Acquisition of research animals must be in accord with local legal requirements.
5. Knowledge of the source of the animal and awareness of all applicable laws/other directives is vital.

In 1996, The International Council for Science (ICSU) issued a Statement of Principles for Use of Animals in Research and Education. (Amongst ICSU's four Statements, this is the third in chronological order.) The core values it expresses are:

1. Improving health and well-being of humans and animals
2. Evaluating the necessity and conduct of animal experimentation

If we compare these four international standards, we find both similarities and differences.

ICSU's core values are consistent with IBRO's but the latter are more extensive and detailed**.** More precisely, the main principles of ICSU's Statement are compatible with IBRO's unless their interpretations of the key-terms differ. The first proposition appears relatively straight-forward: presumably, the wish to improve the health of both human and other animals is part of the motivation to formulate such ethical standards in the first place. In a similar spirit, COE's Convention opens by recognising the moral obligation to respect all animals taking their ability to suffer and remember into account, defining 'animal' as vertebrate non-human life.

The second proposition is, however, more ambiguous, in a manner that the Statement shares with many other relevantly similar standards. ICSU "reaffirms the scientific community's responsibility to establish its own mechanisms to evaluate the *necessity* and conduct of animal experimentation". This can be compared with IBRO's view that "experimental animals must not be subjected to *avoidable* suffering or distress" (author's italics), that also comes to expression in the standards of UNESCO and COE and in the national standards in the list above, for example the French Charter 2§:

> Les animaux sont des êtres sensibles et pourvus de capacités cognitives et émotionelles. Ils sont capables de souffrir. L'expérimentateur a le devoir de s'assurer que leur santé et leur bien-être ne sont pas inutilement menacés. La prévention de toute souffrance inutile sera son premier souci.

Positive as this may sound, it is not necessarily reassuring from the animal's point of view - nor, perhaps, from the scientists': who is to decide – and by what standards – what counts as a 'necessity', 'utility', or as 'unavoidable suffering'? Views differ profoundly concerning the amount of suffering that may be inflicted on sentient non-humans, and by what justification. This discussion carries well beyond the scientific spheres. In Sweden, for example, ritual slaughter that is considered to induce 'unnecessary suffering' is prohibited by law[126] and sets within an international perspective quite controversial limits to religious toleration. (Because this law prevents religious individuals from slaughtering animals they wish to eat as their religions traditionally require, e.g., within certain forms of Islam, Judaism,

[126] The Swedish law on the protection of non-human animals is very detailed and includes regulations for any use of non-humans in experiments or teaching. Interestingly, the legislation for experiments involving human research subjects is far less strict.

or the Lappish religion). Of course, the ritual slaughter is considered 'necessary' by the religious followers who deplore this Swedish preference towards the protection of non-humans.

To give another much-quoted illustration, many cosmetic companies allegedly find it 'necessary' to perform painful experiments on non-humans in order to test their products' adequacy for use by humans. This meets staunch opposition from animal-rights groups that do not consider cosmetics a necessary aspect of human life at all. (Many well-known brands now state on their products that they do not perform tests on non-humans.)

We shall not go into the details of all these disputes, for the list of conflicts between the interests of humans and non-humans in terms of what humans regard as 'necessary' or 'unavoidable' in their own interests is endless. The relevant point for us to make here is that the concept of 'necessity' stands in need of specification in order to be useful, because if it is left unspecified it can serve basically any purpose.

Therefore, as it stands in its present formulation, ICSU's Statement is indeed laconic: maybe too laconic to avoid falling into the analytic trap described in 1.3. The Statement gives the impression of trying to accommodate a great variation of positions all at once: those in favour of liberal usage in experimentation of intelligent non-humans as well as those strongly against it. For the Statement can quite reasonably be interpreted to the satisfaction of either. Granted, the adoption of this ICSU Statement remains of value to the extent that it shows an awareness of the animal rights issues and a wish to accommodate this new development in science and society. Nevertheless, a critical reader could be justified in raising the question whether the statement's substance is not sacrificed for its universality, i.e. for the benefit of the principle of universal consent within the ICSU family. A revision of the 1996 Statement might be envisaged taking the further considerations below into account.

In comparison, IBRO's Guidelines are more extensive than ICSU's Statement, and also more analytic in the details they offer. IBRO further states that local legal regulations should be known and followed, and requests that the animal's source be known; however, the most controversial and interesting addition is the following consideration (third as listed above):

> Ethical issues are best considered in relation to the complexity of the nervous system under study and the organism's apparent awareness of the environment (physical appearance or evolutionary proximity to humans are not such useful guides).

Positing complexity of the nervous system and apparent awareness of the environment as an organism's entrance ticket to moral protection, this important statement makes belonging or resemblance to the human species ethically irrelevant in the context. Logically, there are two possible interpretations of this view that are extremely important not to confuse:

(a) 'Being human is neither necessary, nor sufficient in order to possess moral status'
(b) 'Being human is sufficient but not necessary in order to possess moral status'

By (a), human beings could lack moral status. It would then in principle be no less morally acceptable to perform experiments on humans than on non-humans, provided that they are in sufficient want of complexity and awareness.

By (b), being human guarantees having moral status. No experiment on humans could then be performed (unless, perhaps, it agrees with received ethical regulations; notably, informed consent and the fulfilment of other ethical requirements concerning human experimentation such as those contained in the Helsinki Declaration).

The formulation of the IBRO Guideline suggests that (b) is the correct interpretation. In other words, the message is *not* that some (notably, sub-developed or damaged) humans *should* be used in experimentation by virtue of their relative lack of complexity or awareness, but that some (highly developed) non-humans *should not* be thus used by virtue of their relative neurological complexity and level of awareness. In other words, *more* organisms should be protected by the token of level of complexity and awareness, not less[127]. This is a classic point of misunderstanding that is responsible for numerous heated but superfluous debates. An interesting question to arise in a continuation of this line of thought is at what stage of evolution a non-human might be protected by an extended Helsinki Declaration.

Thus interpreted, IBRO's Guidelines appear compatible with UNESCO's Declaration, which contains explicit reference to the ethical relevance of mental evolution in the case of non-humans. UNESCO's Declaration begins by asserting that life is one, that all living things have a common origin, and that all living organisms have natural rights - special rights if they also have a nervous system. The last point covers humans and many non-humans alike, and they are distinguished in the Declaration as different animal species. That is to say, the

[127] That is also the view of the anti-specicist movement, e.g. expressed in the basic principles of antispecicism elaborated by the Antispecicist Federation in 1995. One of the forerunners of this movement is the Australian philosopher Peter Singer who defends the rights of non-humans in, e.g. 'Animal Liberation', 1990, which has provided an enormous support to the animal rights movements. The most aggressive critics of animal rights typically confuse the interpretations (a) and (b).

Declaration does not use the traditional distinction between 'humans' and 'animals' whereby humans are 'non-animals', but follows the more modern usage distinguishing between 'humans' and 'animals' as human animals versus non-human animals. The importance of this terminological move (especially from the non-human point of view) lies primarily in its highlighting the *similarities* between intelligent and sentient species rather than the differences.

However, UNESCO takes this idea considerably further than IBRO, for example, in calling certain destruction of non-human life 'genocide', a term that in many natural languages is reserved for human destruction[128]. The Declaration also expresses respect of the animal's dignity – including its dead body - and advocates the right of animals to become legal persons and have their rights defended by governmental representatives. Jointly, these positions add up to a declaration that is quite avant-garde in the values it recommends and consequently controversial. Reading the standards of ICSU and IBRO it is difficult to ascertain clearly whether these organisations might agree with UNESCO's views[129].

On the concept of animal dignity, the Swiss Academy of Sciences and the Swiss Academy of Medical Sciences have issued a joint Statement (in supplement to their Ethical Principles and Guidelines for Scientific Experimentation on Animals) that provides interesting reading. Drawing a useful distinction between anthropocentrist and non-anthropocentrist ethics, the statement explores the attitudes towards animal dignity within both approaches, comparing their fundamentally different reasons for recognising animal dignity. In spite of their differences, the Statement concludes that the two approaches are complementary rather than opposed. Both admit that by virtue of their sentience "animals, as a matter of principle, deserve to be accorded a substantial level of respect on this basis alone" and that animal dignity "immediately concerns ethics of responsibility, which it is everyone's duty to observe, regardless of whether humans accord animals any pre-existing intrinsic value or not".

If we superficially compare the standards discussed so far, we find similarities between them, notably:

1. Belief in the necessity of using non-humans in painful or even fatal experimentation.
2. Knowledge that some of these non-humans are intelligent and able to suffer.
3. Realisation that 2 imposes responsibilities when practising 1.

[128] The Swedish translation, for example, is '*folkmord*', the literal meaning of which is 'people-murder'.
[129] SCRES invites them to comment on this directly.

However, many questions have to be answered with some precision and detail before we really know how deep these similarities are. That is to say, we need to know more about the underlying beliefs and motivations before we are justified in making more substantial claims about the degrees and manners in which the organisations behind these national and international standards do point in the same direction. Amongst other things, alternative replies to the following questions, all of which have been evoked by the standards that we are here discussing, must be specified:

(1) Precisely *what counts as 'necessary' or 'unavoidable' suffering* - by which and whose standards?

(2) Can (should or do) non-humans have *rights*, e.g., so-called 'natural rights' (assuming that we believe in the existence of such things as rights)?

(3) Should non-humans be conceivable as *moral persons* (and enjoy the protection that possession of this status entails)? By what standards should this status be attributed?

(4) Should non-humans be able to become *legal persons* (and enjoy the protection that possession of this status entails)? By what standards should this status be attributed?

(5) Is *species-belonging* ethically relevant per se?

(6) Should the status (moral, legal, social or other) of an individual in the context of scientific research, notably experimentation, be a question of degrees, and thus form a *hierarchy* of intelligent creatures that are in different measures candidates for protection with homo sapiens on the top of the pyramid?

(7) Is the *dead animal's body* an item worthy of respect?

(8) Can the killing of a non-human species be called '*genocide*'?

(9) Should the *Helsinki Declaration* be conceptually opened to protect also non-human beings that are relevantly similar to humans?

(10) When replies to questions (1)-(9) have been suggested: how do the replies *connect*? What picture emerges?

The list of questions that the relevance of sentience to moral status raises can easily be prolonged. As said, it has not been our purpose here to give an exhaustive analysis either of the standards in existence, or of the empirical or philosophical problems that these standards provoke. What we have tried to do, in all simplicity, is to point to some of the most problematic themes that the standards in our collection address; themes that any more ambitious standard in the field have to take into account.

There are enough substantial similarities in terms of shared beliefs and interests amongst the standards that we have looked at here to conclude that the project of formulating

an informative and conceptually solid international cross-disciplinary standard would be realistic. According to the French Charter (amongst others), Ethics Committees ought to be the ones to set rules and guidelines for the use of non-humans in experiments, as they do in many countries and organisations. Whoever takes on the responsibility must bear in mind that these issues carry far in many directions and that it is only by conscientiously attempting to address questions such as those raised above that a serious standard can be developed.

Human power over all other sentient species cannot reasonably be challenged: the difference in intelligence and force between humans and non-humans is so grand that the discussion lacks academic interest. The relevant questions concern the methods with which this power can (or should ethically) be employed. Do we retain our accustomed world-view with homo sapiens as an enlightened (or not so enlightened) despot ruling over all other species as (s)he feels fit? Or does a different picture emerge where there are limits (moral if not physical) to the human supremacy, and other interests than purely human ones that need to be taken into account? The Swiss Guideline is eloquent on this theme:

> The ethical principle of reverence for life demands that human beings should protect their fellow-creatures, the animals, which, no less than themselves, are sentient beings. It also implies an obligation to respect their dignity and the right of each species to thrive and flourish in its natural manner. The humanitarian ethos springs very largely from the feeling of solidarity which creates a bond between us and all other creatures susceptible to suffering.

This is indeed a thought-provoking request. For by whatever path: granting moral status and basic social rights on the basis of the individual's capacity to suffer from their denial, instead of the ability to fight for them, would be gesture of immense symbolic importance, the enactment of which would amount to a social revolution.

2.4 Science in the Internet Era*

Background

Breakthroughs in science and technology, particularly in the information science are changing human life in all aspects. As the most important innovation of information science in the 20th century, the Internet today connects over 400 million people of the world, ignoring the sanctity of borders and constraints of geographical distance. The Cyber-World created by Internet is altering many rock solid rules and regulations that are active in the physical life. It is predicted that by 2005 there will be 1 billion people on the Internet. Such connectivity makes is possible to provide various kinds of information services to anyone at any place on anytime. This can benefit economic growth and international exchanges in culture, science and technology.

The information technology revolution is leading the world into an information era. A set of articles published in "Business Week" at the end of 1996 clearly put forward the point of view that USA is stepping into an epoch of a new economy, which is based on the information technology revolution, and is characterised by super-high productivity and economic growth. In June of 2000 the summit of the European Community adopted an acting program to construct "Electronic Europe". In July, the Okinawa summit of 8 countries adopted "Okinawa Charter of the Global Information Society", considering that information technology is the most powerful driving force for social development in the 21st century. In November, leaders of East-Asia Community signed an agreement in Singapore of "Electronic East-Asia Community", in order to promote co-operation in information technology and E-Commerce. Only within the year of 2000, these highly consistent actions of the whole world shows that the information technology based new era is a commonly recognised general trend. Looking back into the history of human development, one can see a widespread penetration of ethical norms and concepts into the whole range of human endeavours. There is almost no single significant elevation of productive force and economy that is not accompanied by comprehensive progress in science, culture and society. And major progresses in science and the productive forces have an outstanding capacity to promote the social development as a whole, including the ethical standards accepted by society.

* This section has not been written by the author of the present document, K. Evers, but constitutes the SCRES' committee's textual contribution to the document.

