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# INTEGRITY AND RESPONSIBILITY IN RESEARCH PRACTICES A GUIDE

*November 2016*

*This guide is intended for all public research staff, regardless of their discipline, status and level of responsibility. It also aims to inform master's and PhD students about the many aspects of the research activity. It should provide support to those who have concerns about the conduct of the profession and assist team leaders and research unit directors who might be faced with integrity violations or ethical dilemmas.*

*This document serves as a basis for reflection. It should benefit from everyone's input and evolve over time.*

## ACKNOWLEDGEMENTS

*The present guide is an updated and enhanced version of the guide "Promouvoir une recherche integer et responsable", published by the CNRS Ethics Committee (COMETS) in 2014. Both guides were written by Lucienne Letellier, Emeritus Research Director at CNRS and member of COMETS. We would like to thank her warmly for her involvement in this important work. Supervised by COMETS President Michèle Leduc, this guide has benefited from the expert opinion of COMETS Committee members.*

*This guide sets out the principles that feature in the French National Charter on Ethics in Research Professions signed in 2015 by a large number of French research institutions and by the Conference of University Presidents. Antoine de Daruvar, a professor at Bordeaux University, has given the text an extra dimension from a university perspective. Florence Eglhoff, a task officer at the Conference of University Presidents, has supported the development of this guide unfailingly. We would like to give her our warm thanks as well as to all the contributors and reviewers of this document. Special thanks to Boris Barbour, a research director at CNRS, for having reread the English version of the guide.*

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# PREAMBLE

The purpose of research is to contribute to the development of knowledge and the advancement of science. It relies on the principles of **honesty**<sup>1</sup>, **scientific integrity**<sup>2</sup> and **responsibility**<sup>3</sup>, on which the public bases its confidence in research. These principles were set out in the [European Charter for Researchers](#) in 2005. They were further developed in the [Singapore Statement on Research Integrity](#) in 2010, the preamble of which underlines that:

*"The value and benefits of research are vitally dependent on the integrity of research. While there can be and are national and disciplinary differences in the way research is organized and conducted, there are also principles and professional responsibilities that are fundamental to the integrity of research wherever it is undertaken."*

In order to harmonise policies on integrity at European level, ESF-ALLEA adopted the [European Code of Conduct for Research Integrity](#) in 2011 and the European ministers for research ratified in 2015 a series of [conclusions](#) underlining the importance of integrity in research:

“Research Integrity: What it means, why it is important and how we might protect it“

Integrity is the pillar of high quality research.

Open Science is one of the conditions for promoting integrity.

The chief responsibility for the integrity of research lies with the researchers themselves and at institutional level more generally.

Integrity is fostered through training in best practices.

*Science Europe, 2015*

In keeping with these major international efforts, the French research public institutions and the Conference of University Presidents (CPU) signed the first French [National Charter on Ethics in Research Professions](#) on January 26<sup>th</sup>, 2015 in which they make the commitment to respect and uphold the principles of integrity and rigour that are inherent to research (see appendix to this guide). A [report](#) commissioned by the French State Secretary for Higher Education was further published on June 29<sup>th</sup>, 2016<sup>4</sup> to implement the charter’s proposals.

By publishing in 2014 the guide ["Promouvoir une recherche intègre et responsable"](#), the CNRS Ethics Committee ([COMETS](#)) intended to raise researchers<sup>5</sup> awareness of responsible research practices. It required an update in

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<sup>1</sup> **Honesty** refers to all aspects of everyday research practices and in making claims about the meaning, relevance and possible applications of research outcomes.

<sup>2</sup> **Scientific Integrity** means the refusal to allow scientific values to be corrupted by motivations for financial gain or public recognition. Integrity is seen in terms of epistemological obligations that vary according to the scientific disciplines concerned.

<sup>3</sup> **Responsibility** refers here to researchers' public obligations, including their duty to anticipate the effects of their findings on society as well as their obligations in relation to their attitude towards the dishonesty of their colleagues or violations of scientific integrity they may be aware of.

<sup>4</sup> *"Review and implementation of proposals of the National Charter for Research Integrity"* by Pr. Pierre Corvol.

<sup>5</sup> The generic term "researcher" refers to all those who contribute to a research activity: researchers, faculty members, engineers, technical and administrative staff.

response to comments and to the rapidly changing research environment. Research practices are undergoing a rapid evolution in the digital world. Open science provides new ways of sharing scientific data and knowledge. Scientific publishing practices are also undergoing substantial mutations.

The CNRS and the Conference of University Presidents have joined forces in order to publish this updated version of the guide. Its content falls within the reference framework of the European Horizon [2020<sup>6</sup>](#) program for research and innovation. It relies on European and international texts issued by the OECD and the ESF-ALLEA, among others. It is structured around the following themes set out in the National Charter on Ethics in Research Professions.

## The National Charter on Ethics in Research Professions

Compliance with legislative and regulatory requirements  
Reliability of research work  
Communication  
Responsibility in collective work  
Impartiality and independence in assessment and expertise  
Collaborative work and plurality of activities  
Training

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<sup>6</sup> The [H2020 framework program](#) brings together research and innovation programs at European level for the first time.

# 1. COMPLIANCE WITH LEGISLATIVE AND REGULATORY REQUIREMENTS

## The French research code

The general organisation of French public research is determined by the [Research Code](#), which sets out research objectives and staff missions.

### The missions of public research staff

- Knowledge development.
- Transfer and application of knowledge to companies and to all fields contributing to the society progress.
- Dissemination of scientific information to the public and especially among young people.
- Participation in professional training.
- Research administration.
- Scientific expertise.

*[Research code \(Art. L411-1\)](#)*

## Rights and obligations of public employees

Research is carried out by public employees<sup>7</sup> and research staff working on contracts<sup>8</sup>. In accordance with their [status](#), public employees benefit from political, trade union, religious and philosophical freedom of opinion. Furthermore, and in agreement with the French [Education Code](#) (art .L.952-2), faculty members and researchers enjoy full independence and complete freedom of expression in carrying out their teaching duties and research activities, providing that they respect the principles of tolerance and objectivity. This **academic freedom** concerns all channels of communication, including social networks. However, it does not free the employees from moral, epistemological or social obligations.

