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FREEDOMS AND RESPONSIBILITIES IN ACADEMIC RESEARCH

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SUMMARY

At the time of UNESCO's revision in 2016 of a recommendation first published in 1974 on the status of scientific researchers, it appeared that academic research practices had evolved so much during the last few decades that it made sense for COMETS to conduct deliberations on the freedom of researchers from political, economic and sociological points of view, and their responsibilities with respect to social and environmental challenges.

This report begins by presenting the status of researchers with respect to their freedom to inform themselves and others, which nowadays includes the free circulation of data and communication of research results. It appears that conditions have considerably evolved since the emergence of the Internet, the worldwide web, the open science movement and the French Digital Republic Act of 2016. They have become much broader for researchers, including in their communication with the public, with major changes now emerging.

The researcher's freedom is then examined with respect to current contractual research policies that are defined, particularly in France and Europe, in terms of the scientific challenges to be met. COMETS, on the other hand, defends a researcher's freedom of choice concerning research subjects and the role of fundamental research, which is the main driving force behind the expansion of knowledge and a bearer of discoveries with great potential for applications. The committee analyses the constraints that hinder the creativity of researchers, emphasising the importance of the time factor and readiness of mind, insufficient in many respects in current scientific practices. It also underlines the importance of the trust that must be placed in a researcher developing personal projects. Finally, it points out that the free exercise of research implies respect for the moral rights of all research players.

COMETS has been considering research carried out in an international framework, especially in countries where decisions are anything but democratic, human rights are disregarded or war has been declared. The free flow of ideas and movement of people are being impeded: pressure is being exerted to steer research in line with economic, ideological or religious prejudices. In such a context, how may we pursue research without endangering our colleagues or endorsing the current political order? On a different plane, the diplomatic strategies established by countries in terms of research sometimes lead them to dictate research subjects that do not match what researchers consider scientific priorities.

COMETS then analyses the freedom of researchers with respect to their responsibilities, recalling that the ethical foundations of the latter are not only related to the absence of harm or wrongdoing in the research, but also preservation of the environment and common public goods. Next, COMETS investigates the responsibility of researchers when invited to play the role of scientific expert that is rightfully theirs within the democratic debate. The conclusion affirms the need and duty that binds all research players to counter untruths when and where they appear insofar as they obviously and blatantly conflict with the insights brought by science.

I. FORMAL INTERNAL REQUEST

The context of the freedoms and responsibilities of academic research has significantly changed over the past few decades, which is why COMETS considers that this issue should be the subject of deliberations, an Opinion and recommendations inspired by ethics.

Article 10 of the European Convention on Human Rights protects freedom of expression in general, which extends to the right of scientists to carry out research and communicate their findings[1]. Indeed, the term 'freedom of research' is explicitly used in the UNESCO Recommendation of 1974 on the Status of Scientific Researchers[2] (see the Annex). This text, designed at the time to grant the scientific community a special status in the context of the Cold War, recognises in particular that "*open communication of the results, hypotheses and opinions [...] lies at the very heart of the scientific process*".

The principle of freedom of research is enshrined in several constitutions, but not that of France, where the principle of freedom of expression is nonetheless embodied in the case law of the Constitutional Council[3]. The European Charter for Researchers[4] (2005) defines the scope: *"Researchers should focus their research for the good of mankind and for expanding the frontiers of scientific knowledge, while enjoying the freedom of thought and expression, and the freedom to identify methods by which problems are solved, according to recognised ethical principles and practices".*

In most economically developed countries, public research—and particularly that carried out within universities—was deployed in keeping with a general principle of freedom with few legal boundaries[5]. However, over the past few decades, there has been a deep-rooted change in the backdrop against which research is played on political, economic and sociological fronts. This is why the activity of researchers increasingly depends on contractual policies, while they are ever more frequently held liable in a world where science plays a key role in political decisions. Indeed, there are multiple opportunities for international funding of research that impose new rules and requirements.

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[1] http://=http//www.echr.coe.int/Documents/Convention_FRA.pdf

[2] http://www.unesco.org/new/fr/social-and-human-sciences/themes/bioethics/1974-recommendation/, see Annex

[3] In decision no. 71-44 DC of 16 July 1971, the French Constitutional Council endorsed the constitutional value of the preamble to the Constitution of 1958 and, indirectly, that of the preamble to the Constitution of 1946, of the Declaration of the Rights of Man and of the Citizen (1789) and thus that of the freedom of expression.

[4] https://euraxess.ec.europa.eu/jobs/charter

[5] In France this refers back to the ancient '*franchise universitaire*' in the Middle Ages, a status that granted universities a certain amount of independence with respect to instituted authorities. Nowadays, academic freedom more specifically concerns higher education and research institutions. It was explicitly introduced in the Education Code (Article L.952-2). It is part of the freedom of expression and implies the freedom of organising the scientific life of all the institution's personnel without any outside political interference.