In the new century, whilst human society is standing at the doorway of the historical period of Internet era, which is strongly accelerating globalisation and social changes, revolutionary reforms in ethical norms and sociological concepts are evidently unavoidable.

Human behaviour in society is constrained and controlled by rules and laws. In many cases, the acceptance of new ethical norms by society is a pioneering formulation of social regulations and rules. The law and legislative system can often be considered as solidified ethical norms. Indeed, the Internet era, which is endowed with unprecedented power by science and technology, is calling upon the emergence of new ethical standards as forerunners for new guidelines, societal rules and laws appropriate to the new era. It is true that, facing the border-less and almost omnipresent Internet, many (if not all) existing principles and regulations which are playing a dominant role in international relations and in the exchange among people of different cultures seem to be inadequate or even powerless. A set of ethical issues emerges against this background that should carefully be studied by the international communities, not least by the scientific communities.

Data Access

In the Internet era, the most valuable source of property and prosperity is no longer natural resources or capital but *knowledge* and *information*. For the success of scientific research, an indispensable factor is to get relevant data and information in time. Great amounts of data and information, which were obtained from public research and investigation, should be available for sharing within public scientific and educational activities in the world. This is particularly meaningful in the era of globalisation, because IT and Internet provide unprecedented possibilities to share data world-wide.

Unfortunately, reality is quite different from that. Because of the diversified sources of scientific research grants, in many cases the data producer and information owner put the data under their control, practically blocking public access[130]. There are even considerations of changing the policy of scientific data sharing under the excuse of *Intellectual Property Rights (IPR) protection*. In this regard, ICSU and CODATA, representing the international scientific community, already expressed publicly the opinion that for scientific and educational purposes data access should continuously follow the policy of public sharing[131]. It is stated that: “Since its creation, a major objective of ICSU has been to assure that scientists in all nations can obtain access to data and other types of technical information that are essential to

[130] Cf. 2.2.

[131] Cf. ‘Access to Databases’ and ‘Principles for Dissemination of Scientific Data’ by ICSU/CODATA Ad Hoc Group on Data and Information, 2000.

their work", and that "CODATA, the Committee on Data for Science and Technology, is an interdisciplinary scientific committee of ICSU, which works to improve the quality, reliability, management, and accessibility of data of importance to all fields of science and technology." A set of principles for dissemination of scientific data have been suggested.

Information Inequality

The opportunities that IT is providing should be equal to all the peoples in the world. A world in the process of globalisation in particular needs balance and equal opportunities between South and North, poor and rich. The ethical issue of equality is also of vital importance for the peaceful and stable development world-wide.

The impact of IT on society, however, is a two-edged sword. IT and the Internet dramatically promote economy and education, and in principle provide significant opportunity for the rapid development of underdeveloped areas to diminish the gap between the developed and developing countries. The annual report of the World Bank in 1999 stated that *Internet has tremendous equalising potentials*. Nevertheless, it is only in developed countries and regions that adequate social conditions exist, a basis that is necessary to make the investment in IT productive. The report of UNCSTD's Special Group for investigating "IT – opportunity and risk for underdeveloped countries" pointed out in 1998 that heavy investment in information infrastructure in developing countries does not always pay back as expected. This is mainly due to the lack of qualified labour and the constraints of local politics. Thus IT provides the opportunity to diminish the South-North gap, but for the unprepared, and underdeveloped, this opportunity is slipping away. So, the UNDP Annual report of 1999 stated that instead *Internet is the engine driving us towards increased inequality.*

To diminish the South-North gap, or, at least, to make the gap increase more slowly, is a strategically important task that the scientific communities have to deal with. It is fairly reasonable to put more duty on the shoulders of the developed areas for bridging up the "Digital Divide". In July of 2000, the 8 countries signed "Okinawa Charter for Global Information Society", which declared that the digital opportunity should be equal to all, and set up a task force on the theme of information inequality.

In the construction of most regulations and rules in the international economic relations it is the developed world that plays the dominant role. Consequently, the interests and demands of the developing regions are ignored to a considerable extent. Ignoring the voice of comparatively weak partners in the game, the inequality is encouraged and increased. The economic globalisation ought instead to ascertain the participation of the developing regions and countries and construct a new game the rules of which facilitate balance and equality.

Information Security

The Internet era is characterised by the presence of a Cyber-World in parallel to physical reality. During the period of the 70's and the 80's, when Internet was in its "infancy", the on-line users were all from the scientific and educational circles and the purpose of using Internet was primarily academic, completely separated from profit-ideas. In those circumstances, the best rule for Internet growth was "no rule, no control". It is this freedom that facilitated the rapid development of Internet. However, once a rule is formed, it soon hardens into a dogma, insensitive to contextual changes. After the commercialisation of Internet the function and structure of on-line users greatly changed, yet this powerful Cyber-World is still operated by the "no control, no rule" principle. At the same time, the Internet is no longer a quiet scientific "ivory tower" but an effective instrument for profit making. Internet looks like a highway full of busy traffic, or a trade fare full of business people. It is just the same as in the physical world and in such circumstances there unavoidably exist different kinds of crooks and pirates amongst the honest people. (And, of course, what constitutes 'honesty' is also open to debate.) The difference is, that whilst in the physical world there is great amount of regulations and laws to control and constrain activities that are perceived to be harmful for society, in the Cyber-World there is nothing but a decision-making principle based on consensus.

Before the advent of Internet, when computers were accessed mainly through the keyboard and mouse, the fear of hackers was not a big issue. Today it is important to realise that hackers can get into your private computer without authorisation via the Internet. Sophisticated software is now available for hackers to find paths into your system and cause potential security breaches. They can even be on your computer at the same time that you are, and you won't know it. Hackers tend to snoop around for a number of reasons. Some want to prove they can break in, some have a political agenda, and still others are looking for private information that they can use for financial benefit. Although diversified products and techniques are available for network security, you cannot feel save while legislation and any consensus on ethical norms and standards for human behaviour on the Internet is lacking.

Hackers and virus makers are hurting innocent people on the Internet. Internet is becoming a risky place for common people and paradise for criminals. A still more serious problem is that the malicious activities are shifting from those without definite purposes to profit-making, even activities with clear political or military background. Scientific communities have to realise the dangers of preparations for a Cyber-War. SCRES (2000) raised this important warning: "The revolution in information technology (IT) has risks as

grand as its potentials. …As our deep concern for the switch to a new millennium reveals, many countries are extremely vulnerable to cyberspace breakdowns in their information-dependent systems, …Such breakdowns could happen due to accidents, or intentional interference …, or they could become objects in a cyberspace war. …Difficult problems of scientific ethics and international security ensue from this new situation; and, …. 'a comprehensive understanding of the impact of cyberwarfare has eluded the international security community',…In November 1988, a committee of the UN General Assembly addressed this issue in a resolution, calling upon all Member States to …help develop 'international principles that would enhance information security and combat information terrorism and criminality' …It is presumably not unreasonable to demand that the scientific community that developed the Internet and the Web share the responsibility of finding solutions to these rather dramatic problems."

In this regard, many academic associations of the IT field have taken good steps. Some professional organisations have constructed ethical norms, codes, guidelines and principles to constrain and control the behaviour of those who work in the IT field. There are cases when members of the organisation voluntarily accept the constraints of the codes, so that the codes become a Charter of enforcement. For example, in the Computer Society of India, in their "Code of Ethics for IT Professionals", it is stated that "I am aware that any breach of the Code of Ethics may lead to disciplinary action against me under the Bylaws and rules of the CSI. I hereby confirm that I shall be bound by any decision taken by the CSI in such matters.". To this category also belong other codes, such as "Code of Ethics and Professional Conduct" of Japan Information Service Industry Association. In other cases the codes are merely a declaration without any binding force to members of the organization that adopted the codes. To this category belongs, for example, the 'Swedish Ethical Rules for Computer Professionals'.

Respect for Cultural Diversity

In the physical world, geographical divisions combined with principles of mutual respect of national sovereignty, etc. serve as buffers between the different and sometimes contradictory interests that exist in economic and political systems, culture and religions, to allow the world to live predominantly in peace. In the Cyber-World those buffers reducing possible conflicts disappear. On the Web there is no lack of speeches insulting other nations, and malicious information (destructive not least for the younger generation) can widely be disseminated via Internet. Someone can hurt another's feelings without taking any responsibility. This phenomenon is harmful to the formation of a peaceful, harmonised world that is friendly

towards diversified cultures. A well known case is Yahoo trying to put up Nazi articles for auction on the Web: whilst this is inadmissible for French people, for example, according to the laws of United States, it is quite alright. This case which resulted in cancelling the auction shows the indispensability of ethical norms and societal regulations that are recognised and adopted world-wide for the Cyber-Space.

In the era of economic globalisation, ethical standards have gained special importance to human society. At the Seattle Conference of WTO (December 1999) developing countries expressed strong dissatisfaction with the current economic system and regulations, considering them as "unfair and immoral". The "Seattle Warning" promulgated on this Conference that raised a suggestion to establish an outpost line of ethics is a warning to the whole world.

People of different cultural traditions and geographical origins have the same rights to keep different life styles and sociological concepts. In an era when economic activities in different countries become more interdependent, the establishment of ethical consensus is of evident importance. If the international communities do not pay enough attention to ethical issues during the formulation of policies, it will lead to trouble and even disasters for human civilisation. Then the troublemakers will have to eat their own bitter fruit. Ethical concepts are spiritual forces that reflect the spirit of society as a whole. No human conduct can be isolated from ethical principles. In all international regulations and rules implying ethical concepts and measure for value, the values of western societies dominate. However, to retain diversity of culture is important for the development of human society. Cultural respect, exchange and plurality have lead to social progress. This has been proved by history. In many Asian countries the commonly accepted ethical norms may be quite different from those of a western society. Therefore, mutual respect for diversified culture and sociological ideas is an important factor to promote human society. We propose that the following are the most important ethical issues for Science in the Internet Era:

1. To reduce information inequality
2. To find a balance between free scientific data access and IPR
3. To build an Internet culture based on respect for cultural diversity and different life styles
4. To fight for a 'clean' cultural environment for the younger generations
5. To combat net crime, such as fraud, the spreading of computer viruses, or cyber warfare
6. To create a peaceful Internet era for common prosperity

2.5 Summary

The leading theme of the present chapter was what the standards collected have in common. In what important ways can they be seen to differ? Can a smallest common denominator be found between them? These analyses focused on three subjects corresponding to ICSU's Statements in SCRES' list.

(1) *Freedom and responsibility in science.* Numerous ethical standards for science have been formulated concerning the freedom and the responsibility of scientific pursuits. We have discussed norms of freedom and responsibility as they come to expression in the ethical standards collected here with a focus on international relations. Various *origins* of limits to academic freedom were distinguished, notably: orthodox religions; political ideologies; state interests; free-market ideologies and practices; and limits generated internally, e.g., issues of academic respectability, fashion in topics considered worthy of research, the influence of dominant personalities, or the role of authority within science. A brief account was subsequently provided of different *kinds* of limits that have been imposed on the freedom of science. Notably, limits on knowledge *per se*, limits in terms of topic priority; limits in the choice of methods; limits in the applications of the scientific knowledge acquired; limits in access to scientific knowledge; limits in the circulation of scientists; limits for the conduct of scientists.

The responsibilities of scientists were roughly divided into *internal* responsibilities related to their conduct towards their discipline, their profession and colleagues, and *external* responsibilities related to the impact of their research upon society. Limits on scientific freedom as rules for scientists' personal conduct are of the former kind. (All the other limits primarily concern the latter kind.)

Concerning these internal responsibilities, the standards in our list show a remarkable (if not surprising) degree of similarity. Certain "core values" stand virtually unchallenged, e.g., honesty, scepticism, fairness, collegiality, and openness. However, it is primarily *the unspecified terms* that are broadly agreed upon. The more that they are specified, e.g., fleshed out with concrete applications in different contexts, increasingly diverging opinions are likely to ensue (for example, concerning with whom the main loyalty lies).

One of the main recommendations that SCRES makes in this document is that ICSU formulate a Statement on Scientific Responsibility and henceforth pursue the related goals with the same vigour as it has pursued those pertaining to scientific freedom. The contents of

that Statement would partly be given by the *Declaration on Science and the Use of Scientific Knowledge* adopted at the World Conference on Science in Budapest, 1999 (the WCS Declaration). The WCS Declaration primarily focuses on external responsibilities and calls for directing the funds for science to ensure, on a global front, fundamental human interests, such as *peace*, *sustainable development*, *social equity*, and *respect of human rights*. All of these recommendations find broad support amongst the standards in our list.

ICSU "has a well-established non-political tradition which is central to its character and operations", and accordingly, these ideals are supposed to be achieved without political bias. ICSU further asserts scientists' right to certain forms of freedom with a clear reference to and endorsement of the *International Bill of Human Rights* (IBHR), in which "such rights are embodied". ICSU posits these rights as *universally valid* independently of politics, religion, finance or culture. However, it has been argued that, largely to its own detriment, and contrary to its original intents and purposes, the human rights discourse has in no small measure become politicised, to the effect that anyone who adheres to IBHR is actually making a strong political statement. So, when ICSU adheres to the IBHR, whilst purporting to do so in a non-political framework, ICSU in reality adopts a highly controversial political position.

A forceful declaration of strong ethical opinions about the sciences' responsibilities to humanity entails an obligation to try and *realise* these ideals. (Otherwise, silence on these topics would have been preferable.) In doing so, the same *academic rigour* must be applied to the fulfilment of those promises as otherwise to the 'purely' scientific pursuits. The option of stating these societal ethical values whilst refusing to enter into the political and economic discussions is therefore not available. So long as the majority of political governments and financial influences in the world (democratic as well as non-democratic) remain opposed to the realisation of social responsibilities that come to notable expression in the International Bill of Human Rights and the WCS Declaration, *there is no such thing as non-political socially responsible ethics in science*. To try and stay clear of politics would be superficial, at best. Worse, it could be hypocritical.