The [rights and obligations of public employees](#) have been reviewed and extended in 2016. The following articles of the law are related to ethics for the research professions.

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<sup>7</sup> Public employees : en français fonctionnaire.

<sup>8</sup> The rights and obligations of research staff working on contracts are set out in the contract conventions and codes.

## Ethics, rights and obligations of public employees

- They carry out their duties with dignity, impartiality, integrity. They must remain neutral and respect the principle of secularism.
- They should prevent or immediately put a stop to any situation that exposes them to a conflict of interest.
- They have the right to receive support from a deontological advisor helping them to fulfil their ethical obligations.
- No action may be undertaken against public employees for having attested facts [...] witnessed in the course of their duties that [...] might be considered as a conflict of interest.
- The law encourages the equal representation of men and women.

*Taken from Law n° 2016-83 of 20 April 2016*

## Laws and regulations governing research practices

Research practices are governed by **laws of broad scope**, among which those related to [plagiarism/copyright infringement](#), [intellectual property](#), [harassment](#), [discrimination](#), [bioethics](#), [biodiversity](#) and to [data processing, files and freedom](#).

Health and safety in the workplace are under the protection of the French Committee for Health, Safety and Working Conditions ([CHSCT](#)). The use of computer resources and internet services is ruled by charters specific to each institution.

Regulations apply for the use of [human biological samples for research](#) and for the [confined manipulation of Genetically Modified Organisms](#). The use of animals for scientific purposes falls under a [specific regulation](#) and the [National Charter on the Ethics of Animal Experimentation](#).

Bioethics regulations committees at research institutions help constituting the requested documents necessary to comply with the current regulations.

## 2. RESPONSIBILITIES IN COLLECTIVE RESEARCH WORK

The responsibilities of researchers are specified in the recommendations of the [European Charter for Researchers](#), which many French public research institutions have agreed to adopt.

### Researchers' responsibilities

*"Researchers need to be aware that they are accountable to their employers, funders or other related public or private bodies as well as, on more ethical grounds, towards society as a whole. In particular, researchers funded by public funds are also accountable for the efficient use of taxpayers' money".*

*[European Charter for Researchers, 2005](#)*

### Respectful relationships at work

**Discriminations** of employees at work are punishable offenses. In accordance with the [law](#) : "no distinction, either direct or indirect, may be made on the basis of political, philosophical or religious beliefs, union affiliation, origin, gender, sexual orientation or identity, age, family name, state of health, physical appearance, disability, ethnicity or race, whether real or perceived." The Ministry for Higher Education has published [recommendations](#) to fight against all forms of discriminations.

**Harassment** at work is also a punishable offence. Victims of **psychological harassment** are protected by a [law](#) and can seek advice from their institution human resources department on whether or not they are justified in making a complaint. [A law](#) also protects public employees from **sexual harassment**. Information about how to protect oneself against sexual harassment can be found in a [practical guide for the academic world](#) and in a dedicated [datasheet](#) published by CNRS.

**Equality between men and women** is a fundamental right enshrined by the [law](#). It comprises actions that are designed to, among others, (i) guarantee professional equality, equal pay and gender diversity in professions, (ii) encourage a better work-life balance and the more equal distribution of parental responsibilities (iii) foster equal access for both men and women to electoral mandates and elected office, as well as to professional and social responsibilities. The Ministry for Higher Education and the CPU have signed a [charter to promote equality between men and women](#). [The Council of the European Union](#) considers equality between men and women as one of its key priorities for research and innovation in the European area.

Equality between men and women begins with mutual respect and the rejection of any type of behaviour that relates to everyday sexism (benevolence, paternalism etc.) or stereotyping that is demeaning for women at work.

## Responsibilities in training PhD students

PhD students belong to the institution [research staff](#). Most of them are bound to the institution by a three-year employment [contract](#). PhD students and thesis supervisors in the host laboratory are also bound by an agreement through the [thesis Charter](#) of their university, which defines their respective rights and obligations. Doctoral schools offer PhD students training modules to build up their professional skills. According to the 2016 bill, they should provide training modules on [research ethics and scientific integrity](#)<sup>9</sup>.

The thesis supervisor is responsible for ensuring the scientific quality of the thesis and for the respect of its scientific integrity.

### Recommendations for supervisors of PhD students

- Inform them about legal and regulatory texts and ethical rules, especially those in relation to human, animal and environmental research.
- Teach them the concepts and methods of the discipline.
- Train them to a critical analysis of scientific data.
- Teach them how to write publications, conference proceedings and abstract.
- Introduce them to standards for referencing sources.
- Make them aware of the fraudulent nature of plagiarism<sup>10</sup>.
- Facilitate their access to the scientific community, external collaborations and conferences.
- Encourage them to take training courses to prepare their future career.

To avoid tensions and misbehaviours that may arise during the thesis, it is recommended to allocate a research tutor to each PhD student, preferably working outside the research unit. In addition to monitoring the progress of the thesis, the tutor may also act as the contact point or mediator in case of conflict. If any ethical questions arise, they should fall first under the arbitration of the doctoral school.

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<sup>9</sup> The [Bill](#) of 25 May 2016 provides a national framework for training and procedures leading to the award of a national doctorate degree.

<sup>10</sup> See chapter 7

## 3. RELIABILITY OF RESEARCH WORK

### Data production

#### *Data reliability and traceability*

The **reliability of data** produced by researchers relies on the adoption of appropriate protocols. Procedures to generate data must be described in clear and explicit terms so they can be replicated by other researchers and reused. Already verified knowledge should be taken into account.

**Traceability** defines all the information concerning the conditions of data production (methods, dates etc.). In some disciplines, particularly in experimental research, it is ensured by a [laboratory notebook](#). The laboratory notebook is compulsory for both permanent and contract staff. It serves documentary and legal purposes. Raw data must be recorded in the notebook so that to enable their replication. A clear distinction must be made between results and conclusions drawn from them. The ownership of the notebook is defined by the contract between the institution and its partners. The contents of the notebook cannot be reproduced without the written authorisation of the unit director. However, the writer may take a copy for personal use without prior permission.