Thus UNESCO initiated a broad consultation in order to update the Recommendation of 1974. The text was revised in 2016[6], COMETS participating in its drafting. It relates the researcher's intellectual freedom to his/her responsibility to society and the environment. This, then, is the background to this COMETS Opinion.

[6] UNESCO, Recommendation on Science and Scientific Researchers, revision of 2016

II. ANALYSIS

The freedom and responsibility of researchers cover multiple aspects. Freedom concerns the right to inform oneself and others, to choose one's own research subjects and complete them in the context of supervision accepted by the scientific community. Like all freedoms, it must be related to the responsibilities that research implies and its potential impact.

A. Freedom to inform oneself and inform others

The UNESCO Recommendation of 1974 affirmed first of all the researcher's freedom to access all available knowledge and data, along with the freedom to inform others and disseminate research results[7]. Today, these freedoms have developed significantly in most countries, mainly through generalisation of the Internet and web resources. The open science movement is generally progressing and tending to make scientific research and its findings accessible to all, whether professional or amateur, despite certain restrictions related in particular to publication constraints. The free movement of researchers worldwide, even if not equal for all countries, together with open data and open access to research results are obvious, irreversible factors of progress.

1. The free flow of research data

The right to free circulation of data and knowledge is enshrined in the Digital Republic Act of 7 October 2016[8] fostering digital technology in France. There are nonetheless limitations inherent to the nature or conditions in which the research is carried out. This is the case, for example, of some defence projects or industry-funded research subject to a ban on the communication of data. The use of international online data exchange platforms is developing differently depending on the sector. They have become essential in disciplines such as biology, medicine, climatology and astrophysics. The processing of big data is sometimes difficult: in biology, for instance, a shortfall in bioinformatics specialists able to process such data can lead to bias due to a lack of expertise. The status of big data generally remains to be clarified. They are still the subject of ethical debate, especially about protecting the confidentiality of personal or 'sensitive' data[9]. There is also a need to consider their use for commercial purposes. Beyond the scope of freedom of exchange, the researcher may be held liable with respect to data.

2. The free communication of research results

Researchers currently have multiple means of communicating their findings through the Internet. Open access allows them to upload digital content—including scientific articles, online seminars, personal web pages, conference videos and the like—where it remains

[7] This freedom may be restricted by patents, by ongoing promotion of applied work, or by non-disclosure issues related to security, especially for dual military and civil projects.
[8] https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033202746&dateTexte=20171101
[9] See COMETS Opinion no. 2015-30: "The ethical challenges of the sharing of scientific data".

available on line. The increasing number of open-access journals fosters the rapid and widespread dissemination of scientific publications. However, publication in open-access journals is conditional upon the payment of often substantial article processing charges (APC). Indeed, some recent 'predatory' open-access journals do not offer the least guarantee of scientific quality[10].

In the 'traditional' model of scientific publication (free for the author, with a fee for the reader) which clearly remains dominant today, the publisher can hinder open access to the journal by imposing embargoes on online dissemination. Open access to traditional publications is not guaranteed for all, because it assumes the acquisition of journals (or of a right to access them online) by the libraries of educational establishments, which do not always have the financial resources needed[11], or which are bound by their choice of 'packages' dictated by key publishers.

It should be noted that, as scientific journals seek profits in the private sector, the researcher's freedom is limited by the decisions of publishing committee members, who may be influenced by considerations other than general interest, even if the published results are from the public sector. New areas of freedom are now opening up to researchers. Alternatives to the usual scientific journals are currently being trialled. Although they keep the peer review system, private publishers are replaced by a group of researchers[12]. Communicating research to the international community may also be speeded up by placing a manuscript on open archives before the peer review of a traditional publisher. This 'preprint' must closely resemble the final publication, which also generates a usable index[13]: by proceeding in this way, discussions between researchers enable the manuscript to be 'improved' prior to submission. This is already commonplace for physics and maths papers, but other disciplines are also beginning to use this procedure.

The freedom to criticise and publicly comment on published work (i.e. a post-publication peer review, or PPR) is developing with the resources available through scientific social networks[14]. Many see this as a greater freedom for researchers to discuss matters beyond the scope of the peer review, which obviously has its limits. This opportunity offered by social networks also involves risks, especially if people can post anonymously; this may lead to problems such as unfounded and malicious accusations damaging the reputation of researchers and undermining the credibility of their work.

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[10] See for example https://openaccess.univ-rennes1.fr/les-revues-predatrices

[11] This is a particularly acute problem in underdeveloped countries, where university libraries have few resources. Some publishers, such as Springer and EDP Sciences in France, may grant them free subscriptions to journals, but the request needs to be submitted officially, and generally speaking, librarians in these countries are unaware of this possibility.