(2) *Animal welfare*. Attitudes towards non-human animals have been the subject of extensive debates in the last decades within science, agriculture, the food industry, as well as in business and society at large. The traditional view that only humans can be moral subjects and enjoy the protection of having rights has been challenged under a number of distinct aspects: scientific, philosophical, ethical and legal. In the contexts where knowledge of non-human sentience is prevalent, it is commonly acknowledged that non-humans can no longer be used indiscriminately for any human purposes, as they have been in the past, and still are in many

contexts. This comes to expression in the principles and guidelines that have been adopted to regulate scientific research involving animal experimentation, in which the ability of non-humans to have preferences, feel frustration, fear and pain is clearly taken into account.

The standards here discussed show some similarities, notably:

1. Belief in the necessity of using non-humans in painful or even fatal experimentation.
2. Knowledge that some of these non-humans are intelligent and able to suffer.
3. Realisation that 2 imposes responsibilities when practising 1.

However, we need to know more about the underlying beliefs in order to justify more substantial claims about the degrees and manners in which the organisations behind these national and international standards may point in the same direction. For example, it must be determined precisely what counts as 'necessary' or 'unavoidable' suffering - by which and whose standards; whether non-humans can (should, or do) have rights, e.g., so-called 'natural rights'; whether non-humans are moral persons, or legal persons (thus enjoy the protection that possession of these types of status entail); whether species-belonging is ethically relevant per se; and if the *Helsinki Declaration* might be conceptually opened to protect also non-human beings that are relevantly similar to humans.

There are enough substantial similarities in terms of shared beliefs and interests amongst the standards that we have considered to conclude that the project of formulating an informative and conceptually solid international cross-disciplinary standard would be realistic. Ethics Committees can be used to set rules and guidelines for the use of non-humans in experiments, as they do in many countries and organisations. Whoever mantles the responsibility must bear in mind that it is only by conscientiously attempting to address questions such as those raised above that a serious standard can be developed.

(3) *Science in the Internet era*. The development of Internet and the Web have brought fruitful advances in IT, but also created dependence on these results. Many countries are extremely vulnerable to cyberspace breakdowns in their information-dependent systems, such as infrastructure (air traffic, electric power, etc.) that could happen due to accidents, intentional interference; or in a cyberspace war. Difficult problems of scientific ethics and international security ensue from this new situation. In 1988, a committee of the UN General Assembly addressed this issue in a resolution, calling upon all Member States to help develop "international principles that would enhance information security and combat information terrorism and criminality". It is predicted that, by 2005, 1 billion people will be connected to the Internet. This benefits economic growth and international exchanges of culture, science

and technology, but also calls for the emergence of new ethical standards. Internet provides unprecedented possibility to share data world-wide; however, in many cases the data producer and information owner put the data under their control, practically blocking public access. In 2000, ICSU and CODATA (the ICSU Committee on Data for Science and Technology) issued A Set of Principles for Science in the Internet Era expressing the opinion that for scientific and educational purposes data access should continuously follow the policy of public sharing. However, attitudes vary between different societies in regard to whether it is most important to maintain public access to scientific data or to protect private ownership via patent laws.

Conclusion

The aim in this project has been to investigate standards for ethics and responsibility in science in order to gain a better understanding of their nature, background and function, to lay a useful ground for future studies, and aid the development of new codes.

What conclusions can be drawn from this material?

If the choice is made to introduce ethics into the scientific realm, it should be done *well*. Ethics in science must be pursued with the same academic rigour, integrity and courage as other academic subjects. In a critical review of the World Conference on Science, *The Economist* wrote about the organisers, ICSU and UNESCO: "Theirs is a world in which the rules are made by an international great and good (untainted by self-interest, of course, and untarnished by corruption). It is a world in which phrases such as "a new social contract between science and society" actually mean something. It is a world in which somebody can stand up and propose that newly graduated scientists take some equivalent of the Hippocratic oath before they are allowed to practise their craft, and be greeted by applause rather than polite giggles. It is, in other words, a world in which pigs have become suitable objects for ornithology."[132]

Whether this image is true or not, it captures precisely what must be avoided. Superficiality, vacuity, hypocrisy, corruption and impunity have here been suggested as five major pitfalls in the context of applied ethics of which the formulation of standards for scientific research is a particular instance. Naivety might have been added to that list.

Ethical standards for science must be formulated with great care and integrity. This requires special skill. Asking scientists to be socially responsible in their capacity as scientists presupposes that they possess the relevant competence. The *study of ethics* should therefore be an integral part of the education and training of all scientists with the purpose of increasing future scientists' ethical competence. That is essential, notably, in determining where the main ethical differences versus similarities between different parties lie, and in resolving conflicts.

The standards here collected appear very similar in their recommendations for individual scientists' conduct. Regarding internal responsibilities that mainly concern the scientific community itself (in relation to colleagues, or to the profession) certain *"sine qua non"*–virtues, without which the scientific enterprise would scarcely be possible, stand virtually unchallenged, such as honesty, scepticism, fairness, collegiality, truthfulness,

[132] *The Economist*, July 3rd 1999, p. 83.

accuracy, conscientiousness, respect and openness. Differences emerge more strongly in the regard to external responsibilities (i.e., those that relate scientists to society beyond their own professional sphere). For example, in demanding loyalty towards distinct groups, or types of groups, notably, different political systems, such as democracy, socialism, or communism.

SCRES should not advocate any political ideology. It is not our role to do so. Notwithstanding, some ethical recommendations are politically loaded. In those cases, *strict* political neutrality cannot be upheld with loss of credibility. ICSU's policy to remain strictly non-political in its ideological positions on responsibility and freedom in science whilst adhering to such documents as the International Bill of Human Rights and the Declaration on Science and the Use of Scientific Knowledge adopted at the World Conference of Science, is unrealistic. Numerous values expressed in both those documents are political dynamite (in so far as they are taken seriously). There is no such thing as non-political socially responsible ethics in science. Applied ethics in science necessarily occurs in a social, political and economic framework that cannot be completely politically neutral. To try and stay entirely clear of politics would be superficial, at best. Worse, it could be hypocritical.

Today, there seems to be a need for international agreement in many domains, such as socio-economic development and equity, sustainability of natural resources, world peace, quality of life, equity between nations**,** the correct handling of scientific data, problems in cyberspace, giving due credit, and so on. Numerous ethical standards for science that address such issues have been formulated, and we have discussed some of them here. It would be valuable to undertake further, more extensive cross-disciplinary studies in order to learn more about the needs for agreement as they arise within different perspectives, in various contexts. The problems of developing countries require special attention –especially, if globalisation is not regarded as the spread of few nations' power to cover a greater area, but as the inclusion of more nations' representation.

The document makes two main recommendations:

III. The formulation of a substantial ICSU statement on the responsibility of science[133].

IV. The adoption of new ethical standards by individual ICSU members who do not as yet have such standards[134].

SCRES also considers the formulation of a universal scientific oath an interesting project for which the present project analysing ethical standards in science might be a useful beginning.

[133] For example, along the lines of SCFCS' Blue Book.
[134] SCRES will co-operate with scientific communities endeavouring to develop ethical norms for their pursuits.

Executive Summary

Introduction

This project grew out of early consultations concerning the preparations for the World Science Conference (Budapest, Hungary 26 June – 1 July 1999) arranged by UNESCO and ICSU. The conference document "Science Agenda – A Framework for Action" states under 3.2 Ethical Issues, point 71: "The ethics and responsibility of science should be an integral part of the education and training of all scientists. It is important to instil in students a positive attitude towards reflection, alertness and awareness of the ethical dilemmas they may encounter in their professional life. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology (COMEST), in co-operation with ICSU's Standing Committee on Responsibility and Ethics in Science (SCRES), have a special responsibility to follow up on this issue." The present document analysing standards for ethics and responsibility in science under given perspectives is ICSU's initial contribution to this task. The document should be regarded as a *starting-point* and not as a final destination. Its aim is to lay a useful ground for further inquiries, and if that can inspire further studies, or be an aid in the development of new codes, then this aim shall have been achieved.

Material

SCRES has collected 115 ethical standards for science, listed in Appendix (i). The collection includes 39 international standards and 76 national standards representing 23 countries on 6 continents. The standards are of different types, and these are conceptually distinguished in Appendix (ii). In a simple manner they are empirically organised in Appendix (iii).

Disposition

The text describing this material comprises two main parts:

I. 'Contexts of Formulation' discusses the contexts in which the perceived need to formulate standards arises, whom they concern, why they should be formulated, their nature, function and means of implementation.

II. 'Comparative Analyses of ICSU Statements and Related Standards' compares ethical standards from the list in Appendix (i) related to ICSU's Statements on freedom and responsibility in science, animal welfare and science in the Internet era.

Part I.

Since the Second World War, a great number of ethical standards have been developed to protect science and society from misconduct in scientific research, such as abusive experimentation, or fraudulent research reports, yet the introduction of ethics in science is controversial. Asking scientists to be socially responsible in their capacity as scientists can be dangerous, some suggest, because this would implicitly be to give power to a group who are neither trained nor competent to exert it. That, however, is equally the point of those in favour of introducing ethics into the scientific realm, who want to include the study of ethics in the scientific education with the purpose of increasing future scientists' ethical competence. Such studies should partly focus on the nature and functions of ethical standards in science.

10 types of argument are discussed concerning the (positive or negative) value of adopting ethical standards regulating scientific research in terms of: analyticity, inconsistency, autonomy, ethical awareness, hypocrisy versus integrity, legalism, social responsibility, publicity, professional security and professional control. Simply phrased, what the arguments purportedly directed against the formulation of ethical standards for science manage to show, is not that such standards should not be formulated at all, but that ethical standards must be formulated with great care and sincerity. Superficiality, vacuity, hypocrisy, corruption and impunity are five of the main pitfalls in applied ethics, of which the context of formulating standards for scientific research is one particular instance.

Ethical standards must be based on sound foundations of relevant information, and normative and consequential analyses. When scientific communities endeavour to formulate ethical standards they must do so in an open context involving discussions also with groups beyond their profession. For such standards are not only the concern of scientists and scientific communities, but also of the public and their representatives.

The perceived need to formulate ethical standards for science arises in a variety of circumstances. Amongst the factors that have actually triggered such projects we find personal ones, such as (individual or communal) misconduct, and impersonal ones, notably general interest or concerns. Within the organisations that have posited standards, distinct groups have adopted them, e.g., the presidium of a scientific organisation or a research ethical committee. The standards are primarily communicated by mail (free for the asking), through publication in a professional journal or member journal/newsletter, or via the website. They are largely enforced in a self-regulatory manner: by peer pressure when the standard is purely voluntary, or by explicit sanctions when they are more obligatory (e.g., official reprimands, suspension of membership in a given group, or withdrawn funding).

Within a national perspective, the relationship between ethical codes for science and, for example, educational strategies and laws are relevant to establish. In international contexts this is equally important, but considerably more difficult. Already within Europe there are profound cultural disparities in the attitudes towards 'acceptable' behaviour in science, and these differences appear to deepen when distinct continents are compared. Nevertheless, there seems to be a need for international agreements in many ethical issues, such as socio-economic development and equity, sustainability of natural resources, world peace, quality of life, equity between nations**,** the correct handling of scientific data, problems in cyberspace, proper treatment of experimental subjects, giving due credit, and so on. It is therefore worthwhile to investigate if it is possible to can find 'smallest common denominators' that might form a foundation for international agreement.

Part II

The leading theme of the document's second part is what the standards collected have in common, and in what important ways they can be seen to differ. These analyses focus on three subjects corresponding to ICSU Statements in SCRES' list.

(1) *Freedom and responsibility in science*. In this section, norms of freedom and responsibility are discussed as they come to expression in the ethical standards collected with a focus on international relations. Various origins of limits to academic freedom are distinguished (orthodox religions, political ideologies, state interests, free-market ideologies and practices, and the role of authority within science). A brief account is given of different kinds of limits that have been imposed: limits on knowledge *per se*, or limits in terms of topic priority, choice of methods, applications, access to (use of) knowledge, circulation of scientists and scientific material, or the conduct of scientists. The responsibilities of scientists are divided into internal responsibilities related to their conduct towards their discipline, their profession and colleagues, and external responsibilities related to the impact of their research upon society. Limits on scientific freedom as rules for scientists' personal conduct are of the former kind. All the other limits primarily concern the latter kind.

Concerning the internal responsibilities the standards in our list show a remarkable (if not surprising) degree of similarity. Certain "core values" stand virtually unchallenged, such as honesty, scepticism, fairness, collegiality, truthfulness, accuracy, conscientiousness, respect and openness. I label these *"sine qua non"*–virtues, for without them the scientific enterprise could hardly take off the ground. Notwithstanding, we must beware of naïvely reading consensus into what can be merely a shared use of a conventional word that might conceal

profoundly different interpretations of meaning. It is primarily the *general* terms that are agreed upon. The more that they are specified, e.g., with concrete applications in different contexts; increasingly diverging opinions ensue. Many codes contain reference to 'freedom', for example, but for whom, from what and to what purpose this freedom is intended is not identical in each case. In each topic that our scope permits us to analyse, we find both profound variations and similarities. Whilst the similarities mainly concern internal responsibilities, the differences emerge strongly in the external responsibilities adopted, e.g., in demanding loyalty towards distinct groups, or types of groups (e.g., political or religious).