#### Why keeping a laboratory notebook?

- Archiving, traceability of raw data and the use an unforgeable laboratory notebook are the only legal ways to prove the prior existence of results in case of a contract, a patent application or a controversy.
- In the case of collaboration with partners, the laboratory notebook allows to estimate each individual's contribution.
- It is a major piece of proof that can be used in case of a conflict or a fraud allegation.

The [electronic laboratory notebook](#) achieves the same objectives as the paper version. In addition, it permits the record of data in their entirety and their online availability. The files should be in an unforgeable format. However, long term data storage is not guaranteed due to the constant development of informatics systems. The electronic notebook requires security, dating systems and a certified digital signature. Encryption methods such as [block-chain](#) distribution can also be used.

**Softwares** used to acquire data are also subject to traceability requirements.

**Data identification.** A [DOI \(Digital Object Identifier\)](#) ensures the constant and unique traceability of digital objects. The DOI allows individuals to access, share, re-use and cite online resources, research data and publications. It also ensures long term access to scientific materials such as images and videos etc. Its use is recommended.

## *Inappropriate data management practices*

The following behaviours are detrimental to the credibility of research and may even become frauds in extreme cases.

### Examples of inappropriate data management practices

- Deny the access to data to collaborators.
- Production of biased or manipulated data under pressure from sponsors providing the funding.
- Interference or obstruction to other researchers' work, especially by making data, research material or equipment unavailable or unusable.
- Use of data belonging to a third party without prior authorisation or without citing the author and sources.

## *Management of big data*

Research increasingly relies on the use of big data. Big data are generally the aggregation of data acquired by teams located all over the world who agree to share their data (**data sharing**<sup>11</sup>) and make it available to all. Data from research financed through public funding must be made freely available (**open data**). This is stated in the French [Research Code](#) and forms part of the objectives of the [European program Horizon 2020](#), as well as of the [French law for a Digital Republic](#).

The use of big data, from data production to data sharing, must fulfil the requirements for scientific relevance, rigour and loyalty. It must also satisfy the need for security as well as [ethical and legal considerations](#). A [Charter for Ethics & Big Data](#)<sup>12</sup> has been issued which “bring enhanced security regarding the maintenance, traceability, quality, impact on employment or legal risks”.

### A few recommendations for the use of big data

- Compliance with data traceability principles.
- Transparency in practices for data handling.
- Respect of intellectual property rights.

[Ethics & Big Data Charter](#)

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<sup>11</sup> Data sharing is one aspect of the international wide movement of [open science](#).

<sup>12</sup> This charter is self-administered. It provides a description framework for databases and serves as a memorandum of the points that must be covered when data is made available for whatever purpose, be it commercial or academic, paid for or free. The elements provided for in the charter must be completed by the supplier, who is responsible for its content.

Four international organisations have signed the "[Open data in a big data world](#)" agreement<sup>13</sup>. It outlines the basic principles of rigour and ethics to be adopted in using open data. These principles are however not fully compatible with those of the National Commission for Information Technology and Civil Liberties ([CNIL](#)) in case where personal data are concerned.

## Protection of personal data

[CNIL](#) ensures the protection of personal data. The law for a Digital Republic has recently introduced new [rights](#) and dispositions that anticipate the [European regulation applicable](#) in 2018. Information Technology and Civil Liberties (CIL) correspondents provide a link between higher education institutions and CNIL<sup>14</sup>.

According to CNIL, the use of personal data should fulfil a number of [obligations](#). Yet CNIL requirements for objectives and proportionality are difficult to apply to research carried out using big data<sup>15</sup>.

### Main obligations when collecting and processing personal data ([CNIL](#))

- Secure files.
- Ensure data confidentiality.
- Define the period of data storage according to the purpose of the file.
- Allow individuals involved in the study to be informed.
- Submit personal data processing operations to CNIL approval in case of risks of rights and liberty violation
- Ensure that the information used in a file matches the objectives.

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<sup>13</sup> The International Council for Science – ICSU, the Inter Academy Partnership – IAP, the World Academy of Sciences – TWAS and the International Social Science Council – ISSC.

<sup>14</sup> The CPU has published a [guide](#) in 2011 called "Information Technology and Civil Liberties for Higher Education and Research", which sets out the conditions for handling students' personal data.

<sup>15</sup> As indicated above, big data is created through the aggregation of results obtained by various teams who have no way of knowing what the data will be used for or how long it will be stored. Furthermore, processing big data can lead to incoherency in the way the information is used.

## 4. SCIENTIFIC PUBLICATION AND COMMUNICATION

Researchers who receive public funding are **obliged** to make their research findings available to the scientific community and also to the public. The development of digital technologies has transformed the way results are communicated.

Communication of scientific results includes three different stages<sup>16</sup>: publication, qualification and certification. **Publication** means any act that makes research findings public through journals, conference proceedings, open archives, blogs, websites, tweets, etc. **Qualification of research** is in most cases attested by peers (peer review) who assess, among others, factual accuracy, originality, suitability of methodology and protocol, adequacy of the cited sources etc. It can also be attested through discussions on scientific social networks. **Certification of the document** is established by an editorial board before it can be included in conference proceedings or appear in a review.

### Preparation of manuscripts: recommendations and misconducts

Preparation of manuscripts must conform to the standards of "good practices" and the principles of integrity<sup>17</sup>. These guidelines are not exhaustive and have to be adapted to suit the concerned academic field.

#### Guidelines for the preparation of manuscripts

- Data must be reliable and collected in good faith.
- Results must be interpreted rigorously and objectively.
- Experimental protocols and data must be sufficiently documented to allow, where applicable, their verification and reproduction.
- Raw data must be accessible insofar as the discipline allows.
- References must be pertinent and refer to work already published by the authors and other teams.
- The authors must cite works at the origin of the questions and hypotheses raised.
- All authors must disclose conflicts of interests.
- All authors must agree on the sequence of authors, preferably at the start of the project or the initiation of the publication.
- The manuscript must be approved by all authors before submission.

<sup>16</sup> Comets (2016). "Discussion and moderation of scientific publications on social networks and in the media: ethical issues".

<sup>17</sup> These recommendations were inspired, among others, the guide: *On being a scientist: a guide to Responsible Conduct in Research*. The National Academies Press (2009) Washington D.C.