[12] See the White Paper by the CNRS's Scientific and Technical Information Department (DIST): "Open Science in a Digital Republic"

[13] See for example the HAL online open archive, a multidisciplinary archive designed to receive and disseminate online scientific research articles that have or have not yet been published or theses from French or foreign higher education and research institutions and public or private laboratories. Though under French management, HAL is linked to an international system

[14] See the COMETS Opinion of 2016, "Discussion and moderation of scientific publications on social networks and in the media: ethical issues".

3. Informing the public

Informing the public is an integral part of the mission of any research stakeholder. Indeed, it is explicitly mentioned in the duties of Horizon 2020 grant beneficiaries[15], who must "*promote the action and its results, by providing targeted information to multiple audiences (including the media and the public)*". It is the responsibility of researchers to share their knowledge with citizens, and help them better understand scientific reasoning. However, this raises the question of the increasingly important role of communication: researchers may be tempted to overestimate the impact of their results, especially in health sectors that primarily interest the public. Rushed or flawed communication may then become misinformation. Researchers must also be aware that the information that they communicate—particularly through social networks—may be used in a way that was not intended and may be interpreted in such a way as to damage their area of research if not to say the institution employing them. Nevertheless, the fact that researchers today can benefit from the multiple opportunities offered by the Internet to communicate with the general public is a huge step forward.

To resume, the freedoms to inform oneself and inform others have become very broad for researchers. Yet these freedoms go hand in hand with the researcher's responsibility to the scientific community, the users of published findings and the general public.

B. Freedom of research, funding and assessment

Academic researchers need to be independent enough to pursue their own hypotheses and explore their intuitions. They need to leave aside current affairs and hot topics of the day. They need enough intellectual freedom to take risks, which is a condition of true creativity.

Such a freedom is granted in particular by sufficient funding for research projects. Research always requires working with colleagues who need to be paid, equipment for experiments, appropriate infrastructures, funding for surveys, etc. Without dedicated resources, it is clear that the research is unlikely to succeed. It should be noted, however, that the choice of research subject may be restricted by the scientific missions peculiar to each institution: this is the case for INRA, for example, an institute dedicated to agronomic research; or IFREMER, which focuses on oceanographic research (especially linked to mining); or INSERM, which concentrates its research on life sciences and health, etc. Any partnership with the private sector—which has its own rules—is governed by an agreement and shared responsibilities. Mutual undertakings often limit the ownership and exploitation of results.

[15] http://www.horizon2020.gouv.fr/cid82035/communiquer-autour-projet.html

1. The researcher's freedom in the light of contractual research policies

For several decades now, successive governments have tried to gear research to the short- and medium-term needs of certain economic stakeholders, or satisfy the government's undertakings in the field of health, energy and resources, or even to shape public policies. These priorities are not generally defined by the research community, so they are founded on economic competitiveness and private or political interests. Publicly-funded research is thus described in terms of scientific challenges to be taken up, challenges that influence calls for tender and contractual funding[16]. Recourse to calls for projects would not be a real hindrance to the freedom of researchers if at the same time the proportion of major recurrent endowments for organisations and universities remained reasonable with respect to contracts. However, the overall amount of French research's investment and operating resources actually remains relatively modest. The basic endowments for laboratories are very often too small to fund efficient infrastructures, let alone ensure their maintenance in the medium to long term. Furthermore, they cannot support high-level teams working on research subjects too far from the challenges described in the calls for projects. Such teams rely for their funding on the implementation of an all-encompassing and supportive scientific and financial policy within each laboratory that avoids teams being split up into many small groups. Alongside contractual scientific policies, a researcher's freedom to conduct personal research within a team may also be considered as a source of creativity.

2. Fundamental research pushing back the boundaries of knowledge

While applied research projects often provide excellent results, targeted research can never replace fundamental research, which is the main driving force able to push back the boundaries of knowledge. It should be remembered that key conceptual discoveries were generally developed due to intellectual curiosity coupled with the freedom to explore a new field. A theory without immediate applications may, by suggesting new methods, enable progress in another theory or an unexpected application. A well-known example of this is the positron, an antiparticle of electrons predicted by Dirac in 1928 then revealed through experiments carried out in 1932. Decades later, this discovery led to positron emission tomography (commonly known as a PET scan), a powerful 3D medical imaging method used to check the metabolic activity of organs. Another example is that of Einstein's general theory of relativity, which used the computational tools developed 50 years earlier by Riemann to solve purely mathematical problems. And we know how important relativity is to us in order to pick up GPS signals[17]! Fundamental research often leads to an unexpected application of major importance[18]. There are numerous examples of this. Lasers were not

[16] See COMETS Opinion no. 2010-22, "*Aspects éthiques du financement public de la recherche sur projet*" [Ethical aspects of the public funding of project-oriented research].

[17] Your satnav device receives signals from orbiting satellites carrying ultra-precise clocks which must take into account the slowing of relativistic time.

[18] Pasteur even went so far as to say that there is no such thing as applied research, only applications of fundamental research.

discovered to perform eye surgery or read smart cards; they are the result of physicists' work on the interaction between light and matter[19].