The *Declaration on Science and the Use of Scientific Knowledge* adopted at the World Conference on Science in Budapest, 1999 (the WCS Declaration) primarily focuses on external responsibilities. It calls for directing the funds for science to ensure, on a global front, fundamental human interests, such as *peace, sustainable development, social equity,* and *respect of human rights.* All of these recommendations find broad support amongst the standards in our list. Here, however, a problem of realism and sincerity, or integrity, emerges:

ICSU claims to have "a well-established non-political tradition which is central to its character and operations" and asserts scientists' right to certain forms of freedom with a clear reference to and endorsement of the *International Bill of Human Rights* (IBHR), in which "such rights are embodied". ICSU posits these rights as *universally valid* independently of politics, religion, finance or culture. Accordingly, the ideals are supposed to be achieved without political reference. However, I argue that, largely to its own detriment and contrary to its original intents and purposes, the human rights discourse is in no small measure politicised, to the effect that anyone who adheres to IBHR is actually making a strong political statement. So, when ICSU adheres to the IBHR, whilst purporting to do so in a non-political framework, ICSU in reality adopts a highly controversial political position. And the same can be said of many of the scientific standards of ethics in our list. For example, the WCS Declaration is quite an explosive political document. To illustrate, the governments of many arms-producing countries would most likely be provoked by the suggestion not to develop further weapon technology. In asserting freedom of thought and expression we oppose dictatorial forms of communism, military regimes, autocracies, or 'democratures'[135]. In accepting as fundamental the rights of workers to receive adequate salaries, form powerful trade unions, and have equal access to public services we oppose the free-market ideology that posits that the value of unlimited profit should not be conditioned by such socio-political

[135] A formal democracy that lacks democratic substance in terms of the citizens' participation and rights, such as adequate working conditions, general access to education or health care, etc.

rights. In asserting the rights of women to participate in the scientific communities, we oppose the Islam countries governed by the shariah. And so on, and so forth, the list can easily be continued.[136]

A forceful declaration of strong ethical opinions about the sciences' responsibilities to humanity entails an obligation to try and *realise* these ideals. In doing so, the same academic rigour must be applied to the fulfilment of those promises as otherwise to the 'purely' scientific pursuits. The option of stating these societal ethical values whilst refusing to enter into the political and economic discussions is therefore not available. So long as the majority of political governments and financial influences in the world (democratic as well as non-democratic) remain opposed to the realisation of social responsibilities that come to notable expression in the International Bill of Human Rights and the WCS Declaration, *there is no such thing as non-political socially responsible ethics in science.* To try and stay clear of politics would be superficial, at best. Worse, it could be hypocritical.

(2) *Animal welfare*. The traditional view that only humans can be moral subjects and enjoy the protection of having rights has in the last decades been challenged under a number of distinct aspects: scientific, philosophical, ethical and legal. In the contexts where knowledge of non-human sentience is prevalent, it is commonly acknowledged that non-humans can no longer be used indiscriminately for any human purposes, as they have been in the past, and still are in many contexts. This comes to expression in the ethical standards adopted to regulate scientific research involving animal experimentation, in which the ability of non-humans to have preferences, feel frustration, fear and pain is clearly taken into account.

The standards here discussed show some similarities, notably:

1. Belief in the necessity of using non-humans in painful or even fatal experimentation.
2. Knowledge that some of these non-humans are intelligent and able to suffer.
3. Realisation that 2 imposes responsibilities when practising 1.

However, we need to know more about the underlying beliefs in order to justify more substantial claims about the degrees and manners in which the organisations behind these national and international standards may point in the same direction. For example, whether non-humans (can) have rights, are moral or legal persons, whether species-belonging is ethically relevant per se, and if the *Helsinki Declaration* might be extended to protect also non-human beings that are relevantly similar to humans.

[136] Quite possibly, every country could be provoked by some assertion of alleged human rights, even those with the most 'humane' societies. Sweden, for instance, limits the right to religious freedom in order to protect children against (by Swedish standards) fanatic parents, or animals against ritual slaughter.

(3) *Science in the Internet era*. The development of Internet and the Web have brought fruitful advances in IT, but many countries are extremely vulnerable to cyberspace breakdowns in their information-dependent systems, such as infrastructure, that could happen due to accidents, intentional interference; or in a cyberspace war. Difficult problems of scientific ethics and international security ensue from this new situation. In 1988, a committee of the UN General Assembly addressed this issue in a resolution, calling upon all Member States to help develop "international principles that would enhance information security and combat information terrorism and criminality". Internet provides unprecedented possibility to share data world-wide; however, attitudes vary between different societies in regard to whether it is most important to maintain public access to scientific data or to protect private ownership via patent laws. In 2000, ICSU and CODATA (the ICSU Committee on Data for Science and Technology) issued A Set of Principles for Science in the Internet Era expressing the opinion that for scientific and educational purposes data access should continuously follow the policy of public sharing.

Conclusion

What conclusions can be drawn from this material?

If the choice is made to introduce ethics into the scientific realm, it should be done *well*. Ethics in science must be pursued with academic rigour, integrity and courage. In a critical review of the World Conference on Science, *The Economist* wrote: "Theirs is a world in which the rules are made by an international great and good (untainted by self-interest, of course, and untarnished by corruption). It is a world in which phrases such as "a new social contract between science and society" actually mean something. It is a world in which somebody can stand up and propose that newly graduated scientists take some equivalent of the Hippocratic oath before they are allowed to practise their craft, and be greeted by applause rather than polite giggles. It is, in other words, a world in which pigs have become suitable objects for ornithology."[137] Whether this image is true or not, it captures precisely what must be avoided. Superficiality, vacuity, hypocrisy, corruption and impunity have here been suggested as five major pitfalls in the context of applied ethics of which the formulation of standards for scientific research is a particular instance. Naivety might have been added to that list.

[137] *The Economist*, July 3rd 1999, p. 83.

Ethical standards for science must be formulated with great care and integrity. This requires special skill. Asking scientists to be socially responsible in their capacity as scientists presupposes that they possess the relevant competence. The *study of ethics* should therefore be an integral part of the education and training of all scientists with the purpose of increasing future scientists' ethical competence.

The standards here collected appear very similar in their recommendations for individual scientists' conduct. Regarding internal responsibilities that mainly concern the scientific community itself (in relation to colleagues, or to the profession) certain *"sine qua non"*–virtues, without which the scientific enterprise would scarcely be possible, stand virtually unchallenged, such as honesty, scepticism, fairness, collegiality, truthfulness, accuracy, conscientiousness, respect and openness. Differences emerge more strongly in the regard to external responsibilities (i.e., those that relate scientists to society beyond their own professional sphere). For example, in demanding loyalty towards distinct groups, or types of groups, notably, different political systems, such as democracy, socialism, or communism.

SCRES should not advocate any political ideology. It is not our role to do so. Notwithstanding, some ethical recommendations are politically loaded. In those cases, *strict* political neutrality cannot be upheld with loss of credibility. ICSU's policy to remain strictly non-political in its ideological positions on responsibility and freedom in science whilst adhering to such documents as the International Bill of Human Rights and the Declaration on Science and the Use of Scientific Knowledge adopted at the World Conference of Science, is unrealistic. Numerous values expressed in both those documents are political dynamite (in so far as they are taken seriously). There is no such thing as non-political socially responsible ethics in science. Applied ethics in science necessarily occurs in a social, political and economic framework that cannot be completely politically neutral. Scientific pursuits are intimately connected to the political and economic realities in which they are undertaken, and the ethical dilemmas to which they give rise contain complex political dimensions that cannot be ignored lest the 'scientific ethics' become very unscientific indeed.

Today, there seems to be a need for international agreement in many domains, such as socio-economic development and equity, sustainability of natural resources, world peace, quality of life, equity between nations**,** the correct handling of scientific data, problems in cyberspace, giving due credit, and so on. Numerous ethical standards for science that address such issues have been formulated, and we have discussed some of them here. It would be valuable to undertake further, more extensive cross-disciplinary studies in order to learn more about the needs for agreement as they arise within different perspectives, in various contexts.

The problems of developing countries require special attention –especially, if globalisation is not regarded as the spread of few nations' power to cover a greater area, but as the inclusion of more nations' representation.

The document makes two main recommendations:

V. The formulation of an ICSU statement on the responsibility of science[138].

VI. The adoption of new ethical standards by individual ICSU members who do not as yet have such standards[139].

SCRES also considers the formulation of a universal scientific oath an interesting project for which the present project analysing ethical standards in science might be a useful beginning.

[138] For example, along the lines of SCFCS' Blue Book.
[139] SCRES will co-operate with scientific communities endeavouring to develop ethical norms for their pursuits.

Appendixes:

(i) List of Standards

(ii) Conceptual Analysis

Types of ethical standards regulating scientific research: a conceptual analysis of the possible objects of inquiry

(iii) Empirical Classification

Type, geographic origin, disciplinary reach, and topics

Appendix (i): List of Standards

Contents:

Abstract:
The present collection of ethical standards comprises the following types of standards: oath, pledge, code, guideline, principle, appeal, recommendation, manifesto, statement, declaration, resolution, convention, charter, and law. Their distinctions are clarified in Appendix (ii).

The collection includes 115 standards: 39 international standards (28 interdisciplinary + 11 discipline-specific) and 76 national standards (36 interdisciplinary + 40 discipline-specific) representing 23 countries in 6 continents:
Africa: South Africa, Zimbabwe
America (North): Canada, USA
America (South): Cuba
Asia: China, India, Japan, Singapore
Australasia: Australia, New Zealand, Philippines
Europe: the Czech Republic, France, Germany, Greece, Italy, Latvia, Norway, Poland, Sweden, Switzerland, United Kingdom

The following disciplines/areas are represented by the standards collected:

Agriculture & Agrology
Agronomy
Anthropology
Archaeology
Biology
Brain science
Chemistry
Computer science, informatics & IT technology
Engineering
Food Science and Technology
Genetics
Geology
Geodesy and Geophysics
Health Sciences
Human Sciences, Social Sciences & Law
Microbiology
Peace research
Pharmacology
Physics
Psychology
Toxicology
Volcanology

[1] 'International' hear means 'more than one nation', not necessarily including all nations.
[2] Denoting 'more than one discipline', not necessarily including all disciplines.
[3] Denoting exactly one discipline. Conceptually, the distinction between interdisciplinary and 'discipline-specific' is relatively neat and clear-cut; however, in reality it is not always clear what number of disciplines (one or several) a given standard/code refers to. The organisation below may be questionable in this regard.

1. LIST OF INTERNATIONAL ETHICAL GUIDELINES FOR SCIENCE

1:1 Interdisciplinary (28)

International Council for Science[4] — ICSU
http://www.icsu.org

1. Statement on Freedom in the Conduct of Science

   Approved by the Executive Board and General Committee of ICSU, Lisbon, October 1989, and revised by the Executive Board, Rabat, October 1994.
   Cf. Appendix B in the Handbook of ICSU's Standing Committee on Freedom in the Conduct of Science (SCFCS)

2. Statement of Principles for Use of Animals in Research and Education
   18 July 1996

3. Statement on Gene Patenting[5]
   Paris, June 1992

4. ICSU/the Committee on Data for Science and Technology — ICSU/CODATA
   A Set of Principles for Science in the Internet Era
   Prepared by the ICSU/CODATA Ad Hoc Group on Data and Information, April 20, 2000
   http://www.codata.org

5. *International Brain Research Organization* — IBRO
   http://www.ibro.org

   Guidelines on the Use of Animals in Research, 1992

6. *International Network of Engineers and Scientists* — INES
   INES Appeal to Engineers and Scientists for Global Responsibility
   Standing Committee on Ethical Questions, 1995
   http://www.inesglobal.org/ines3.htm

7. *International Union of Food Science and Technology* — IUFoST
   IUFoST Guidelines of Professional Behaviour
   http://www.inforamp.net/~iufost

[4] The name of the Council was changed from the International Council of Scientific Unions to the International Council for Science at an Extraordinary General Assembly held in 1998. The acronym, "ICSU", was retained.
[5] Statements on gene patenting are not listed here as discipline-specific because they involve other disciplines; notably, law. However, they are included in the Alphabetic Listing by Discipline under 'genetics'.

8. *The Human Genome Organization* HUGO
   HUGO Statement on Patenting of DNA sequences – in Particular Response to the European Biotechnology Directive –
   April 2000
   http://www.gene.ucl.ac.uk/hugo/

   United Nations Educational, Scientific and Cultural Organization UNESCO
   http://www.unesco.org

9. Universal Declaration on the Human Genome and Human Rights
   Dec 3, 1997
   Adopted on 12 November 1997 by the General Conference of UNESCO at its 29th session

10. Déclaration Universelle des Droits de l'Animal
    Proclamée à Paris le 15 octobre.
    Révidée par la Ligue internatio nale des droits de l'animal en 1989; deux annexes, l'une sur l'esprit, l'autre sur les bases biologiques, accompagnent la Déclaration.

11. Déclaration sur l'Éthique Alimentaire
    Texte rédigé en 1981 par la Fondation mondiale pou la qualité de la vie (Genève), l'Institut international de biologie humaine (Paris) et la Ligue internationale des droits de l'animal (Genève). Il a été soumis à l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) ainsi qu'à l'Organisation mondiale de la santé (OMS).

12. Declaration on the Responsibilities of the Present Generation Towards Future Generations
    Adopted on 12 November 1997 by the General Conference of UNESCO at its 29th session

13. Declaration on Science and the Use of Scientific Knowledge
    Text adopted by the World Conference on Science 1 July 1999. Definitive version.
    Cf. the Recommendation on the Status of scientific researchers adopted by the General Conference at its eighteenth session Paris, 20 November 1974.

14. *World Medical Association* WMA
    The Declaration of Helsinki: Recommendations Guiding Medical Doctors in Biomedical Research Involving Human Subjects.

    Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964, amended by the 29th World Medical Assembly, Tokyo, Japan, October 1975, the 35th World Medical Assembly, Venice, Italy, October 1983, the 41st World Medical Assembly, Hong Kong, September 1989, the 48th General Assembly,

Somerset West, Republic of South Africa, October 1996, and the 52nd General Assembly, Edinburgh, Scotland, October 2000.

http://www.health.gov.au/nhmrc/ethics/helsinki.htm

15. The Nuremberg Code
From the Nuremberg Military Tribunals (1949, 181-82)

16. *World Health Organization/The World Conservation Union/ World Wide Fund For Nature* WHO/IUCN/WWF
The Chiang Mai Declaration: Saving Lives by Saving Plants
March 1988
http://users.ox.ac.uk/~wgtrr/chiang.htm

17. The Manila Declaration Concerning The Ethical Utilisation of Asian Biological Resources
Developed at the 7th Asian Symposium on Medicinal Plants, Spices, and Other Natural Products held in Manila, Feb 1992.
http://users.ox.ac.uk/~wgtrr/assomps.htm

Council of Europe COE
http://www.coe.int

18. European Treaties ETS No. 164
Convention pour la protection des droits de l'homme et de la dignité de l'être humain à légard des applications de la biologie et de la médicine: Convention sur les droits de l'homme et la biomédicine
Oviedo, 04.IV.1997
http://www.coe.fr/fr/txtjur/164fr.htm

19. Rapport explicatif relatif à la Convention européenne sur la protection des animaux vertébrés utlisés à des fins expérimentales ou à d'autres fins scientifiques
Convention ouverte à la signature le 18 mars 1986.

20. *The European Association for BioIndustries* EuropaBio
http://www.europa-bio.be
EuropaBio's Statement of Core Ethical Values
September, 1998

Pugwash
http://www.igc.org/pugwash/

21. The Russell-Einstein Manifesto
Issued in London, July 9 1955

22. Student Pugwash Pledge

Developed in 1995 as a response to the Nobel Peace Prize and as an acknowledgement to Prof. Rotblat's commitment to young people.

23. The Guadalajara Declaration
    Adopted in the city of Guadalajara, State of Jalisco, on July 15th, 1998, within the framework of the first edition of the International Summer University "Science and Life"

24. The Toronto Resolution (TTR)
    April 2, 1992
    http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Toronto.Recommendation.html

    Institute for Social Inventions ISI

25. The Hippocratic Oath for Scientists

26. The Hippocratic Oath for Scientists, Engineers and Technologists

    http://www.globalideasbank.org/isi.html

27. *The InterAction Council* IAC
    A Universal Declaration of Human Responsibilities
    Proposed by the IAC September 1, 1997
    http://www.asiawide.or.jp/iac/UDHR/EngDecl1.htm

28. First Code of Ethics (Members' Obligations to Indigenous Peoples)
    World Archaeological Congress, Barquisimeto, Venezuela, 1990.

1:2 Discipline-specific (11)

1. *European Informatics Skill Structure* — EISS-CEPIS
   Code of Professional Conduct
   Oct 5, 1994 (?)
   http://courses.cs.vt.edu/~cs3604/lib/World Codes/CEPIS.Code.html

2. *South East Asia Regional Computer Federation* — SEARCC
   Code of Ethics
   June 19, 1993
   http://courses.cs.vt.edu/~cs3604/lib/World Codes/SEARCC.Code.html

3. *International Federation for Information Processing* — IFIP
   Recommendations Regarding Codes of Conduct for Computer Societies, by the IFIP Ethics Task Group
   Last updated Aug 11, 1995
   http://courses.cs.vt.edu/~cs3604/lib/World Codes/IFIP.Recommendation.html

4. *European Physics Society* — EPS
   Code of Conduct
   1998
   http://www.nikhef.nl/~ed/conduct.html

5. *International Physicians for the Prevention of Nuclear War* — IPPNW
   Declaration of Paris
   July 2, 2000
   http://www.ippnw.org/DecParis.html

   International Union of Geodesy and Geophysics — IUGG
   http://www.obs-mip.fr/uggi

6. Code of Practice for Earthquake Prediction
   12-13 Aug 1983

   International Association of Volcanology and Chemistry of the Earth's Interior — IAVCEI
7. Statement of Professional Conduct of Scientists during Volcanic Crises, 4 Oct 1998

8. *International Academy of Compounding Pharmacists* — IACP
   Code of Ethics
   http://www.iacprx.org

9. *International Sociological Association* — ISA
   ISA Code of Ethics
   (Draft presented at the ISA Executive Committee meeting in Courmayeur, May 2000, and not yet approved)

10. *The World Federation of Engineering Organizations* WFEO
    Code of Ethics
    (Draft of November, 2000)
    http://www.unesco.org.fmoi

11. An Engineer's Hippocratic Oath
    http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Hippocr.Oath.html

2. LIST OF 76 NATIONAL ETHICAL GUIDELINES FOR SCIENCE

2:1 National listing

AFRICA (4) [6]

South Africa (3):
(1) Code of Conduct for Persons in Position of Responsibility
From the "Moral Summit" held by President Nelson Mandela and representatives of all major political parties and religious leaders
Oct 22, 1998.
http://www.transparency.de/documents/source-book/c/co_conduct.html

(2) Proposed Charter for a South African National Ethics Advisory Committee on Science and Technology (SANEACST) (*Draft only*)

Computer Society of South Africa CSSA
(3) Code of Conduct, edited Oct 4, 1994.
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/RSA.Code.html

Zimbabwe (1):
The Computer Society of Zimbabwe
(4) Code of Professional Conduct for Registered Consultants CSZ
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Zimbabwe.Code.html

AMERICA (NORTH) (23)

Canada (7):
Canadian Psychological Association CPA
(5) Canadian Code of Ethics for Psychologists
http://www.cpa.ca

Cf: Sinclair, C. & Pettifor, J. (Eds.) (1992). Companion Manual to the Canadian Code of Ethics for Psychologists. Ottawa, ON: Canadian Psychological Association.

Further reading:
Leach, M. M. & Harbin, J. J. (1997). Psychological ethics codes: A comparison of twenty-four countries. International Journal of Psychology, 32(3), 181-192.)

[6] Numbers in brackets show numbers of standards listed from each continent/country. In some cases, the codes are exhaustive of what we have been able to find, e.g., in Africa. In other cases the number of codes far exceed the numbers collected here, e.g. in the Philippines or the United States. We have been selective, trying to achieve a reasonable geographic balance and spread.

Canadian Association of Physicist CAP
(6) Code of Ethics
Adopted by the CAP Council (per Trademark Committee)
1999 October 16

National Research Council Canada NRC-CNRC
(7) Principles to ensure the integrity of NRC research, in:
NRC (1996) Human Resources Manual, Chapter 11.8.2.

Alberta Society of Professional Biologists ASPB
(8) Code of Ethics, Aug 22, 1996 (?)
http://www.ccinet.ab.ca/asbp/ethics.htm
http://www.csep.iit.edu/codes/coe

Canadian Consulting Agrologists Association CCAA
(9) Code of Ethics
http://www.consultingagrologists.com/ethics.htm

Agricultural Institute of Canada AIC
(10) Code of Ethics
(11) Code of Practice. A Guideline To The Ethical Responsibilities of Agrologists
http://www.aic.ca/progs/codeethics.html

USA (16):
The American Anthropological Association AAA
http://www.aaanet.org
(12) Code of Ethics, June 1998
Related document: Commission to Review the AAA Statements on Ethics Final Report

The American Association for the Advancement of Science AAAS
http://www.aaas.org

(13) Resolution on the Theory of Creation in Science Curricula. Dec 30 1972
(14) Forced Teaching of Creationist Beliefs in Public School Science Education. Jan 1981
(15) Protection of Human Subjects of Research. Jan 1981
(16) Human Rights and Scientific Freedom. Jan 1981
(17) National Security and Secrecy. Jan 1981
(18) Policy and Procedures for Responding to Allegations of Misconduct in Scientific Research and Publication. Feb 28, 1990

The American National Academy of Science NAS
http://www.nationalacademies.org/
(19) On Being a Scientist: Responsible Conduct in Research.
Second edition published in 1995 by the National Academy Press.

Other publications include:

Responsible Science: Ensuring the Integrity of the Research Process
NAS Press, 1992

(20) The Humboldt Pledge
Drafted in 1987 at the Humboldt State University
http://www.bioethics.uu.se/codex/texts/humboldt.html

The Institute of Electrical and Electronics Engineers IEEE
(21) Code of Ethics, Aug 1990

The American Society of Mechanical Engineers ASME
(22) Code of Ethics, June 1914
http://www.csep.iit.edu/codes/coe

American Academy of Microbiology AAM
(23) Code of Ethics, Dec 7, 1970
(revised Jan 18, 1973)
http://www.csep.iit.edu/codes/coe

Institute of Medicine IOM
(24) Responsible Conduct of Research in the Health Sciences
1989

Society of Toxicology SOT
(25) Code of Ethics
(26) Animals in Research Public Policy Statement

Society for Professional Archaeologists SOPA
(27) Code of Ethics 1991
(See *Guide to SOPA*, pp. 7-11)

AMERICA (SOUTH) (1)

Cuba (1):
Academia de Ciencias de Cuba ACC
http://www.cuba.cu/ciencia/acc/
(28) Codigo sobre la etica profesional de los trabajadores de la ciencia

Related documents:
Nanvy Chacón Arteaga: (1) El componente humanista y la formación de maestros cubanos. Resultados de un proyecto estrategico para el desarollo de la profesionalidad pedagogica.
(2) Etica y profesionalidad en la formación de maestros.

ASIA (10)

China (7):

National learned societies affiliated to the China Association for Science and Technology — CAST

(29) An Agreement on Scientific and Technological Periodicals Reached by National Learned Societies

Chinese Academy of Engineering — CAE

(30) Code of Conduct of Academicians of the Chinese Academy of Engineering
Set out on April 17, 1998 by the Scientific Moral Construction Committee of the Chinese Academy of Engineering and passed on April 28, 1998, at the Presidium Conference of the Chinese Academy of Engineering.
Cf. 'Some opinions on the Code of Conduct for Scientific and Technological Personnel' issued jointly by the Ministry of Science and Technology, the Ministry of Education, Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), and the China Association for Science and Technology (CAST).

(31) Norms of Scientific Morals and Conducts for the Academicians of the Chinese Academy of Engineering
Drafted on April 17, 1998 by the Scientific Morals Construction Committee of the Chinese Academy of Engineering, and passed on April 28, 1998 by the Presidium of the General Assembly of the Chinese Academy of Engineering.

(32) Regulations Concerning Procedures and Methods for Handling Letters of Complaint Involving Problems of Scientific Morals of Academicians
Discussed and drafted on August 14, 1998 at the first session of the Second Scientific Morals Construction Committee of the Chinese Academy of Engineering, and examined and passed on November 10, 1998 by the Presidium of the General Assembly of the Academy.

China Psychology Society — CPS

(33) Moral Principles for Psychological Testers
December 1992

China Taiwan Science Committee — CTSC

(34) Principles for Handling Violations of Academic Ethics of China Taiwan Science Committee
Adopted and brought into effect on November 25, 1999 by the 384th Executive Council of the Science Committee. Revised and brought into effect on April 20, 2000 by the 388th Executive Council of the Science Committee

National Taiwan University — NTWU

(35) Code of Ethics, 1998

India (1):
Computer Society of India CSI
(36) Code of Ethics, May 8, 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/India.Code.html

Japan (1):
Japan Information Service Industry Association JISA
(37) Code of Ethics and Professional Conduct
Engl. transl. 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Japan.Code.html

Singapore (1):
Singapore Computer Society SCS
(38) Professional Code of Conduct
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Singapore.Code.html

AUSTRALASIA (18)

Australia (7):

National Health and Medical Research Council NHMRC
http://www.nhmrc.health.gov.au

(39) Guidelines for genetic registers and associated genetic material
(40) Guidelines for ethical review of research proposals for human somatic cell gene therapy and related therapies
Further reading: Ethical aspects of Human Genetic testing: An information paper
http://www.health.gov.au/nhmrc/ethics/contents.htm

(41) Guidelines for Research Involving Humans
The National Statement on Ethical Conduct in Research Involving Humans
http://www.nhmrc.health.gov.au/publicat/e-home.htm

(42) Joint NHMRC/AVCC statement and guidelines on research practice
http://www.health.gov.au/nhmrc/ethics/contents.htm
Note: This "Joint Statement and Guidelines" replaces the "NH&MRC Statement on Scientific Practice" (1990) and the AVCC ‘Guidelines for Responsible Practice in Research and Problems of Research Misconduct' (1990). The Statement and Guidelines exist to guide institutions in developing their own procedures and guidelines, by providing a comprehensive framework of minimum acceptable standards.