## Some misconducts

- Fabrication of results.
- Falsification (manipulation of data, research materials, exclusion of data or results without justification, retouching images).
- Plagiarism of research carried out by a third party.
- Dissimulation of conflicts of interest.
- Intentional misrepresentation or erroneous quotation of research carried out by competitors.
- Deliberate omission of contributions made by other authors in references.
- Incorrect indications on the progress of the researcher's own work.
- Overestimation of the applicability of the research findings.
- Addition of "guest" or "ghost" authors to the list of authors.
- Omission of anyone who made a significant contribution to the project from the list of authors.
- Mention of co-authors without their consent.
- Re-publish parts of previous publications without citing the original source.

## Who can claim authorship of a publication?

The increasing importance of publications for career development and projects funding has led to the multiplication of authors that is often a source of conflict. The notion of authorship depends widely on academic fields. General recommendations for authorship have been set out by The International Committee of Publication Ethics ([COPE](#))<sup>18</sup>. They have been adopted by the French National Alliance for Life Sciences and Health ([AVIESAN](#)) and are also approved in some other scientific fields.

### Who can claim authorship of a publication?

- The author of an article must make a direct and substantial intellectual contribution to the research process, from conception and measurements to interpretation of the findings and drafting of the publication.
- The author must be able to defend part or all of the publication content.
- The project director (corresponding author) guarantees the accuracy of the publication content as a whole. The other authors taking part in the project are responsible for verifying the truth of the assertions made.
- All authors must have a share in the benefits of a published work.

### *Authorship conventions*

Numerous journals publish **guidelines that outline authorship conventions**. Some journals mention "author contributions", which allow authors to specify their respective contributions and makes them individually

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<sup>18</sup> COPE is a forum for peer-reviewed journals to discuss all ethical issues relating to publications.

accountable. If two main authors contributed equally to the work, they can ask the publisher to be **co-first authors** (a specific mention will be made as a note in the published article).

Authorship agreements depend on the field research and are under the responsibility of the teams. To avoid conflicts, researchers are advised to agree upon authorship and order of authors sufficiently ahead of publication and in a transparent way. This is especially important in the case of collaborative work. This tricky issue should be discussed collectively in research units and signature recommendations included in the **laboratory internal regulations**.

When the publication results from a **collaborative research**, authors may not always be able to judge whether the results obtained by collaborators from another discipline are well-founded. It is therefore useful to identify the author(s) who will be able to evaluate the results obtained in each field and those who will guarantee the coherence and integrity of the whole work. This avoids the risk of all authors being accused, should the publication being found fraudulent.

It is important to respect the institutional conventions of author affiliation. This allows the unequivocal identification of an author's publication and of the institution to which the author belongs. This may also be used to assess and rank the institution.

The use of **ORCID ID** ([Open Researcher and Contributor IDentification](#)) allows a clear and unambiguous identification of researchers. This unique digital code avoids the issue of namesakes and name changes. It can be used to respond to a call for projects, submit an article, deposit data sets and to become more visible on social networks etc.

### *Participation of engineers and technicians as co-authors*

The co-signature of publications by engineers and technicians can be a major step forward in their careers. It is a sensitive and complex matter, and its treatment is largely dependent on disciplinary practices and professional activities. Researchers are advised to discuss the subject during laboratory meetings and to **include guidelines about signatures in internal regulations**.

### *Acknowledgements*

Those who do not fulfil the criteria for authorship of a publication but are involved in the research work (technical assistants, individuals who supplied material, colleagues who contributed to discussions or proofreading of the publication etc.) have to be mentioned in the acknowledgements. All those included in the acknowledgements must give their consent. Sponsors and funding institutions have also to be acknowledged.

## **Publications and open access**

**Open access** refers to the free online availability of original results of scientific research. The rights to open access are defined in the [French bill for a Digital Republic](#) which stipulates that publications will have to be available to the public after an embargo of **6 months maximum** (12 months for Social and Human Sciences) following its acceptance by the publisher. Research funding from the European program [Horizon 2020](#) carries with it the obligation to ensure open access to the resulting publications.

**Open access journals** allow articles to be immediately available on Internet. The authors and/or institutions assume the cost of publications in the form of an Article Processing Charges (APC). One should remain vigilant in

view of the proliferation of second-rate journals created by "[predatory publishers](#)". Open access journals that are subject to peer review are listed in the [DOAJ](#) (Directory of Open Access Journals)<sup>19</sup>. Articles appearing in **traditional journals** (no fees for authors, charges for readers) might become open access after the embargo period defined by the law.

**Multidisciplinary repository platforms** such as [ArXiv](#), [HAL](#) (Hyper Articles en Ligne) and [bioRxiv](#) allow researchers to deposit articles and various manuscripts online. The publication of PhD theses on HAL is strongly recommended as the platform provides a useful archiving and indexing for young scientists in view of their future careers. HAL also fulfils the requirements of the [Horizon 2020](#) program.

## Publications and social networks

Some scientific social networks ([Academia](#), [ResearchGate](#), [MyScienceWork](#) etc.) facilitate communication between researchers and give their work visibility. Researchers can advertise their publications on these networks and also deposit them online. These sites must be used in accordance with the [rules of good conduct](#) <sup>20</sup>. Researchers but not their employer are responsible for the work they deposit, even if the name of the institution appears on the platform. Importantly, the publication which is deposited by the author becomes the [exclusive property of the network](#), which can exploit it freely, notably for commercial ends.

## Communicating results to the public and the media

Researchers must make their knowledge and research activities available to the public, so that non-experts can understand their purpose and signification. [Public research staff](#) have the freedom of expression and opinion but also have a duty to ensure discretion, confidentiality, neutrality and transparency about their personal links of interests. Holders of grants awarded within the framework of [Horizon 2020](#) programs must provide information on their research findings to various audiences, including the media and the public.

Researchers are responsible for the reliability and objectivity of the information they communicate. They may have to express their opinions publicly or in the media on sensitive or controversial subjects on which there are no simple or unambiguous answers. They must be honest and make a clear distinction between scientific knowledge and their own personal opinions<sup>21</sup>.

Blogs and social networks are becoming one major source of information for the public and the media. Researchers are responsible for making sure that the information they communicate is reliable and objective, in the interest of science and respect of their institution.

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<sup>19</sup> The list of such journals is jointly established by a group of a few dozen publishers of international scientific journals.