Actually, there are cases where totally unexpected discoveries have brought fame to the researchers that found them. A good illustration of such 'serendipity'[20] is Alexander Fleming's accidental discovery of penicillin in 1928. Even if such discoveries are not only the result of fundamental research, they are the result of open minds, often well-prepared by unimpeded research.

A vast pool of knowledge from untargeted research may also turn out to be very valuable in times of crisis. Neither efficiency nor money are optimised when considerable resources are urgently channelled into creating, practically *ex nihilo*, a scientific community able to address a precise topical issue whose importance had not been foreseen. Themes considered as mere scholarship may suddenly become crucial. One example concerns the dreadful terrorist attacks of November 2015 in France, which triggered a governmental need for knowledge, particularly in the realm of religious sociology. Other themes, considered low-priority or 'obsolete' and practically wiped off the research board—like those concerning bacteriophages—may lead to discoveries with a huge potential for application[21]. Finally, the concentration of resources being detrimental to what are considered low-priority fields of research, there is a major risk of the country forever losing expertise in areas that may later turn out to be vital.

It should nonetheless be noted that, for the knowledge obtained from fundamental research to be properly exploited, it is necessary for research communities to work in coordination with other communities able to transfer this knowledge to applied concepts or subjects, which is the prerequisite to reducing the time needed to move on to applications. This "translational" research is carried out by the numerous joint CNRS-industry laboratories in technology and energy sectors. In the healthcare sector, translational research linking hospitals and laboratories comes in many shapes and sizes; it has benefited from the creation of university hospitals, and there are still opportunities for further improvement.

3. Constraints in a researcher's career

Let us first recall that the free practice of research is based on respecting the rights of all the individuals involved, and that any form of pressure, intimidation, moral or sexual

[19] Charles Townes, inventor of the laser, said that the story of the laser is the perfect example of the impact of fundamental research not only on science but also on the economy—an impact that is truly spectacular and (often) completely unexpected. Fundamental science is both fascinating and likely to make a huge contribution to human welfare. Townes is quoted in the preface to the book entitled *Le laser,* by F. Bretenaker and N. Treps, EDP Sciences, 2016.

[20] See, for example: Danièle Bourcier and Pek van Andel, *La sérendipité, le hasard heureux* [Serendipity: good luck], Editions Hermann, 2013

[21] CRISPR-Cas9, a bacterial immune defence system revolutionising genetics: http://www.pourlascience.fr/ewb_pages/a/article-crispr-cas-9-l-outil-qui-revolutionne-la-genetique-35917.php

harassment not only violates the law and human rights, but hinders the development of research.

Numerous factors currently impede researchers and hinder them from freely developing personal, high-risk projects. The competition for contracts requires repeated efforts that are particularly time-consuming compared to the success rates, which are sometimes so low that they can indicate nothing other than a shortage of funds. Furthermore, the multiplication of assessments and administrative tasks[22] considerably reduces the time dedicated to research per se. Short-term contracts, which are the most frequent, need the researcher to produce results quickly, and do not leave enough time to bring a project to maturity and push it to its limits. This obligation to produce results may also lead to violations of integrity[23]. A long-term horizon is vital in order to pursue lines of thought or complex but promising experiments that may sometimes fail. What is more, creativity implies a broad cultural knowledge base, which also takes time to acquire.

Innovative researchers should thus be free to keep some of their time for personal research, so as to develop their ideas outside the scope of a defined programme, follow their intuitions and act on their convictions without having to account for this research in the short term[24]. This is a fundamental intellectual freedom based on trust, and not a luxury, though obviously this does not exonerate researchers from their duty to report on the work being funded. This freedom must be conditional on two complementary undertakings: firstly, the institution undertakes to trust the researcher; and secondly, the researcher undertakes to remain accountable to the institution, implying integrity proportional to the institution's trust.

The lack of flexibility in career management is another barrier to creativity. Whether thematic or geographical, mobility is not sufficiently encouraged, whereas it often decides how much freedom of choice researchers have in their subject matter. Obviously, institutions such as the CNRS try to support mobility through various procedures. However, the imperative nature of evaluation generally steers researchers towards low-risk projects, thus ensuring the stream of publications needed to obtain a job or career change. To resume, the lack of time dedicated to research as such, and the absence of career flexibility too often lead to an early depletion of creative capacities and dynamics.

[22] See reference 16

[23] COMETS Opinion no. 2016-33: "How CNRS can respond to scientific integrity violations".

[24] An example is provided by the "obstinacy", or single-mindedness, of Alain Brillet (CNRS gold medal winner in 2017) for his development of an experiment to detect gravitational waves despite a general consensus affirming for decades that it was technically impossible

C. The freedom of research subject to political considerations

The researcher's freedom to choose his/her own subject of research may be restricted by various political considerations.