(43) Australian Code of Practice for the care and use of Animals for Scientific Purposes
http://www.nhmrc.health.gov.au/publicat/ea-home.htm

Australian Academy of Science AAS
http://www.science.org.au
(44) On Human Cloning, a Position Statement, 4 Feb 1999
http://www.science.org.au/academy/media/clone.pdf

(45) Statement on Scientific Fraud
September 1989 (revised)

New Zealand (1):
The Royal Society of New Zealand RSNZ
(46) Code of Professional Standards and Ethics
http://www.rsnz.govt.nz/directory/code_ethics.php

Philippines (10):
The Philippine Association for the Advancement of Science PAAS
Board of Geology
(47) Code of Ethics

Board of Chemistry
(48) Code of Ethics

Board of Chemical Engineering
(49) Code of Ethics

Board of Electrical Engineering
(50) Code of Ethics

Board of Civil Engineering
(51) Code of Ethics

Board of Radiologic Technology
(52) Code of Ethics

Board of Medical Technology
(53) Code of Ethics

Board of Medicine
(54) Code of Ethics

Board of Pharmacy
(55) Code of Ethics

University of Santo Tomas UST
(56) Code of Ethics for Researchers

EUROPE (20)

The Czech Republic (1):

The Academy of Sciences of the Czech Republic ASCR
(57) Science Policy of the Academy of Sciences of the Czech Republic
14 December 1999
http://www.Cas.cz/en/Documents/scpolicy.html

France (1):

(58) Charte pour une éthique de l'expérimentation animale. Projet élaboré sous l'égide du ministère de la recherche et qui devrait dans sa version définitive être approuvé notamment par l'INRA (Institut National de la Recherche Agronomique), l'INSERM (Institut National de la Santé et de la Recherche Médicale), le CEA (Commissariat à l'Énergie Atomique) et le CNRS (Centre National de la Recherche Scientifique)

Germany (4):

(59) *Deutsche Forschungsgemeinschaft* DFG
Proposals for Safeguarding Good Scientific Practice
http://www.dfg.de/english/press/spec_inform.html#praxis

(60) *Universität Ulm*
Satzung der Universität Ulm zur Sicherung guter
wissenschaftlicher Praxis 1. September 1999

(61) *Deutsche Physikalische Gesellschaft* DPG
Verhaltenskodex für Mitglieder
http://www.dpg-physik.de/dpg/statuten/kodexco.htm

(62) *GDCh - Gesellschaft Deutscher Chemiker* GDCh
GDCh Code for Conduct
http://www.gdch.de
Related document: Appeal to GDCH members, a resolution against discrimination, racism and xenophobia, Sep 18, 2000

Further reading: Prof. Dr. H. J. Quadbeck-Seeger:
'Der Verhaltenskodex der GDCh'

Greece (1):

Academy of Athens AA
(63) Pledge for Scientists

Italy (2):

The Italian Scientific Antivivisection Committee
(64) Manifesto for the protection of our genetic heritage
http://www.antivivisezione.it/manifestoengl.html

Associazione Italiana per l'Informatica ed il Calcolo Automatico AICA
(65) Professional Code of Conduct for AICA Members
Engl. Transl. Nov 1993.

Latvia (1):

The Latvian Academy of Sciences & The Latvian Council of Science LAS/LCS

(66) Scientist's Code of Ethics, May 5 1998

Norway (1):

Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora NESH

(67) Forskningsetiske retningstlinjer for samfunnsvitenskap, jus og humaniora, 15 Feb, 1999

Poland (1):

The Polish Academy of Sciences PAS

(68) Good Manners in Science, Collection of Rules and Guidelines Warsaw, 1995

Sweden (2):

(69) Uppsala Code of Ethics

Code of Ethics For Scientists that was formulated in 1984 by a group of scientists. For a thorough background, cf. Bengt Gustafsson, Lars Rydén, Gunnar Tibell, and Peter Wallensten: "Focus on: The Uppsala Code of Ethics for Scientists" Journal of Peace Research, Vol. 21, No 4, 1984.

(70) Swedish Ethical Rules for Computer Professionals

From: Dahlbom,B., and Matthiassen, L.: A Scandinavian View on the ACM's Code of Ethics.

http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Swedish.Code.html

Switzerland (4):

Swiss Academy of Medical Sciences & Swiss Academy of Sciences SAMS/SAS

http://www.samw.ch http://www.sanw.unibe.ch

(71) Ethical Principles and Guidelines for Scientific Experimentation on Animals

Supplement: Statement on the Concept of Animal Dignity

The Swiss Academy of Engineering Sciences SATW

"Ethics and Technology" Commission

http://www.satw.ch

(72) Ethics for Engineers/Technical Scientists

(SATW Guideline)

L'école polytechnique féderal de Lausanne EPFL

http://www.epfl.ch

(73) Charte éthique de EPFL

(74) Serment d'Archimède

United Kingdom (2):

The Royal Institute of Chemistry RIC
(75) Professional Conduct, Guidance for Chemists, Feb 1975
http://www.csep.iit.edu/codes/coe

Institute of Physics IOP
(76) Bylaw: Code of Conduct and Rules of Conduct
http://www.iop.org/IOP/Member/conduct.html

2:2 Interdisciplinary (36)

AFRICA

South Africa:
(1) Code of Conduct for Persons in Position of Responsibility
From the "Moral Summit" held by President Nelson Mandela and representatives of all major political parties and religious leaders
Oct 22, 1998.
http://www.transparency.de/documents/source-book/c/co_conduct.html

(2) Proposed Charter for a South African National Ethics Advisory Committee on Science and Technology (SANEACST) (*Draft only*)

AMERICA (NORTH)

Canada:
National Research Council Canada NRC-CNRC
(3) Principles to ensure the integrity of NRC research, in:
NRC (1996) Human Resources Manual, Chapter 11.8.2.

United States:
The American Association for the Advancement of Science AAAS
http://www.aaas.org

(4) Resolution on the Theory of Creation in Science Curricula. Dec 30 1972
(5) Forced Teaching of Creationist Beliefs in Public School Science Education. Jan 1981
(6) Protection of Human Subjects of Research. Jan 1981
(7) Human Rights and Scientific Freedom. Jan 1981
(8) National Security and Secrecy. Jan 1981
(9) Policy and Procedures for Responding to Allegations of Misconduct in Scientific Research and Publication. Feb 28, 1990

The American National Academy of Science NAS
http://www.nationalacademies.org/
(10) On Being a Scientist: Responsible Conduct in Research.
Second edition published in 1995 by the National Academy Press.
Other publications include:
Responsible Science: Ensuring the Integrity of the Research Process
NAS Press, 1992

Institute of Medicine IOM
(11) Responsible Conduct of Research in the Health Sciences
1989
(12) The Humboldt Pledge

Drafted in 1987 at the Humboldt State University
http://www.bioethics.uu.se/codex/texts/humboldt.html

AMERICA (SOUTH)

Cuba:

Academia de Ciencias de Cuba ACC
http://www.cuba.cu/ciencia/acc/
(13) Codigo sobre la etica profesional de los trabajadores de la ciencia

ASIA

China:

National learned societies affiliated to the China Association for Science and Technology CAST
(14) An Agreement on Scientific and Technological Periodicals Reached by National Learned Societies

Chinese Academy of Engineering CAE
(15) Regulations Concerning Procedures and Methods for Handling Letters of Complaint Involving Problems of Scientific Morals of Academicians
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China Taiwan Science Committee CTSC
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Revised and brought into effect on April 20, 2000 by the 388th Executive Council of the Science Committee
Cf. 'Some opinions on the Code of Conduct for Scientific and Technological Personnel' issued jointly by the Ministry of Science and Technology, the Ministry of Education, Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), and the China Association for Science and Technology (CAST).

National Taiwan University NTWU
(17) Code of Ethics, 1998

AUSTRALASIA

Australia:
National Health and Medical Research Council NHMRC
http://www.nhmrc.health.gov.au

(18) Guidelines for Research Involving Humans
The National Statement on Ethical Conduct in Research Involving Humans
http://www.nhmrc.health.gov.au/publicat/e-home.htm

(19) Joint NHMRC/AVCC statement and guidelines on research practice
http://www.health.gov.au/nhmrc/ethics/contents.htm
Note: This "Joint Statement and Guidelines" replaces the "NH&MRC Statement on Scientific Practice" (1990) and the AVCC 'Guidelines for Responsible Practice in Research and Problems of Research Misconduct' (1990). The Statement and Guidelines exist to guide institutions in developing their own procedures and guidelines, by providing a comprehensive framework of minimum acceptable standards.

(20) Australian Code of Practice for the care and use of Animals for Scientific Purposes
http://www.nhmrc.health.gov.au/publicat/ea-home.htm

Australian Academy of Science AAS
http://www.science.org.au
(21) Statement on Scientific Fraud
September 1989 (revised)
http://csep.iit.edu/codes

New Zealand:
The Royal Society of New Zealand RSNZ
(22) Code of Professional Standards and Ethics
http://www.rsnz.govt.nz/directory/code_ethics.php

Philippines:
University of Santo Tomas UST
(23) Code of Ethics for Researchers

EUROPE

The Czech Republic:
The Academy of Sciences of the Czech Republic ASCR
(24) Science Policy of the Academy of Sciences of the Czech Republic
14 December 1999
http://www.Cas.cz/en/Documents/scpolicy.html

France:
(25) Charte pour une éthique de l'expérimentation animale. Projet élaboré sous l'égide du ministère de la recherche et qui devrait dans sa version définitive être approuvé notamment

par l'INRA (Institut National de la Recherche Agronomique), l'INSERM (Institut National de la Santé et de la Recherche Médicale), le CEA (Commissariat à l'Énergie Atomique) et le CNRS (Centre National de la Recherche Scientifique)

Germany:
(26) *Deutsche Forschungsgemeinschaft* DFG
Proposal for Safeguarding Good Scientific Practice
http://www.dfg.de/english/press/spec_inform.html#praxis

(27) *Universität Ulm*
Satzung der Universität Ulm zur Sicherung guter wissenschaftlicher Praxis 1. September 1999

Greece:
Academy of Athens AA
(28) Pledge for Scientists

Italy:
The Italian Scientific Antivivisection Committee
(29) Manifesto for the protection of our genetic heritage
http://www.antivivisezione.it/manifestoengl.html

Latvia:
The Latvian Academy of Sciences & The Latvian Council of Science LAS/LCS
(30) Scientist's Code of Ethics, May 5 1998

Norway:
Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora NESH
(31) Forskningsetiske retningstlinjer for samfunnsvitenskap, jus og humaniora, 15 Feb, 1999

Poland:
The Polish Academy of Sciences PAS
(32) Good Manners in Science, Collection of Rules and Guidelines
Warsaw, 1995

Sweden:
(33) Uppsala Code of Ethics
Code of Ethics For Scientists that was formulated in 1984 by a group of scientists. For a thorough background, cf. Bengt Gustafsson, Lars Rydén, Gunnar Tibell, and Peter Wallensten: "Focus on: The Uppsala Code of Ethics for Scientists" Journal of Peace Research, Vol. 21, No 4, 1984.

Switzerland:
Swiss Academy of Medical Sciences & Swiss Academy of Sciences SAMS/SAS
http://www.samw.ch http://www.sanw.unibe.ch
(34) Ethical Principles and Guidelines for Scientific Experimentation on Animals
Supplement: Statement on the Concept of Animal Dignity

L'école polytechnique féderal de Lausanne EPFL
http://www.epfl.ch
(35) Charte éthique de EPFL
(36) Serment d'Archimède

2:3 Discipline-specific (40)

AFRICA

South Africa:
Computer Society of South Africa CSSA
(1) Code of Conduct, edited Oct 4, 1994.
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/RSA.Code.html

Zimbabwe:
The Computer Society of Zimbabwe
(2) Code of Professional Conduct for Registered Consultants CSZ
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Zimbabwe.Code.html

AMERICA (NORTH)

Canada:
Canadian Psychological Association CPA
(3) Canadian Code of Ethics for Psychologists
http://www.cpa.ca

Cf: Sinclair, C. & Pettifor, J. (Eds.) (1992). Companion Manual to the Canadian Code of Ethics for Psychologists. Ottawa, ON: Canadian Psychological Association.

Further reading:
Leach, M. M. & Harbin, J. J. (1997). Psychological ethics codes: A comparison of twenty-four countries. International Journal of Psychology, 32(3), 181-192.)

Canadian Association of Physicist CAP
(4) Code of Ethics
Adopted by the CAP Council (per Trademark Committee)
1999 October 16

Alberta Society of Professional Biologists ASPB
(5) Code of Ethics, Aug 22, 1996 (?)
http://www.ccinet.ab.ca/asbp/ethics.htm
http://www.csep.iit.edu/codes/coe

Canadian Consulting Agrologists Association CCAA
(6) Code of Ethics
http://www.consultingagrologists.com/ethics.htm

Agricultural Institute of Canada AIC
(7) Code of Ethics
(8) Code of Practice. A Guideline To The Ethical Responsibilities of Agrologists
http://www.aic.ca/progs/codeethics.html

USA:
The American Anthropological Association AAA
http://www.aaanet.org
(9) Code of Ethics, June 1998
Related document: Commission to Review the AAA Statements on Ethics Final Report

The Institute of Electrical and Electronics Engineers IEEE
(10) Code of Ethics, Aug 1990

The American Society of Mechanical Engineers ASME
(11) Code of Ethics, June 1914
http://www.csep.iit.edu/codes/coe

American Academy of Microbiology AAM
(12) Code of Ethics, Dec 7, 1970
(revised Jan 18, 1973)
http://www.csep.iit.edu/codes/coe

Society of Toxicology SOT
(13) Code of Ethics
(14) Animals in Research Public Policy Statement

Society for Professional Archaeologists SOPA
(15) Code of Ethics 1991
(See *Guide to SOPA*, pp. 7-11)

ASIA

China:
Chinese Academy of Engineering CAE
(16) Code of Conduct of Academicians of the Chinese Academy of Engineering
Set out on April 17, 1998 by the Scientific Moral Construction Committee of the Chinese Academy of Engineering and passed on April 28, 1998, at the Presidium Conference of the Chinese Academy of Engineering.
Cf. 'Some opinions on the Code of Conduct for Scientific and Technological Personnel' issued jointly by the Ministry of Science

and Technology, the Ministry of Education, Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), and the China Association for Science and Technology (CAST).