<sup>20</sup> See [the conditions for the use of social networks to distribute publications](#) recommended by CIRAD.

<sup>21</sup> [On ethical aspects of researchers' communications with the media](#) (Comets, 2012)

## 5. INTELLECTUAL PROPERTY RIGHTS

Intellectual property refers to **literary and artistic property** (copyright, database rights), and **industrial property** (protection of inventions and technical expertise). It is governed by the Intellectual Property Code, which recognises the ownership rights to intellectual or aesthetic works as well as to technical inventions.

### Literary and artistic property

#### *Copyright*

A vade mecum is available that gives concrete answers to questions about rights in relation to publications, open archives, visual documents, software, teaching materials and PhD theses.

**Scientific publications** fall within the legal framework for literary and artistic property. Researchers own all the moral and economic rights of their written work, despite being public employees<sup>22</sup>. Transferring copyright to a publisher may prevent the automatic reuse of the researcher's work in other formats or in future compilations. It often takes away the author's right to re-use parts of the text submitted. Authors are strongly advised to carefully read the contract and discuss clauses in detail with the publisher. Authors are advised to use Creative Commons (CC) licences, which allow copyright holders to keep their rights while making their work publicly available under predefined conditions.

#### Author's rights

- The author and co-authors hold all the rights on their manuscript until they sign a contract assigning property rights to the publisher.
- The article as a whole is subjected to copyright.
- The published images and illustrations can be reused according to the conditions indicated in the contract with the publisher.
- Publishers can reuse parts of an article in another context if the property rights have been reassigned to them and if this is mentioned in the contract.

<http://www.cnrs.fr/dist/>

**Visual documents** (images, slides, videos, posters, etc.) are also subject to copyright and might be protected by a CC licence. The use of images published online requires the author's consent or must be in accordance with the CC licence.

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<sup>22</sup> Law of 1<sup>st</sup> August 2006 known as DADVSI

## Depositing articles in open archives

- Depositing a text in an open archive counts as publication.
- Depositing the full text of an article in an open archive requires the co-authors' agreement.
- An author can manage the rights on his own work by using a Creative Commons licence.
- The full text of a published article can be made available on a personal website if allowed by the contract with the publisher.

Teaching materials are [copyright protected](#). Authors can choose between different levels of protection for each teaching material using an appropriate CC licence. The re-use of materials for teaching or research purposes is permitted and falls within the scope of the [educational exception](#)<sup>23</sup>.

**Databases** are covered by a [law](#) that offers protection through copyright and by a specific property right for databases. Open licenses such as the [Open Database License](#) (ODBL) are specifically developed for databases.

**Softwares:** The research institution owns the rights to any software developed by its agents. The institution may grant the right to use and/or market the software. Software applications are subject to copyright legislation.

## Industrial property. Patent

Any result produced by research that may have an economic interest (new product, molecule, material, process or know-how) can be transferred in various forms.

If results show signs of novelty, inventiveness or industrial applicability, institutional valorisation services will take steps to ensure the protection of intellectual property rights by filing a patent<sup>24</sup>. A patent affords its owner national or European temporary exclusivity. It protects not only the invention of a product but also the entire reproduction process, as well as the rights of the creator(s) in the event of industrial exploitation. Patent applications are subject to the non-publication of results in any oral or written form. This includes the publication of articles, notices and conference papers.

Importantly, the institution is responsible for the reliability of the studies supporting the patent, in case it is purchased by a private company. The institution may face lawsuits in the event of inaccuracy or malpractice.

If the invention is not patentable but may still be used commercially, the institutional valorisation services provides the means to transfer the expertise developed in its laboratories

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<sup>23</sup> Educational exceptions permit the use of works for illustrative purposes only for an audience of students or researchers within a teaching or research environment and exclude all commercial use.

<sup>24</sup> See reference materials on the [C.U.R.I.E network](#), which covers commercialisation, the transfer of technology and innovation as a result of public research.

## 6. EVALUATION AND EXPERTISE

### Research evaluation

The aim of evaluation activities is to assess the quality of the research activity of a colleague, a team, a laboratory or research institution in relation with publication, career development, funding requests etc.

#### *Recommendations to scientific evaluators*

Evaluation entails the responsibility of the evaluator. Faced to an increasing number of national and international evaluation tasks, the evaluator may sometimes experience tension. Conflicts of interest, appropriation of ideas or plagiarism may arise. The following [recommendations](#) aim at clarifying the conditions for a reliable and objective evaluation.

#### Some recommendations for scientific evaluators

##### **Scientific excellence**

- They must demonstrate a broad understanding of their discipline. Collective expertise is recommended for multidisciplinary research.
- Evaluators must ensure that the experts they have appointed to assist them have complementary skills and points of view.

##### **Impartiality and conflicts of interest**

- Evaluators have a duty to give equal attention to all research work.
- They must step down if they guess that a conflict of interest may jeopardise their impartiality.
- They must refrain to evaluate a research carried out by a colleague whose activity was recently linked to them.
- They must refrain from intervening in discussion related to a research project that is in competition with theirs.

##### **Confidentiality**

- They must preserve the confidentiality of deliberations.
- The information gathered during their assessment must not be used for themselves or for their laboratory.
- Comments of the evaluation assessment must remain confidential.
- They must report any infringement of ethical standards from researchers or research projects.

##### **Transparency**

- Their conclusions must be explained and justified so that they can be defended in the event of an appeal.
- The evaluated colleagues must have the possibility to access the elements of the evaluation.
- If valid objections are raised, the evaluator cannot refuse to participate to investigations carried out as a result.

## Evaluation and bibliometric indicators

Bibliometric indicators are used to evaluate scientific work. Well known indicators are the Hirsch index and the journal impact factor <sup>25</sup>.

The **Hirsch index (h-index)** estimates the significance and impact of a researcher's publications. A researcher has *h-index* equal to N if he has published N articles that are cited at least N times. The h-index increases with the career progress and is in general not significant for young researchers. It does not take in account the position of the author in the publication and whether the article is signed by one or many authors. It favours researchers in disciplines with high numbers of citations. The use of h-index is not appropriate in certain disciplines (SHS for example).