1. Researchers must comply with governments' diplomatic strategies

Governments conduct a diplomatic strategy in the international arena that includes options of a scientific nature. Some sectors may appear more important than others in the light of the government's own interests and the medium- to long-term development of the country(ies) with which it is cooperating. Research to develop energy resources may thus appear to be of a higher priority than studies on tropical diseases in a developing country. International programmes have their own standards, strategies and funding, with variations in the rules to be applied: regulations on medical research for the United States' National Institutes of Health (NIH), for instance, differ from European regulations. Multilateral or bilateral funding is governed by specific policies which obviously vary depending on the partnership agreements involved. Major research institutions each have their own international strategy. This situation leads to global options with goals, priorities and time scales that do not necessarily correspond to the researcher's free choice.

Research can also become the driving force behind a 'diplomatic strategy' over which the researchers themselves have no control. This strategy is then implemented by a powerful country which can use it to negotiate power relations that extend far beyond the scope of scientific activity. Setting aside the risks involved, archaeological research in the Middle East, for example, is particularly sensitive to the guidelines laid down by the regimes that administer the remains to be studied. It is often exploited during international negotiations.

2. Impediments to the flow of ideas, people and research material

There are exceptions to the principle of the free flow of ideas. In some areas of the world, for example, no communication is allowed over the Internet. Researchers obviously find other ways of communicating, through parallel networks or private discussions between colleagues, but their research may be hindered. The movement of scientists also depends on many factors. It necessarily depends on obtaining a visa, but procurement rules vary according to the prevailing political climate. It can also come up against arbitrary situations, such as a country banning access to nationals of certain foreign countries, or banning access by researchers to certain parts of its territory. Some authoritarian regimes impose daily surveillance on researchers by making them train a student who is actually there to spy on their activities.

The promulgation of decrees restricting freedom and affecting the free movement of research staff has disastrous consequences on scientific partnerships and may lead to a brain drain. It must also be said that the free circulation of research material (cells for biology, chemical samples, lasers and other scientific equipment that may be considered of strategic importance, for example) and computer programs may be restricted by national

laws or globally-decided embargoes. The extremely slow procurement of laboratory equipment, even if not officially blocked, also causes serious difficulties for researchers in some developing countries. Another obvious impediment to their research is the cost of material and equipment.

In fact, all kinds of constraints restrict the freedom of researchers depending on the type of regime governing the countries where they work. In countries where the absence of democratic decisions is the rule, and even in certain countries considered to be democratic, pressure may be exerted to guide research according to the choices of the ruling power; choices that are shaped by ideological prejudices or economic interests considered to be of higher priority. This is the case when a government's official position is to deny the impact of human activity on climate change. Ideologies resulting from religious beliefs may also impose their view of science on whole populations, encourage the denial of proven scientific truths[25], or even directly oppose medical advances such as vaccination. This is how, in an increasing number of countries across the globe, creationism and intelligent design have come to be placed side by side in education with evidence for Darwin's theory of evolution, thus trying to discredit the latter. It should be noted that in this case, ideological prejudices often match political leanings. Researchers thus find their freedom greatly restricted: funding for certain research is axed, access to available data blocked, and threats made about keeping personal data. Researchers thus have to implement circumvention strategies to save the intellectual heritage acquired. For the first time in history, the global March for Science in April 2017 gathered tens of thousands of participants who took to the streets to advocate the freedom of science and scientific researchers.[26] Marchers included researchers and ordinary citizens supporting those wishing to make a stand against the arbitrary nature of non-democratic political systems.

The political context in which a team works is also likely to impose moral constraints and lead to dilemmas. By divulging their results, researchers may objectively find themselves in the position of endorsing an authoritarian regime. Demographic data, for example, may be used to justify decisions on immigration, or ethnographic results be referred to when discriminating against native populations. Researchers cannot ignore the possible manipulation of their research for the purposes of political propaganda in a State not respecting the rule of law. All the abuses and restrictions placed on research by the political system require scientists to be extremely vigilant[27]. This vigilance must be expressed within their work community and institutions, and through their political voice.

[25] See, for example the interview with Tunisian physicist Faouzia Charfi in "Le Monde des Sciences" of 15/10/2017

[26] See the call to participate in the March for Science (April 2017)

[27] Le Monde of 15/02/17, an opinion piece signed by members of the French scientific community: declared that it is important to remember that recognition of the scientific approach, which is based on the collection, verification and rational analysis of facts, and the guarantee of its independence with respect to the ruling power are both essential challenges.

3. Research in countries at war

Research in conflict zones is an extreme case for researchers both in terms of the limits imposed on their freedom at their place of work and of the responsibilities that come with the specific conditions in which they have to work. Generally speaking, the communication of research results may be subject to arbitrary checks; circulation within the field of investigation may be restricted; pursuance of research may be conditional upon compromises of dubious ethical value. Researchers may appear to endorse a murderous regime by agreeing to take part in activities such as conferences held within its borders. They may also run risks themselves or subject anyone having to assist them to risks. In all these situations, they should avoid exposing local partners to risk, as the latter do not generally benefit from the same protection as visiting researchers.