(17) Norms of Scientific Morals and Conducts for the Academicians of the Chinese Academy of Engineering
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China Psychology Society CPS
(18) Moral Principles for Psychological Testers
December 1992

India:
Computer Society of India CSI
(19) Code of Ethics, May 8, 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/India.Code.html
Japan:
Japan Information Service Industry Association JISA
(20) Code of Ethics and Professional Conduct
Engl. transl. 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Japan.Code.html

Singapore Computer Society SCS
(21) Professional Code of Conduct
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Singapore.Code.html

AUSTRALASIA

Australia:
National Health and Medical Research Council NHMRC
(22) Guidelines for genetic registers and associated genetic material
(23) Guidelines for ethical review of research proposals for human somatic cell gene therapy and related therapies
Further reading: Ethical aspects of Human Genetic testing: An information paper
http://www.health.gov.au/nhmrc/ethics/contents.htm

(24) *Australian Academy of Science* AAS
On Human Cloning, a Position Statement, 4 Feb 1999
http://www.science.org.au/academy/media/clone.pdf

Philippines:

The Philippine Association for the Advancement of Science PAAS
Board of Geology
(25) Code of Ethics

Board of Chemistry
(26) Code of Ethics

Board of Chemical Engineering
(27) Code of Ethics

Board of Electrical Engineering
(28) Code of Ethics

Board of Civil Engineering
(29) Code of Ethics

Board of Radiologic Technology
(30) Code of Ethics

Board of Medical Technology
(31) Code of Ethics

Board of Medicine
(32) Code of Ethics

Board of Pharmacy
(33) Code of Ethics

EUROPE

Germany:
(34) *Deutsche Physikalische Gesellschaft* DPG
Verhaltenskodex für Mitglieder
http://www.dpg-physik.de/dpg/statuten/kodexco.htm

(35) *GDCh - Gesellschaft Deutscher Chemiker* GDCh
GDCh Code for Conduct
http://www.gdch.de
Related document: Appeal to GDCH members, a resolution against discrimination, racism and xenophobia, Sep 18, 2000
Further reading: Prof. Dr. H. J. Quadbeck-Seeger:
'Der Verhaltenskodex der GDCh'

Italy:
Associazione Italiana per l'Informatica ed il Calcolo Automatico AICA
(36) Professional Code of Conduct for AICA Members
Engl. Transl. Nov 1993.

Sweden:
(37) Swedish Ethical Rules for Computer Professionals
From: Dahlbom,B., and Matthiassen, L.: A Scandinavian View on the ACM's Code of Ethics.
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Swedish.Code.html

Switzerland:

The Swiss Academy of Engineering Sciences — SATW
”Ethics and Technology” Commission
http://www.satw.ch

(38) Ethics for Engineers/Technical Scientists
(SATW Guideline)

United Kingdom:

The Royal Institute of Chemistry — RIC
(39) Professional Conduct, Guidance for Chemists, Feb 1975
http://www.csep.iit.edu/codes/coe

Institute of Physics — IOP
(40) Bylaw: Code of Conduct and Rules of Conduct
http://www.iop.org/IOP/Member/conduct.html

3. ALPHABETIC LISTING BY DISCIPLINE[7]

Agriculture & Agrology
Agricultural Institute of Canada AIC
(1) Code of Ethics
(2) Code of Practice. A Guideline To The Ethical Responsibilities of Agrologists
http://www.aic.ca/progs/codeethics.html

(3) *Canadian Consulting Agrologists Association* CCAA
Code of Ethics
http://www.consultingagrologists.com/ethics.htm

Agronomy
(1) Charte pour une éthique de l'expérimentation animale. Projet élaboré sous l'égide du ministère de la recherche et qui devrait dans sa version définitive être approuvé notamment par *l'INRA (Institut National de la Recherche Agronomique)*, l'INSERM (Institut National de la Santé et de la Recherche Médicale), le CEA (Commissariat à l'Énergie Atomique) et le CNRS (Centre National de la Recherche Scientifique)

Anthropology
(1) *The American Anthropological Association* AAA
http://www.aaanet.org
Code of Ethics, June 1998
Related document: Commission to Review the AAA Statements on Ethics Final Report

Archaeology
(1) First Code of Ethics (Members' Obligations to Indigenous Peoples)
World Archaeological Congress, Barquisimeto, Venezuela, 1990.

Biology
(1) *Alberta Society of Professional Biologists* ASPB
Code of Ethics, Aug 22, 1996 (?)
http://www.ccinet.ab.ca/asbp/ethics.htm
http://www.csep.iit.edu/codes/coe

(2) *The European Association for BioIndustries* EuropaBio
http://www.europa-bio.be
EuropaBio's Statement of Core Ethical Values
September, 1998

[7] The concept 'discipline' is sometimes vague and admits of borderline cases. The present organisation of standards is open for criticism in this regard. For example, it is uncertain whether the statement of bioindustry is properly listed under biology – arguably, it should be listed under 'economy', or 'finance'. However, seeing that these headings are not included here (because the list should include only scientific disciplines), it seems relevant to place that statement under the heading 'biology'. There may be other similar examples.

Brain science

(1) *International Brain Research Organization* IBRO
http://www.ibro.org
Guidelines on the Use of Animals in Research, 1992

Chemistry

(1) *GDCh - Gesellschaft Deutscher Chemiker* GDCh
GDCh Code for Conduct
http://www.gdch.de
Related document: Appeal to GDCH members, a resolution against discrimination, racism and xenophobia, Sep 18, 2000

Further reading: Prof. Dr. H. J. Quadbeck-Seeger:
'Der Verhaltenskodex der GDCh'

(2) *The Royal Institute of Chemistry* (UK) RIC
Professional Conduct, Guidance for Chemists, Feb 1975
http://www.csep.iit.edu/codes/coe

The Philippine Association for the Advancement of Science PAAS
Board of Chemistry
(3) Code of Ethics

Computer science, informatics & IT technology

(1) *ICSU/the Committee on Data for Science and Technology* ICSU/CODATA
A Set of Principles for Science in the Internet Era
Prepared by the ICSU/CODATA Ad Hoc Group on Data and Information, April 20, 2000
http://www.codata.org

(2) *European Informatics Skill Structure* EISS-CEPIS
Code of Professional Conduct
Oct 5, 1994 (?)
http://courses.cs.vt.edu/~cs3604/lib/World Codes/CEPIS.Code.html

(3) *South East Asia Regional Computer Federation* SEARCC
Code of Ethics
June 19, 1993
http://courses.cs.vt.edu/~cs3604/lib/World Codes/SEARCC.Code.html

(4) *International Federation for Information Processing* IFIP
Recommendations Regarding Codes of Conduct for Computer Societies, by the IFIP Ethics Task Group
Last updated Aug 11, 1995
http://courses.cs.vt.edu/~cs3604/lib/World Codes/IFIP.Recommendation.html

(5) *Associazione Italiana per l'Informatica ed il Calcolo Automatico* AICA
Professional Code of Conduct for AICA Members
Engl. Transl. Nov 1993.

(6) Swedish Ethical Rules for Computer Professionals
From: Dahlbom, B., and Matthiassen, L.: A Scandinavian View on the ACM's Code of Ethics.
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Swedish.Code.html

(7) *Computer Society of India* CSI
Code of Ethics, May 8, 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/India.Code.html

(8)*Japan Information Service Industry Association* JISA
Code of Ethics and Professional Conduct
Engl. transl. 1993
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Japan.Code.html

(9) *Singapore Computer Society* SCS
Professional Code of Conduct
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Singapore.Code.html

(10) *Computer Society of South Africa* CSS
Code of Conduct, edited Oct 4, 1994.
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/RSA.Code.html

(11) *The Computer Society of Zimbabwe*
Code of Professional Conduct for Registered Consultants CSZ
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Zimbabwe.Code.html

Engineering
(1) *The World Federation of Engineering Organizations* WFEO
Code of Ethics
(Draft of November, 2000)
http://www.unesco.org.fmoi

(2) An Engineer's Hippocratic Oath
http://courses.cs.vt.edu/~cs3604/lib/WorldCodes/Hippocr.Oath.html

(3) *International Network of Engineers and Scientists* INES
INES Appeal to Engineers and Scientists for Global Responsibility
Standing Committee on Ethical Questions, 1995
http://www.inesglobal.org/ines3.htm

Chinese Academy of Engineering CAE
(4) Code of Conduct of Academicians of the Chinese Academy of Engineering
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(6) Regulations Concerning Procedures and Methods for Handling Letters of Complaint Involving Problems of Scientific Morals of Academicians
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"Ethics and Technology" Commission
http://www.satw.ch
Ethics for Engineers/Technical Scientists (SATW Guideline)

(8) *The American Society of Mechanical Engineers* ASME
Code of Ethics, June 1914
http://www.csep.iit.edu/codes/coe

(9)*Institute for Social Inventions* ISI
The Hippocratic Oath for Scientists, Engineers and Technologists
http://www.globalideasbank.org/isi.html

(10) *The Institute of Electrical and Electronics Engineers* (USA) IEEE
Code of Ethics, Aug 1990

The Philippine Association for the Advancement of Science PAAS
(11) *Board of Chemical Engineering*
Code of Ethics

(12) *Board of Electrical Engineering*
Code of Ethics

(13) *Board of Civil Engineering*
Code of Ethics

(14) *Board of Radiologic Technology*
Code of Ethics

Environment
(4) *World Health Organization/The World Conservation Union/ World Wide Fund For Nature* WHO/IUCN/WWF
The Chiang Mai Declaration: Saving Lives by Saving Plants
March 1988
http://users.ox.ac.uk/~wgtrr/chiang.htm

(5) The Manila Declaration Concerning The Ethical Utilisation of Asian Biological Resources
Developed at the 7th Asian Symposium on Medicinal Plants, Spices, and Other Natural Products held in Manila, Feb 1992.
http://users.ox.ac.uk/~wgtrr/assomps.htm

Food Science and Technology

(6) *International Union of Food Science and Technology* IUFoST
IUFoST Guidelines of Professional Behaviour
http://www.inforamp.net/~iufost

(7) Déclaration sur l'Éthique Alimentaire
Texte rédigé en 1981 par la Fondation mondiale pou la qualité de la vie (Genève), l'Institut international de biologie humaine (Paris) et la Ligue internationale des droits de l'animal (Genève). Il a été soumis à l'Organisation des Nations Unies pour l'alimentation et l'agriculture (FAO) ainsi qu'a l'Organisation mondiale de la santé (OMS).

Genetics

(1) *International Council for Science* ICSU
http://www.icsu.org
Statement on Gene Patenting, Paris, June 1992

(2) *The Human Genome Organization* HUGO
HUGO Statement on Patenting of DNA sequences – in Particular Response to the European Biotechnology Directive – April 2000
http://www.gene.ucl.ac.uk/hugo/

(3) *United Nations Educational, Scientific and Cultural Organization* UNESCO
http://www.unesco.org
Universal Declaration on the Human Genome and Human Rights
Dec 3, 1997 Adopted on 12 November 1997 by the General Conference of UNESCO at its 29th session

(4) *Australian Academy of Science* AAS
On Human Cloning, a Position Statement, 4 Feb 1999
http://www.science.org.au/academy/media/clone.pdf

National Health and Medical Research Council NHMRC
(5) Guidelines for genetic registers and associated genetic material
(6) Guidelines for ethical review of research proposals for human somatic cell gene therapy and related therapies
Further reading: Ethical aspects of Human Genetic testing: An information paper
http://www.health.gov.au/nhmrc/ethics/contents.htm

(7) *The Italian Scientific Antivivisection Committee*
Manifesto for the protection of our genetic heritage
http://www.antivivisezione.it/manifestoengl.html

Geology

(1) *The Philippine Association for the Advancement of Science* PAAS
Board of Geology
Code of Ethics

Geodesy and Geophysics

(1)*International Union of Geodesy and Geophysics* IUGG
http://www.obs-mip.fr/uggi
Code of Practice for Earthquake Prediction, 12-13 Aug 1983

Health Sciences

(1) *Council of Europe* COE
http://www.coe.int
European Treaties ETS No. 164
Convention pour la protection des droits de l'homme et de la dignité de l'être humain à légard des applications de la biologie et de la médicine: Convention sur les droits de l'homme et la biomédicine
Oviedo, 04.IV.1997
http://www.coe.fr/fr/txtjur/164fr.htm

(2) *World Medical Association* WMA
The Declaration of Helsinki: Recommendations Guiding Medical Doctors in Biomedical Research Involving Human Subjects.
Adopted by the 18th World Medical Assembly, Helsinki, Finland, June 1964, amended by the 29th World Medical Assembly, Tokyo, Japan, October 1975, the 35th World Medical Assembly, Venice, Italy, October 1983, the 41st World Medical Assembly, Hong Kong, September 1989, 48th General Assembly, Somerset West, Republic of South Africa, October 1996, and the 52nd General Assembly, Edinburgh, Scotland, October 2000.
http://www.health.gov.au/nhmrc/ethics/helsinki.htm

(3) The Nuremberg Code
From the Nuremberg Military Tribunals (1949, 181-82)

(4) *National Health and Medical Research Council* NHMRC
http://www.nhmrc.health.gov.au
Guidelines for Research Involving Humans
The National Statement on Ethical Conduct in Research Involving Humans
http://www.nhmrc.health.gov.au/publicat/e-home.htm

(5) *Institute of Medicine* (US) IOM
Responsible Conduct of Research in the Health Sciences
1989

(6) *International Physicians for the Prevention of Nuclear War* IPPNW
Declaration of Paris, July 2, 2000
http://www.ippnw.org/DecParis.html

Microbiology

(1) *American Academy of Microbiology* AAM
Code of Ethics, Dec 7, 1970
(revised Jan 18, 1973)
http://www.csep.iit.edu/codes/coe

Peace research

(1)*Pugwash*
http://www.igc.org/pugwash/
The Russell-Einstein Manifesto
Issued in London, July 9 1955

(2) Student Pugwash Pledge
Developed in 1995.

(3) Uppsala Code of Ethics
Code of Ethics For Scientists that was formulated in 1984 by a group of scientists. For a thorough background, cf. Bengt Gustafsson, Lars Rydén, Gunnar Tibell, and Peter Wallensten: "Focus on: The Uppsala Code of Ethics for Scientists" Journal of Peace Research, Vol. 21, No 4, 1984.