The **impact factor (IF)** of a scientific journal measures the yearly number of citations received by articles published in that journal over the two preceding years, compared to the number of articles published by the journal over the same two years. Note that the strategy of fostering journals on the basis of their impact factor is not without bias<sup>26</sup>. Facing the frequent inappropriate use of bibliometric indicators, publishers of scientific journals, academies and institutions all over the world have signed the "[San Francisco Declaration on Research Assessment](#)" (DORA), which calls on evaluators not to use the IF to evaluate researchers' activity. The [Leiden Manifesto](#) has set out general principles that should enable a better use of bibliometric indicators to evaluate research.

### 10 principles for a wise evaluation using bibliometric indicators

- Quantitative evaluation should support qualitative, expert assessment.
- Measure performance in relation to the research missions of the institution, group or researcher.
- Protect excellence in locally relevant research.
- Keep data collection and analytical processes open, transparent and simple.
- Allow those evaluated to verify data and analysis.
- Account for variation by field in publication and citation practices.
- Base assessment of individual researchers on a qualitative judgement of their portfolio.
- Avoid misleading simplifications and false precision.
- Recognize the systemic effects of assessment and indicators.
- Scrutinize indicators regularly and update them.

*Leiden Manifesto, 2015*

## Expertise

Expertise is mostly commissioned by people outside the scientific community (politicians, entrepreneurs, associations, etc.). It aims at providing an analysis, interpretation, opinion or recommendation on a specific issue. Expertise may be carried out in name of the institution. A [National Charter for Institutional Expertise](#) provides

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<sup>25</sup> Alternative indicators known as [Altmetrics](#) have also recently emerged. They measure an article's potential and immediate impact by analysing its dissemination and discussion on social networks (Twitter, Facebook and mentions on blogs and wikis). Altmetrics can be dominated by superficial inputs (e.g. tweets of sensational titles by people who have no expertise and have not read the paper).

<sup>26</sup> French Academy of Sciences report: (2014):[The new challenges of scientific publishing](#).

recommendations to ensure the transparency of scientific expertise and every research institution has implemented its own version according to its needs.

Employees of research institutions may also be approached individually to carry out an expertise. Some general recommendations are outlined in that case.

### A few recommendations for individual expertise

- The expertise has to be informative but may not be used to endorse political or economic decisions made as a result.
- Agents are free to express their personal opinions but they must indicate that those do not reflect the opinion of their institution.
- Scientists must highlight any uncertainties surrounding their expertise. They must be vigilant of how their opinions are used by decision-makers and media. This recommendation is particularly prevalent in crisis situations where there are potential risks (health, alimentation, seism, etc.) and a decision has to be made quickly on an issue that has no simple solution.

### Links and conflicts of interest<sup>27</sup>

The expertise activity and the funding of research by sponsors create profitable interest links between academic research and businesses. Yet, they are also likely to result in conflicts between private interests and obligations of public employees. They can also undermine the independence of research. Professional, personal or financial considerations may prompt researchers to stop or modify a study, prevent its publication or manipulate the results to serve the interests of a private sponsor. The scope of conflicts of interest in public institutions and the transparency mandatory from public officials can be found in the Law of 20 April 2016.

Public employees must devote their professional activities to the public sector. Yet, they are allowed to carry out activities outside the institution providing that they are in connection with specific tasks (teaching, consulting or expertise, research valorisation, etc.) These activities are subject to regulation and in some cases to the institution's approval.

### *Whistleblower protection*

The Law n° 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 employees the right of whistleblowing. The Law of 8 April 2016 now protects whistle blowers. Public staff cannot be punished for reporting a conflict of interest in good faith and no measures may be taken to impede their careers.

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<sup>27</sup> Some of the citations refer to a text published by the INRA Consultative Ethics Committee

## 7. PREVENTING SCIENTIFIC FRAUD

The violation of scientific integrity discredits research studies, damages the institution's reputation and also affects public faith in scientific researchers and in science in general. Research integrity and its violation was a concern of [The Council of the European Union](#) in 2015<sup>28</sup>.

**Questionable practices** affect all stages of the research process. Misconducts targeting publications have already been mentioned in previous chapters. Other inappropriate behaviours concern, among others, the misrepresentation of scientific achievements in a CV or publication list, the overstatement of the applicability of the research and findings in publications, funding proposals or towards the public.

An international consensus defines **scientific fraud** as the [fabrication, falsification or plagiarism](#) in proposing, performing, or reporting research results. In France, fabrication or falsification do not generally come under the law and sentences are the responsibility of the scientific community, notably through [disciplinary procedures](#). Plagiarism may be punishable under some circumstances by civil or criminal law<sup>29</sup>.

### Plagiarism

Plagiarism is the use of content (text, images, tables, graphics etc.) in part or as a whole without the permission of the author or without referencing the source. It affects publications in journals, books, reports and conference proceedings, PhD theses, etc. Copy of online scientific resources may also be considered as plagiarism. Easy access to online documents makes the use of "copy and paste" commonplace. As a result, one easily tends to forget that [plagiarism is a form of intellectual dishonesty and fraud](#).

PhD students may not be aware of the standards for referencing sources. It is therefore the thesis supervisor's duty to inform them. Plagiarism may lead to the cancellation of the doctoral degree in extreme cases. [PhD theses published online are protected](#) by the [Intellectual Property Code](#). It is illegal to represent or reproduce theses in part or as a whole without the author's permission (Art. L112-1). The same applies to their translation or adaptation (Art. L 122-4).

[Anti-plagiarism software](#) can have a preventive effect. Universities have made available anti-plagiarism software specifically designed for master's and PhD works. Publishers of major scientific journals share databases that contain all the manuscripts submitted to them, and for which dedicated software allows to detect potential plagiarism. The Office of Research Integrity ([ORI](#)) has published online a [guide to ethical writing](#), which includes a focus on plagiarism and self-plagiarism<sup>30</sup>. Researchers can use anti-plagiarism software to check the originality of their own work and to help them referencing sources correctly. In all cases, sources (including the online ones)

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<sup>28</sup> "The Council of the European Union EMPHASISES the need for measures to prevent and address research misconduct, including questionable research practices; INVITES research organisations and Member States to find appropriate channels for the examination of allegations of misconduct made against researchers and, if appropriate, institutions where research misconduct takes place; and HIGHLIGHTS the role that education, training and lifelong learning at different stages of the researchers' careers can play in this respect."