Researchers investigating subjects linked to terrorism may also find themselves in a difficult position. The name and picture of researchers working on the sources of radicalisation have in the past been found in the propaganda of groups affiliated with terrorism, especially after programmes on such subjects were initiated following terrorist attacks in France. Both a name and picture may be used in contradiction to their message and opinions to support a cause without their consent. Taken to the extreme, the researchers may even be threatened, either directly or through social networks. In all these cases, the employing institution is responsible for advising and protecting them.

These highly topical situations raise many ethical issues, and place researchers in the front row of the dilemma between freedom and responsibility.

D. Responsibility towards society and the environment

A researcher's freedom remains within the boundaries imposed by his/her social and environmental responsibilities. This is because research concerns the human community as a whole on several counts, whether in the development of its intellectual heritage or the preservation of global public goods such as the climate and the environment, biodiversity, world health, cultural heritage, education, etc. Research must be based on an ethical stand that is guided by solidarity, humanism and the defence of human rights. Support for development thus involves a relevant choice of themes able to improve the life of people in the countries concerned. This requires researchers to pay close attention to the requests of partners and to strengthen their capabilities.

Social responsibility constantly compels researchers to comply with ethical research practices[28]. Unreliable data may lead to incorrect results with adverse effects in sectors such as healthcare or economics[29]. Researchers must remain loyal to working methods that avoid unsupported or hasty publication; they must withstand the pressure of the drive to publish,

[28] Since 2015, integrity in science has been included in the French National Charter for Research Integrity, and most research institutions also have their own integrity charters geared to their particular field of work. OFIS, the French Office for Research Integrity, was founded in April 2017.

[29] See Seven reasons to care about integrity in science, Science Europe, 2015

managerial divergences that support this drive, and subjugation of the mind to vested interests.

1. Responsibility in the choice of subjects and the precautionary principle

Research subjects themselves also have to comply with ethical constraints. Whether a researcher's choices are related to personal interest, the initiative of a team or the institution's own policy, researchers and the organisation that employ them must consider the potential impact of their research in the medium to long term.

Researchers are responsible for considering whether the risks involved in a research project are likely to run counter to its original objectives. To take an example, the large-scale development of a geo-engineering technique developed in research laboratories could irreversibly deteriorate the ocean or atmosphere without solving the environmental or climate-related problem which motivated the development[30]. Work on ultra-dangerous viruses may lead to a health disaster if its possible consequences are not fully thought out beforehand, especially if their potential use in bacteriological warfare is disregarded. In areas such as agriculture in developing countries, some French CIRAD teams have already developed the habit of collectively studying the potential consequences of their research projects on local living conditions before considering carrying out the studies or even seeking funding. Researchers may find themselves facing a dilemma: on the one hand, it is very difficult for them to look ahead in order to assess potential dangers; but on the other, an overcautious approach is likely to render science sterile. They should still remain free to exercise their right of withdrawal should research subjects include any potential or proven risk to humans or the environment, even if the programmes are intellectually and financially attractive.

We should here point out that the researcher's freedom is bound by the 'precautionary principle'. Asserted by the philosopher Hans JONAS in 1979[31], this principle first entered international then domestic laws before being finally integrated into French constitutional law in 2005. Its scope—originally the environment—has since been extended to numerous areas of activity, and particularly healthcare. Its applicability, however, is poorly defined in the research sector and it is often referred to by mistake[32]. It is often considered to go against the principle of 'innovation'. Nearer the theme of the researcher's responsibility, there is an increasing number of discussions on the principle of 'vigilance' formulated by the French Academy of Technologies[33]. Furthermore, it should be noted that civil servants have

[30] Geo-engineering describes technical practices conducted by humans that are designed to change the environment. It has been suggested, for instance, that aerosols be injected into the atmosphere in order to correct the effects of climate change on the environment on a large scale, or iron be added to fertilise the ocean and stimulate its ability to absorb CO_2. Such techniques have the potential to cause major adverse effects on natural environments

[31] Back in ancient times, Aristotle mentioned a 'principle of prudence'.

[32] The precautionary principle in research will be explored in a separate COMETS Opinion.

[33] Communicated to the CCNE, France's national advisory body on ethics, on 29 November 2017 by Professor Louis Dubertret, chair of the Academy of Technologies.

the legal right to raise the alarm if their research reveals the danger of certain poorly controlled practices to people or the environment[34].

2. Expert researchers' response to controversies

An increasing number of questions are being raised by society concerning controversies with scientific implications. Researchers must be aware of such fears and the need to inform their fellow citizens. They cannot avoid the need to bring their expertise to bear at the right time and contribute to the democratic public debate in a way that requires being well prepared, with a message that may be communicated over a long period to be effective[35]. Neither public opinion nor the media may restrict the freedom of researchers. They must remain free to choose their research subjects, resist the pressure exerted by lobbies and in particular remain firmly detached from the prejudices and schemes circulated by vested interests, whether religious, political or economic.