Pharmacology

(1) *International Academy of Compounding Pharmacists* IACP
Code of Ethics
http://www.iacprx.org

Physics

(1) *European Physics Society* EPS
Code of Conduct
1998
http://www.nikhef.nl/~ed/conduct.html

(2) *Institute of Physics* (UK) IOP
Bylaw: Code of Conduct and Rules of Conduct
http://www.iop.org/IOP/Member/conduct.html

(3) *Deutsche Physikalische Gesellschaft* DPG
Verhaltenskodex für Mitglieder
http://www.dpg-physik.de/dpg/statuten/kodexco.htm

(4) *Canadian Association of Physicist* CAP
Code of Ethics
Adopted by the CAP Council (per Trademark Committee)
1999 October 16

Psychology

(1) *Canadian Psychological Association* CPA
Canadian Code of Ethics for Psychologists
http://www.cpa.ca

Cf: Sinclair, C. & Pettifor, J. (Eds.) (1992). Companion Manual to the Canadian Code of Ethics for Psychologists. Ottawa, ON: Canadian Psychological Association.

Further reading:
Leach, M. M. & Harbin, J. J. (1997). Psychological ethics codes: A comparison of twenty-four countries. International Journal of Psychology, 32(3), 181-192.)

(2) *China Psychology Society* CPS
Moral Principles for Psychological Testers, December 1992

Social Sciences, Human Sciences and Law
(1) *International Sociological Association* ISA
ISA Code of Ethics
(Draft presented at the ISA Executive Committee meeting in Courmayeur, May 2000, and not yet approved)

(2) *Den nasjonale forskningsetiske komité for samfunnsvitenskap og humaniora* (Norway) NESH
Forskningsetiske retningstlinjer for samfunnsvitenskap, jus og humaniora
15 Feb, 1999

Toxicology
Society of Toxicology (USA) SOT
(1) Code of Ethics
(2) Animals in Research Public Policy Statement

Volcanology
(1) *International Association of Volcanology and Chemistry of the Earth's Interior* IAVCEI
Statement of Professional Conduct of Scientists during Volcanic Crises, 4 Oct 1998

Collections of codes can be found at the following web-sites:

(1) http://courses.cs.vt.edu/~cs3604/lib/WorldCodes
Maintained by the Department of Computer Science, Virginia Polytechnic Institute and State University, USA. Contact person: J.A.N. Lee at Virginia Tech.

(2) http://www.codex.uu.se
Maintained by the Department of Bioethics, Uppsala University, Sweden. Contact person: Stefan Eriksson.

(3) http://www.csep.iit.edu/codes
Maintained by the Centre for the Study of Ethics in the Professions, Illinois Institute of Technology, Chicago. Contact person: Vivian Weil.

Appendix (ii): Conceptual Analysis of Types of Standards

Types of ethical standards regulating scientific research: a conceptual analysis of the possible objects of inquiry

The name of this project is "Standards for ethics and responsibility in science – an analysis and evaluation of their content, background and function". "Standards" (for ethics and responsibility in science…) is, however, an ambiguous term. An analysis of such standards can be taken to focus on a number of different objects, for example: ethos, pledges, oaths, codes, set of principles or guidelines, appeals, recommendations, manifestos, statements, declarations, resolutions, conventions, charters, or laws. It is not necessary in SCRES' project exclusively to choose between these types of standards (to the contrary, we have included examples of most of them in our database). It *is* necessary to clarify their distinction. Distinctions need to be drawn; notably, between the morally and the legally binding norms, and between different levels of prescription. In this section, I therefore propose briefly to discuss each of these concepts, what their meaning is and how they are related.

Ethos. The word 'ethos' is a Greek word that means, approximately, character, custom, morals or mores[1]. An ethos is an abstract set of values that capture the fundamental character or *spirit* of a culture. Within the perspective of science, R. K. Merton suggested in 1942 that the behaviour of scientists could be captured in an (interestingly non-ethical) scientific ethos emphasising the scientific norms of communalism, universalism, disinterestedness, and organised scepticism[2].

[1] The terms 'ethics' and 'morals' will here be used interchangeably. The former word stems from Greek whereas the latter originates in Latin, but their meanings are equivalent. An 'ethics' is a moral principle (or set of principles) concerning what is good or bad, right or wrong, in character or behaviour.
[2] Cf. John Ziman (1998).

Oath & pledge. An ethos can be manifested concretely in, for example, the utterance of an *oath*, or a *pledge*. If an oath is sworn, or a pledge is made, this can be regarded as a concrete manifestation of an underlying abstract ethos. The former notions (oath versus pledge) are not identical, but can be treated as equivalent expressions without denying that a distinction can be drawn between them. They share essential features in that both contain the important elements of *testimony*, promise, word of honour and warrant, or guarantee. Both are *performative utterances*[3] *with moral weight* (cf., e.g., the Hippocratic Oath for Scientists, or the Pledge of Chinese National Learned Societies in the list below.)

As the terms are commonly used, oaths and pledges are *public* assertions of a commitment to uphold specific principles or responsibilities. For example, the act of swearing the Hippocratic Oath that is obligatory to (amongst others) French medical students when they enter the profession as physicians[4] has to be performed in public. However, in reality there are exceptions to this rule (e.g., the Student Pugwash Pledge does not have to be made public but concedes a right to privacy).

There appear to be cultural differences in regard to which of these two – the oath versus the pledge - carries the most moral weight and in what manner (both arguably carry more weight than a promise[5]). The question is philosophically and sociologically interesting, but for SCRES' present purposes it is not necessary to enter that discussion at this stage.

Code & guideline. The word 'code' stems from the Latin word *'codex'*, which can mean tree-trunk, or book. Originally, a codex was a book made by wooden tables covered with wax. In its modern meaning a code is a collection of laws, or regulations; a *written text* that offers guidelines – e.g., rules, directives or principles for moral conduct. "The modern idea of codes", writes Veatch (1995, p. 1422) "derives from the Renaissance ideal of rationalizing Roman law, putting the diverse parts into some order and stating briefly and clearly the essence of the rule". Accordingly, the code can be described as *an ordered collection of guidelines* in some specific field[6].

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[3] This term was introduced by the philosopher J.L. Austin to denote an utterance by the making of which some further act is performed. A performative utterance brings it about that a further act is performed without describing antecedent states. For example, saying 'I promise…' constitutes promising, my utterance brings it about that I do actually promise. Similarly, swearing an oath, or making a pledge, constitute an act of commitment to that which is pledged or sworn.

[4] In the ancient world, oaths were an integral part of the initiation ceremony for medical apprentices. Unlike in most modern ceremonies, and more like medical prayers, ancient oaths reflect the physician's belief that an alliance with the deity was a necessary requirement in order to succeed (cf. Robert M. Veatch (1995)).

[5] Cf., e.g., Daniel. P. Sulmasy (1999).

[6] Typically, the code banishes "the first person singular, the language of oath, subjectivity, and idiosyncrasy, replacing it with the second and third person plural" Robert Baker (1999, p. 3).

Thus described the fundamental concept seems to be the guideline, which can be written in a code and expressed in an oath. An oath makes appeal to a principle that must be universalizable, i.e., applicable to all individuals in relevantly similar circumstances. This principle (or a cluster of them) can - but need not - be stated in a code and/or expressed in a ceremony where the individual swears to follow its dictate.

There are many different sorts of codes, and Mark Frankel (1989) distinguishes between three kinds. (1) The *aspirational* code sets an ideal to strive for, (2) the *educational* code serves to enhance understanding of its provision with extensive commentary and interpretation, whilst (3) the *regulatory* code posits rules for professional conduct and providing a basis for adjudicating grievances. The third kind is typically connected to sanctions.

Before moving on to consider the other types of standards listed above, and in order clearly to capture these differences, it is useful to draw two distinctions: between *weak and strong prescription*, and between *morally and legally binding* standards.

Roughly, a weak prescription gives an advice whereas a strong prescription issues an order. In legal terminology, a weak prescription is an *optional rule* that suggests what we *should* do in given circumstances, whilst the strong prescription is an *imperative rule* informing us what we *must* do in certain contexts. An advice does not connect to sanctions in the way that an order does; it is not binding in the same way. The aspirational and the educational codes are weak prescriptions offering guidance and information, unlike the regulatory code that, with its back-up of sanctions, aims to lead its subjects rather more forcefully along its set path.

When a standard is binding, it can be so either *morally* relative to some system of ethical principles, or *legally*, by national or international legislation. A norm can be both morally and legally binding, but the two forms of prescription with their correlated forms of commitment can also stand in conflict with one another. Accordingly, when an ethical standard is formulated, one aspect of interest concerns its relations to the relevant legislation (which numerous codes of conduct in SCRES' collection point out, e.g., the Code of Ethics of the Cuban Academy of Science).

Let us illustrate this returning to the listed types of standards going from the weaker to the stronger types:

Appeal. An appeal is an earnest request for support, a petition, entreaty, or *plea*. There is nothing prescriptive or binding about an appeal, which is merely intended to be evocative. For example, the INES appeal to engineers and scientists is an entreaty to sign the INES pledge as a part of a general campaign to "raise ethical awareness and practice in the scientific and engineering communities". (Cf. the Appeal to GDCH members to endorse a resolution against discrimination, racism and xenophobia, Sep 18, 2000.)

Recommendation. A recommendation serves to induce acceptance or favour. To recommend is to represent or urge as advisable or expedient. A recommendation is a prescription only in the weak sense of offering advice: a normative *suggestion* that is neither legally nor morally binding. It can, however, urge advice quite forcefully. Since each item in SCRES' List of codes (below) is normative, it ipso facto makes some recommendation, but X amongst them are labelled 'recommendations'; e.g., IFIP's Recommendations Regarding Codes of Conduct for Computer Societies.

Manifesto. A manifesto is a *public declaration* of intentions, opinions, objectives or motives, often issued by a government, sovereign or organization. For example, the Russell-Einstein Manifesto of 1955 is a public declaration against war and the further development of weapons of mass destruction.

Statement & declaration. Basically, a statement or a declaration is a *communication* in speech or writing setting forth facts, particulars, etc. As such, it can be either weakly or strongly prescriptive, morally or legally binding. To illustrate:

(a) An international declaration, such as the UN declarations, is binding in international law (the status of which is, however, controversial within jurisprudence) once the member countries have accepted it. A declaration is legally binding nationally if it is formally ratified and transformed into the national legislation.

(b) An international statement, such as the ICSU statements, set forth norms that are morally binding for the members of ICSU unconnected to legislation.

Resolution. A resolution is a *formal expression of opinion or intention* made (usually after voting) by a formal organisation, legislature, or other group; e.g., AAAS' Resolution on the Theory of Creation in Science Curricula. Dec 30 1972.

Convention. A convention is a form of agreement, or a contract. It can also mean a practice established by general consent. An international convention is an *agreement between different states* concerning a specific matter, such as postal service, copyright, etc. Such a convention is, for example, the European Convention on Human Rights. If a convention is ratified it becomes binding for the individual states.

Charter. The word 'charter' stems from the Greek word '*khartes*' designating a leaf of papyrus or a sheet of parchment (cf. the Latin word '*charta*' meaning the same). The term is ambiguous and has had slightly different meanings in distinct historical contexts. (If, for example, we compare Antiquity, the Roman era, the Middle Ages, the time of the European Enlightenment and the present, we shall find numerous instances of diverging usage[7].) The term remains ambiguous and complex still today, but its basic meaning can perhaps be described as a *legal act or document* defining the formal organisation of a corporate body or a constitution conceding special rights and privileges. An example is the Charter of the United Nations. The charters have a legal character and connected in principle to sanctions when not properly executed.

Law. Here: principles established by a government applicable to a people and enforced by judicial decision.

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[7] Cf. C. Benayoun (1999).

Appendix (iii): Empirical Classification

Type, geographic origin, disciplinary reach, and topics

The collected standards can be organised empirically in terms of (1) type, (2) geographic origin, and (3) disciplinary reach.

(1) Types of standards:

Approximately thirteen[8] types of standards were distinguished and, in some measure, defined, or explained in the previous section. SCRES' collection comprises 115 standards including (thus labelled): 3 pledges, 4 oaths, 49 codes, 24 sets of principles or guidelines, 1 appeal, 1 recommendation, 2 manifestos, 11 statements, 11 declarations, 6 resolutions, 3 charters, and 2 conventions that have been ratified into laws in some countries.

(2) Geographic distribution:

The collection includes 39 international standards (28 interdisciplinary + 11 discipline-specific) and 76 national standards (36 interdisciplinary + 40 discipline-specific), representing 23 countries on 6 continents:

Africa (4): South Africa (3), Zimbabwe (1)

America (North) (23): Canada (7), USA (16)

America (South) (1): Cuba (1)

Asia (10): China (7), India (1), Japan (1), Singapore (1)

Australasia (18): Australia (7), New Zealand (1), Philippines (10)

Europe (20): the Czech Republic(1), France (1), Germany (4), Greece (1), Italy (1), Latvia (1), Norway (1), Poland (1), Sweden (2), Switzerland (4), United Kingdom (2)

[8] The number is approximative because it depends on how we choose to draw these distinctions; e.g., if we decide to separate oaths from pledges, guidelines from principles, and so on. It does not appear essential here to specify any exact number of types so long as the most relevant conceptual distinctions are clearly drawn.

(3) Disciplinary spread:

The following disciplines/areas (presented in alphabetic order) are represented:

Agriculture & Agrology
Agronomy
Anthropology
Archaeology
Biology
Brain science
Chemistry
Computer science and IT technology
Engineering
Food Science and Technology
Genetics
Geology
Geodesy and Geophysics
Health Sciences
Human Sciences, Social Sciences & Law
Microbiology
Peace research
Pharmacology
Physics
Psychology
Toxicology
Volcanology

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