<sup>29</sup> [Plagiarism does not have a legal definition](#). "Plagiarism of creative works" is the only punishable [offence](#) of this type in France under civil law (damages) and criminal law (up to three years' imprisonment and a €300,000 fine) (Art. L335-2 of the Intellectual Property Code).

<sup>30</sup> Self-plagiarism involves recycling texts so that the same data is published several times. Its definition is not completely clear and may vary according to the discipline. Some publishers simply refer to it as an "overlap". Others use software to stamp it out.

must be explicitly cited. Texts that are copied from a published document must be written in italics and/or between quotation marks.

The appropriation of information contained in calls for projects or publications submitted for evaluation or expertise may be considered as **intellectual property stealing**. The same applies to ideas developed during meetings or debates. This behaviour is ethically unacceptable although difficult to prove. From a [legal point of view](#), stealing of ideas is not regarded as a fraud as long as it does not concern the form in which the ideas are expressed. Only ideas that have been formulated and published can be protected.

## Falsification and fabrication of data

The falsification and fabrication of data are among the [major frauds](#) uncovered in recent years. Biomedical sciences are often concerned<sup>31</sup>, but hard sciences and social sciences are also affected, as highlighted on the [Retraction watch](#) website, which compiles retracted publications. The majority of articles are retracted because of fraud, though some are retracted because of errors made in good faith. Frauds in publications are also reported on websites such as [Pubpeer](#) in which comments are usually anonymous. Frauds can have serious consequences, not just for the concerned field of research, but also for the society if the research impacts medical guidelines or public policy. Even if a case of fraud is identified, it can take several years to retract the publication, which will often continue to be [cited](#) long after the retraction.

To prevent falsification, publishers of scientific journals have issued [recommendations](#) for authors. An increasing number of journals require the simultaneous publication of the raw data, a condition that can be only fulfil in certain disciplines.

## Allegation and treatment of scientific fraud

Reporting scientific fraud and scientific integrity violations is included in the recommendations of the [National Charter](#) on Ethics in Research Professions and the [European Code of Conduct for Research](#). The allegation must be based on factual, reliable and verifiable arguments. Whistle blowers must be aware of the gravity of their accusation. Allegation may not only impact the suspected person but also other members of the laboratory and could damage their image. Whistle blowers are advised not to act alone and be supported by collaborators or colleagues who can confirm their testimony. If the issue cannot be solved within the laboratory, it is best to [pass the allegations to the integrity referent of the institution](#) who has to respect confidentiality regarding the whistle blower and the suspected person.

Treatment of scientific frauds varies according to the country. In the United States, fraud is considered as misuse of public funds and offenders may experience legal penalties such as a fine or even a prison sentence<sup>32</sup>. In most European countries, cases of fraud are handled by the concerned institutions.

In France, questions of violation of research integrity are currently addressed by each institution. Cases of fraud are treated confidentially. The suspected fraud is examined by a scientific expert or a board of experts. They have to be free from any conflict of interest. The researcher accused of fraud receives a verdict from the Joint Administrative Committee for CNRS researchers or from a disciplinary committee for university personals after

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<sup>31</sup> Fanelli, D. *How many scientists fabricate and falsify research? A systematic review and meta-analysis of survey data*: PLOSone, 2009, 4, e5738; Van Noorden, R. *The trouble with retraction*, Nature, 2011, 78, 26-28; Fang F., Steen G., Casadevall A., *Misconduct accounts for the majority of retracted publications*, PNAS, 2012, 109, 17028–33

<sup>32</sup> The [Office of Research Integrity](#) (ORI) handles accusations of fraud and misconduct within the framework of research funded by the French Ministry of Health and its judgements are mentioned nominally in a [News Letter](#) that is publicly available.

consideration of the experts' report. The direction of the institution decides the penalties and/or reparations, or attempts to restore the researcher's reputation if no evidence of fraud is found.

Preventing scientific fraud is a major concern internationally. It is the responsibility of everyone's including the institutions. Among other things it is indispensable to decrease the publication pressure on researchers. This would prevent researchers from publishing results to quickly or deliberately falsify them.

## 8. RESEARCHERS RESPONSIBILITY TOWARDS SOCIETY

Recommendations were made throughout this guide to help research staff adopting good research practices. The need for honest, rigorous, reproducible and responsible research conditions is a worldwide preoccupation. These principles have been already stated in 1974 in the "[UNESCO Recommendation on the status of the scientific researchers](#)". They will still be at the heart of the revised version of this foundation statement expected to be issued by UNESCO in 2017. In its 2015 report the Council of Europe confirmed that research integrity forms the basis of a high quality research and is vital in order to achieve top level in research and innovation. The knowledge of the laws of nature and of society has been revealed over centuries and has to be constantly consolidated. Researchers today therefore have a strong **responsibility towards the domains of science** to which they have chosen to contribute. They share this responsibility with their research institution and with the publishers world, with which they form the complex echo-system of science production today.

It is also important to emphasize **the researchers' responsibility towards society**. One of the aims of science is indubitably to contribute to the common good of humankind. Yet, the relations between science and society have altered profoundly over the course of history. Advances in technology that result from scientific discoveries are generally unpredictable. Today the notion of progress has come questioned due to growing awareness of the technologies impact on the environment and human health. This puts the spotlight on the questions that citizens ask to researchers and research institutions. It also stresses the importance for researchers to explain their scientific approach to society as a whole.

There is an urgent need for a relationship of trust to be built between citizens and scientists. In a world shaken by successive crises and controversies on sensitive matters, researchers have to listen to the public's questions and consider the impact of their choices. With the consciousness of new risks, public opinion has become increasingly divided between admiration for the meteoric progress of science and worried about some technological developments that provoke controversies across the world. Moreover, the complexity of knowledge means that unequivocal responses are not always anymore possible. Without denying the autonomy of the scientific sphere, the researchers should make in depth reflection about the responsibility that frames their intrinsic liberty. They also should tend to enlighten the public debates from their personal knowledge and expertise. The importance of disseminating the scientific culture and contributing to the elevation of the scientific knowledge of the population is a crucial challenge addressed to the research community as a whole.