Researchers are sometimes consulted for their expertise, either as a representative of their institution[36] or in their own right. In this case, communicating their results requires them in particular to be free and not subject to pressure. Furthermore, it is their responsibility to clearly indicate and explain the limits of the knowledge they are sharing, which generally include margins of uncertainty. It must also be said that it is their responsibility to take care as to how their expertise is used by political or industrial decision-makers[37]. They should emphasise the difference between their opinion as an expert and their viewpoint as a citizen and perhaps even an activist.

This is the context in which we need to consider the responsibility of scientists in response to the multiplication of untruths and fake news spread through the media and social networks. Researchers, like their institutions, must not grow tired of using arguments to speak out against such things, even when they are proffered by colleagues or even Nobel Prize winners having lost their sense of scientific argument[38]. It is even a duty for the research community to find the right words and enter such debates so as to show that the so-called indifference to truth that lies at the very core of the concept of post-truth, is by no means an unavoidable fact of life[39]. More generally, in an era in which 'post-truth' is

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[34] Act no. 2013-316 of 16 April 2013 gives everyone the right to inform the public of a serious threat to public health or to the environment. This law gives all company employees the right of whistleblowing to alert staff representatives on the CHSCT health and safety committee or indeed any other employee. The Act of 8 April 2016 on ethics and civil servants' rights and duties now protects whistleblowers. Public officials cannot be punished for reporting a conflict of interest in good faith and no measures may be taken to impede their careers.

[35] See COMETS Opinion no. 2015-31, "Citizen Science".

[36] There is a national charter for institutional expert assessments, every research institution having implemented its own version. The charter sets the limits of a researcher's liability when consulted as a representative of his/her institution.

[37] See COMETS Opinion no. 2013-27: "Natural Risks, Assessment and Crisis Situation".

[38] See, for example, the case of statements by Professor Luc Montagnier denounced by the French Academy of Medicine.

[39] See, for example, Mathias Girel *Ignorance stratégique et post-vérité* [Strategic ignorance and post-truth] in Raison Présente, issue no. 204, January 2018

beginning to take hold, scientists and their institutions have to uphold their responsibility to take a stand against such a situation; a responsibility whose full extent they have not yet fully realised[40].

E. Conclusion: freedom and responsibility are inseparable in the research sector

In today's particularly complex and shifting global context, the work of researchers is of key importance. They must be given the means to exercise their freedom and free their creativity, trusting that their methodology is solid and their practice thorough, as these are judged by their own peers. In return, researchers and their institutions must bear in mind their social and environmental responsibilities, in addition to their role in the construction of democracy. Giving serious personal or collective thought to the programmes in which they are involved, they must have both the freedom and the responsibility to express their views on contemporary science production as well as on the achievement of goals relating to global public goods.

[40] See the COMETS Opinion on post-truth to be published in 2018.

III. RECOMMENDATIONS

- Researchers must be protected from the pressures exerted on them by moral, sexual, or any other kind of harassment. The power and commitment of the bodies in their institution set up to protect them should be strengthened.

A. Freedom in academic research

- COMETS suggests a change in the contract funding rules so as to encourage solidarity in laboratories by allowing part of their endowments to be channelled to high-quality teams without a contract.

- A policy fostering the freedom of research should encourage open access to research results. COMETS recommends, insofar as possible, the opening of online data platforms, taking into account the necessity to protect personal data and providing the means to process them without bias.

- Concerning publications, COMETS recommends that researchers submit preprints to open archives and encourages institutions to develop such archives. COMETS is favourable to trying out new ways of disseminating research findings by the researchers themselves outside the traditional publishing channels insofar as scientific rigour is upheld.

- Research administrators should alleviate the burden on researchers so as to grant them the time and availability required to unleash their creativity.

- Still in the aim of fostering the creative performance of researchers and maintaining their enthusiasm, they should be given the opportunity of keeping part of their time for personal scientific projects with no short-term requirement to produce results, under the supervision of their peers and in a climate of trust with respect to accountability.

- To facilitate researchers' free choice of a subject, it is advisable for institutions to encourage thematic and geographical mobility throughout their career. In the event of a change in sector or exploration of a new field, the appraisal of research activities should take into account, if necessary, a temporary lull in production.

- Support should also be developed for fundamental research not having any immediate application while fostering knowledge transfer to applications in the research sectors concerned.

- Finally, it is considered essential to return to recurrent, significant basic endowments in addition to short-term incentive programmes.

B. Reconciling freedom and responsibility

- Researchers may be held liable not only by their colleagues, but by all those who use their results, which is potentially the whole of humankind. They must provide them with clear information and reliable, reproducible data that validate their hypotheses.

- It is up to researchers to exercise caution about the terms of any agreement signed with the private sector so that the constraints to which they may be submitted do not prevent them from conducting their research in accordance with the ethical criteria of scientific rigour, objectivity and impartiality.

