Journées du Campus d'Illkirch

21 avril 2016

Scientific Integrity

Research ethics and scientific expertise

Jean-Alain Héraud

Professeur de Sciences Economiques

Université de Strasbourg

Chercheur au BETA

The scientific fraud: a debate of growing importance

- Exemple of a recent article:

« Les scientifiques sont-ils poussés à la fraude? Des résultats trop beaux pour être vrais », *La Recherche*, (506) dec. 2015

  - Question: are fraud statistics growing with the extent of the phenomenon or with the measurement and controls?
  - Analysis of the causes:
    - *Pressures to publish*: « la science est – après le journalisme – l'industrie où l'injonction 'publier ou périr' est la plus forte » (op.cit., p.85)
    - Other factors cited in the literature: lack of relevant policies; socio-cultural background; early-career; gender….
- Research-based publications on the topic :
  - « Misconduct policies, academic culture and career stage, not gender or pressures to publish, affect scientific integrity »

Fanelli, Costas, Larivière*, Plos One,* July 2015

The complexity of the question

- *Retractation* statistics are a central information for the studies on scientific fraud
- Let us start with one remark in *La Recherche* (2015):

  > The **reproducibility** issue is one of the causes of *article retractions*.
  > Does this challenge the **honesty and integrity** of scientists?

- The issue is quite different following the scientific disciplines: for instance, in biomedicine a large part of the discoveries are difficult to reproduce
- Are researchers pushed to publish too soon? To which extent is it a misconduct, a fraud, the denial of R.K. Merton's norms? (slide 5)

Applied sciences and local specificities

- When scientific research is closely related to a given field, the results are generally very useful (high *practical value*), but they are at the same time less robust in terms of generality. They have a lower *epistemic value*.
- Examples: many domains in medicine, economics, human sciences…. where local complex circumstances play an important role.
- The more adapted to a concrete situation, the less reproducible are the *models*, even when designed with a rigorous method.
- One important problem with scientific expertise is precisely related to this issue. Scientific researchers are more disturbed by the issue than *professional experts* -lawyers, doctors, managers- for whom it is just business as usual…

Mertonian norms

Sociology of science: *Robert K. Merton(1973) [1942], "The Normative Structure of Science", in The Sociology of Science: Theoretical and Empirical Investigations, Chicago: University of Chicago Press*

universalism: scientific validity is independent of the sociopolitical status/personal attributes of its participants

"communism": all scientists should have common ownership of scientific goods (intellectual property), to promote collective collaboration; secrecy is the opposite of this norm

disinterestedness: scientific institutions act for the benefit of a common scientific enterprise, rather than for the personal gain of individuals within them

organized scepticism: scientific claims should be exposed to critical scrutinity before being accepted: both in methodology and institutional codes of conduct

The reality of scientific life

See Dominique Vinck, *Sociologie des sciences,* 1995

Priority disputes: Gallo vs Montagnier (AIDS), but long before… Newton *vs* Leibnitz (differential calculus), Flamsteed *vs* Halley (astronomical observations), Descartes *vs* Hobbes, etc. Accusation of fraud, plagiarism, manipulation of scientific institutions, etc. were part of the strategic weapons used in such scientific duels (generally not swords or guns).

Secret: revealing only partially the details and proofs of one's discovery for preventing competition during a certain time.

Attachement to own ideas: psychological bias towards own previous representations. Can push outstanding scientist to misconducts like creating false proves of their theory. *My theory = my religion* (belief over methodological doubt and sound scepticism)

Other aspects to consider in the following slides: interactions between several *arenas*: scientific arena, social arena, economic arena, etc.

Exemples of creativity in different domains and possible interactions

Domain	Activity	Results ***measurement***
Science	Research (basic, possibly finalized)	Discovery ***publication***
Technology	Applied research	Invention ***Patent*** *(Not systematically)*
Economy/ society	Industrial and commercial development	Innovation *Sales, profits, employment*...