## GLOSSARY

ESF-ALLEA: European Science foundation-All European Academies

COMETS : CNRS Ethics Committee

CPU: Conference of University Presidents

ESR: Enseignement Supérieur et Recherche (Higher Education Research)

CHSCT: Committee for Hygiene, Safety and Working Conditions

CNIL: National Commission for Data Protection and Liberties

DOI : Digital Object Identifier

COPE : International Committee of Publication Ethics

AVIESAN : French National Alliance for Life Sciences and Health

ORCID ID: Open Researcher and Contributor Identification

APC : Article Processing Charge

DOAJ : Directory of Open Access Journals

HAL : Link to Articles online

CC: Creative Commons

IF: Journal impact factor

H: Hirsch index

ORI: Office of research integrity

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## ANNEX

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### The National Charter of Ethics for the Research Professions

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#### Signatory institutions (26 January 2015)

A PHP, CIRAD, CNRS, Conférence des présidents d'universités (CPU), INRA, INRIA, INSERM, Institut Curie, Institut Pasteur, IRD.

#### Preamble

In a *knowledge and innovation society* marked by acceleration in the construction and transmission of knowledge and by international competitiveness; public higher education and research establishments and institutions are in a privileged position to address current and future challenges. They are responsible for the provision, dissemination and transmission of decisive advances in knowledge, and contributing to the implementation of a qualified expert evaluation, notably by providing guidance for public decision-making. However, the application of this major responsibility implies consolidating the relationship of trust between research and society.

The aim of a National Charter of Ethics for the Research Professions is to clarify the criteria which define a rigorous and integrated scientific approach, and notably one which is applicable in the context of all national and international partnerships.

This Charter constitutes a French national version of the main international texts in this field: the European Charter for Researchers (2005); the Singapore Statement on Research Integrity (2010); the European Code of Conduct for Research Integrity (ESF-ALLEA, 2011). The Charter falls within the reference framework put forward in the European research and innovation programme, HORIZON 2020.

It is the individual responsibility of every public body and institution involved in research and education to implement this Charter by promoting best practices in research, through training and raising the awareness of both their staff and their students, by setting out ethical markers and establishing clear procedures known to all, with the aim of preventing and addressing any potential divergence from the Code of Ethics.

*It will be up to each institution to adapt this Charter as appropriate to the disciplines and professions concerned.*

#### The Charter

The National Charter of Ethics for the Research Professions concerns all women and men (referred to in the text by the generic term 'researcher') forming part of an institution or body, whether permanent staff or not, who contribute to a research activity and who undertake to respect the principles of integrity expressed herein, in the context of those research projects in which they are involved, either directly or indirectly.

##### 1. Compliance with legislative and regulatory requirements

Any researcher should ensure that they remain informed and up-to-date concerning the legislation and regulations which govern their professional activities and that they comply with any such legislation, notably that covering research on human subjects, animals and the environment.

## **2. Reliability of research work**

Researchers must respect the commitments undertaken by their research unit or for any specific contract. They must always use the most appropriate methods to conduct any research project.

A detailed description of the research protocol, through the use of laboratory notebooks, or any other media, must enable the reproducibility of the experimental work.

All raw results (which are the property of the institution) together with the resulting analysis must be conserved to enable their verification.

The conclusions must be based on a critical analysis of the results and possible applications should not be unjustifiably amplified. The results should be communicated in their entirety in an objective and honest manner.

All research will naturally rely on previous studies and outcomes. The use of these sources must be shown by explicit referencing on the occasion of any scientific production, publication and communication. In certain situations, their use may require prior authorisation to be obtained.

## **3. Communication**

It is the vocation of research outcomes to be brought to the attention of the scientific community and the public, with any earlier intellectual and experimental contributions and intellectual property rights being appropriately acknowledged.

Such work is often collective and, when this is the case, any decision to publish must be taken collectively, with each author being granted intellectual property rights. Authorship should be based on an explicit role in the work carried out and all persons having fulfilled such a role should have their authorship acknowledged. Contributors who do not qualify for the status of author according to international criteria must be included in the 'acknowledgements' section of the publication.

The notion of freedom of expression and opinion is applicable within the legal framework of public service, with a duty of reserve, confidentiality, neutrality and transparency of any personal connections or interests. On each occasion, the researcher shall clearly indicate whether they are intervening in a personal or institutional capacity, and distinguish between that which results from their scientific expertise and that which is based on personal convictions.

Any communication made via the social networks must respect the same rules.

## **4. Responsibility in collective work**

Through their professional activities, the researcher undertakes those tasks entrusted to them by their employer, according to the rules of good practice current within that institution.

Those responsible for collective work and, more generally, those researchers having a supervisory and educational role, must devote sufficient attention to sharing the collective project, clarifying the contribution and developing the skills of all those involved, thus creating a collective dynamic.

Respectful work relationships should be encouraged, with discrimination, harassment and abuse of authority being considered professional misconduct.

The falsification or fabrication of data and plagiarism are deemed the most serious breaches of integrity. They must be reported to the institution concerned and fought against.

#### **5. Impartiality and independence in assessment and expertise**

During the evaluation of a research project, a laboratory or a colleague, the researcher shall examine all files with impartiality, stating any personal connection and withdrawing should they find a potential conflict of interest, incompatible with an impartial assessment. They are required to respect the confidentiality of any deliberation and to refrain from using any data provided during the evaluation procedure.

In the case of an assessment carried out in the name of an institution, the researcher must respect the terms of the national charter on scientific expert reports and the specific version of this which applies to their institution.

#### **6. Collaborative work and plurality of activities**

Collaborative work, particularly outside the institution and internationally, shall be subject to prior agreements with the public or private partners and must preserve the independence of the researcher, notably concerning the provision and use of data, their intellectual property rights and communication. Such work is covered by the same ethical rules, with a responsibility to ensure integrity, transparency and honesty.

Should the advisory or evaluation activities be carried out in conjunction with or peripheral to the research work, researchers are required to inform their employer and to comply with their institution's rules concerning plurality of activities and remuneration. Any interests which may arise from such work must be declared in any communication.

#### **7. Training**

Ethical rules must be integrated into educational curricula, particularly those for Master and PhD degrees, and learning them should be considered an integral part of mastering the specific domain of research.