- The dissemination of results is part of the researcher's remit. Researchers are responsible for informing the public while complying with objectivity criteria and refraining from exaggerating the significance of their own research findings. Established facts must always be distinguished from personal opinions or speculative projections when communicating with the media and political authorities. When consulted as an expert, the researcher's findings must be qualified by an indication of their uncertainty margins.

C. Responsibility towards society and the environment

- Researchers are increasingly engaged in social issues. Before implementing a project, they and their colleagues should together consider the consequences of research in this area. They and their research team must be able to exercise their right to withdraw from what they consider to be high-risk projects.

- In the context of political conflict, or even war, researchers should take care to ensure that colleagues in the country concerned are not exposed to risk. They should also make sure that they do not endorse the regime of States not respecting the rule of law and making non-democratic decisions.

- Institutions must advise and protect their researchers if they are exposed to risks related to the sensitive subjects upon which they are working.

- While research abroad is subject to the constraints of diplomatic relations, it should nonetheless avoid focusing on them.

- It is the responsibility of the whole researcher community to collectively oppose the dissemination by certain media and social networks of untruths when they obviously and blatantly violate scientific knowledge.

- Researchers must be free to determine the slant given to their own research subjects. Institutions are therefore required to protect them from any kind of

pressure, whether religious, political, economic or ideological. It is the responsibility of all researchers to strongly resist the unfounded limits that may be imposed from the outside on the freedom of science. In return, they undertake to comply with the moral rules and any moratorium decided upon by the entire scientific community.

IV. QUALIFIED PERSONS CONSULTED

Danièle BOURCIER, lawyer, CEA/CESTA laboratory

Bruno CHAUDRET, chemist, chair of the CNRS Scientific Board

Faouzia CHARFI, physicist, University of Tunis

Marie-Françoise CHEVALLIER-LEGUYADER, biologist and journalist, former chair of the IHEST science and technology institute

Louis DUBERTRET, chair of the ethics committee of the French Academy of Technologies

Philippe FELDMANN, ethics director at CIRAD, the Centre for international cooperation in agronomic research through development

Mathias GIREL, philosopher, lecturer at the Ecole Normale Supérieure (ENS)

Jean JOUZEL, climatologist, chair of the MURS association, which fosters scientific responsibility

Claude KIRCHNER, computer scientist, science director at INRIA, the French national institute for research in computer science and control

Cécile MICHEL, archaeologist, senior researcher at the CNRS

V. ANNEX

A. Article 10 of the European Convention on Human Rights

"1. Everyone has the right to freedom of expression. This right shall include freedom to hold opinions and to receive and impart information and ideas without interference by public authority and regardless of frontiers. This Article shall not prevent States from requiring the licensing of broadcasting, television or cinema enterprises.

2. The exercise of these freedoms, since it carries with it duties and responsibilities, may be subject to such formalities, conditions, restrictions or penalties as are prescribed by law and are necessary in a democratic society, in the interests of national security, territorial integrity or public safety, for the prevention of disorder or crime, for the protection of health or morals, for the protection of the reputation or rights of others, for preventing the disclosure of information received in confidence, or for maintaining the authority and impartiality of the judiciary".

B. UNESCO's 1974 Recommendation on the Status of Scientific Researchers

The 1974 Recommendation on the Status of Scientific Researchers is an important standard-setting instrument that not only codifies the objectives and value systems by which science functions, but also emphasises that they should be supported and protected so that science may develop.

The 1974 Recommendation promotes an equitable, appropriate status for scientific researchers and sheds light on the formulation of suitable national policies on science, technology and innovation which "encourage and assist indigenous capability to perform research and experimental development in an enhanced spirit of responsibility towards man and his environment" and guarantee that societies make responsible use of the knowledge acquired from scientific disciplines.

The 1974 Recommendation also indicates how this may be achieved, in theory. For example, it underlines the importance of two issues: the need to ensure the free flow of scientific data, and the need to provide scientists with appropriate financial and institutional support.

C. Extracts from UNESCO's 1974 Recommendation

"Member States should seek to encourage conditions in which scientific researchers, with the support of the public authorities, have the responsibility and the right:

a. to work in a spirit of intellectual freedom to pursue, expound and defend the scientific truth as they see it;

b. to contribute to the definition of the aims and objectives of the programmes in which they are engaged and to the determination of the methods to be adopted which should be humanely, socially and ecologically responsible;

c. to express themselves freely on the human, social or ecological value of certain projects and in the last resort withdraw from those projects if their conscience so dictates

d. to contribute positively and constructively to the fabric of science, culture and education in their own country, as well as to the achievement of national goals, the enhancement of their fellow citizens' well-being, and the furtherance of the international ideals and objectives of the United Nations; it being understood that Member States, when acting as employers of scientific researchers, should specify as explicitly and narrowly as possible the cases in which they deem it necessary to depart from the principles set out in paragraphs (a) to (d) above".