Examples of arenas

Arena	Institutions	Typical resources & outcomes	Dominant actors	Symbolic referential	Typical deviations
scientific	Research institutes Sci. Journals	Funding Reputation	Researchers (Experts)	Scientific method Objectivity	Lack of independance Fraud
economic	Market	Money	Producers Consumers	Efficiency Competition Utility	Cartels Monopolies Fraud
administrative	Public bureaucracies Agencies	Regulations Procedures Policies	Regulators Lobbyists	Public good	Corruption Inaction
politic	Parliament Public opinion	Power Legitimacy	Politicians Citizen	Democracy	Despotism Private interests

Table partially inspired by Bonneuil, Joly, Marris (2008)

The scientist and the demand for expertise

- Expertise is about specific uses of knowledge, not about knowledge production and evaluation per se
- It is a question of *know what*, not *know why*
- Problems for experts never focus on one discipline, because social reality (including economic, environmental, legal, political… aspects) is multidimensional
- Nevertheless scientific knowledge and legitimacy are required

Know what *vs* know why

- « *In ancient Egypt, the arrival of the ibis in the Nil valley back from the South was supposed to be responsible for the annual flooding. Appeal to the return of the ibis as a causal factor in producing the Nile inundations could accomodate their regular reappearance* » (*)
- For expertise this sort of knowledge is often enough
- Of course, for a scientific theory we need more than conformity with the facts :
- *Epistemic value* (McMullin 1983) expresses « *properties of scientific knowledge that are appreciated independently of pragmatic merits, utilitarian preferences, or social benefits of this knowledge* » (*)

(*) verbatim from M. Carrier, « Scientific knowledge and scientific expertise: Epistemic and social conditions of their trustworthiness »,

Analyse & Kritik 2/2010 (195-212)

Expertise is also more than scientific knowledge

- Applying scientific general knowledge to clarify particular phenomena requires feeding in *additional, local* information
- How relevant is scientific knowledge for scientific expertise?
- There are examples where adjusting general science-based models to local circumstances fails completely :

  Case study : Wynne, Crease (2010) on British sheep farmers problems after the Cernobyl accident in 1986.

- « *It is sometimes the laypeople, being familar with the local conditions, who are much better in giving good advice than scientists* » (Carrier 2010)
- Nevertheless scientific (*epistemic*) knowledge is useful in complement to *non-epistemic* knowledge. It must be harmoniously integrated

The scientist can be personally upset: Why not sticking to the scientific posture? Why doing the job of an expert?

- « *Science is held in high esteem presently*»
- « *Public and private expenditure on research has reached an all-time high in the second half of the 20th century* »
- But « *the driving force is the assumed practical benefit of science* »
- As a result, « *science is demanded to be relevant for expert judgment* »

(Carrier 2010)

What if the scientist is « forced » to participate in expertise?

- Model-building as a basis of expert judgment
- *Bridging the gap between overarching laws and the subtelties of experience*
- The models turn out to be much more complex than assumed earlier
- *The additional elements often modify the theory-based conceptual framework (Morrison 1999)*

(Carrier 2010)

Stakeholders in some case also interfere in the scientific method

- Example of the causal effects of alcohol on road accidents
- The original econometric *non linear* model gave a U-curve at the beginning
- The funding institution did not accept the publication of the report like that and imposed a limitation to the econometric evaluation: restriction to a *linear model* (the probability of accident becomes a strictly monotonic growing function)
- Here, the scientific expertise is not really cheating, but all the possible scientific information is not given...
- And the motivation for manipulating the scientific procedure is (socially) moral in this case!

Conclusions

- The objectives and rules of science (*e.g.* Mertonian norms) are not necessary compatible with the objectives and even with the ethical constraints of other arenas.
- Expertise always implies a dimension of compromise, a tradeoff between professional norms and values of each knowledge community involved.
- For any piece of information or knowledge used in a scientific expertise, there is a potential confrontation between *epistemic value* and *practical value* for many reasons: efficiency, legitimacy, ethics…

Bureau d'économie théorique et appliquée (BETA) UMR 7522

Merci de votre attention

heraud@unistra.fr
jaheraud.eu