

THE OATH OF ISHANGO: WHY AND WHAT FOR?

Vladimir PLETSER
Ishango Milele Foundation,
www.ishango-milele.com
Email : vpletser@ishango-milele.com

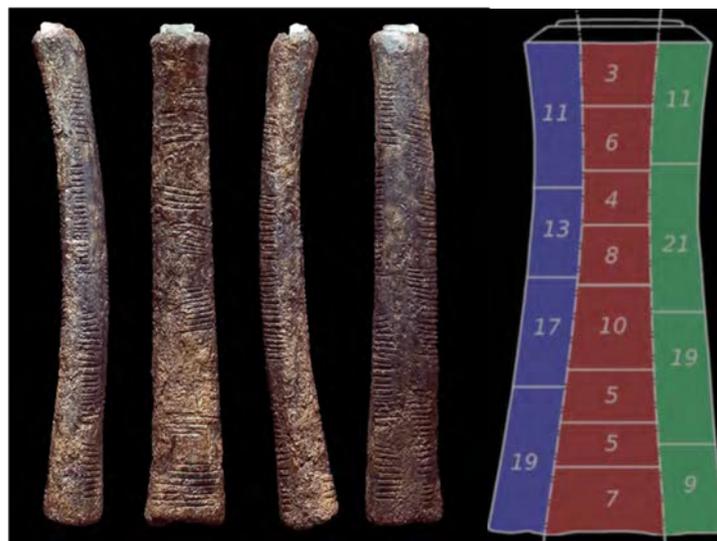
1. Introduction

The African scientific community is invited to reflect upon the need to define a set of ethical rules that would apply to scientists in their research and knowledge transfer activities. These ethical rules could be included in a document to be drawn up, called “The Oath of Ishango”, in homage to the rod of Ishango, the earliest man-made object of a scientific nature, found in Ishango, in Central Africa.

2. The Ishango rod

In the 1950's, the Belgian archaeologist Jean de Heinzelin discovered near the Semliki River, which flows into Lake Edward, a fossilized bone with dozens of incisions on three sides. It is now called the Ishango rod because of its fossilized appearance. Using the Carbon-14 dating method, the age of this fossilized bone is estimated to be approximately 22,000 years old.

Kept at the Museum of the Royal Institute of Natural Sciences of Belgium [1], this bone is in fact a tool composed of a quartz cutting edge and a handle. The very fine quartz tip present at one end may have been used for precision work or skin scarification. The handle bone was thinned, scraped, polished and engraved with 168 approximately parallel notches. The notches are arranged in groups of lines distributed in columns on three sides of the rod.



The Ishango rod : four different views and the distribution of notch numbers by group
(Credit: Museum, Royal Institute of Natural Sciences of Belgium)

Jean de Heinzelin started with the hypothesis that these groups of traits represented numbers. He looked for mathematical correspondences that might exist between these numbers and saw links allowing him to assume basic mathematical knowledge [2-3]. For example, the sum of the numbers is 48 for the middle column and 60 for the left and right columns. The central column has examples of a number and its double: 3 and 6, 4 and 8, 5 and 10, as well as two numbers that are not interpreted: 5 and 7. On the right column, the numbers seem to be related in simple ways to the number 10: $11 = 10 + 1$; $21 = 20 + 1$; $19 = 20 - 1$; $9 = 10 - 1$. The left column contains the numbers 11, 13, 17 and 19. Jean de Heinzelin saw them as the prime numbers between 10 and 20. The mathematician Dirk Huylebrouck and this author have taken up Jean de Heinzelin's early ideas of number notation but consider that there is not enough evidence of knowledge of prime numbers. Instead, on the left column, they see numbers related to the numbers 12 and 18: $11 = 12 - 1$; $13 = 12 + 1$; $17 = 18 - 1$; $19 = 18 + 1$, as for the numbering base 10 in the right column. This observation led to their proposing [4-8] that the rod should be considered as a kind of calculating tool that allows simple arithmetic operations between bases 10 and 12 and their submultiples: 5 and 10, and 3, 4, 6 and 12.

Alexander Marshack, an archaeologist at Harvard University, has also thought of a number notation system but related to a lunar calendar.

If one day one of the mathematical hypotheses is confirmed, it would mean that the men of the Upper Palaeolithic era must have had very advanced knowledge of mathematics, even before the invention of writing.

Jean de Heinzelin pushed the hypothesis even further [2] by asking whether the mathematical knowledge of the Ishango People had not been transmitted to the civilizations of ancient Egypt since other ancient tools found in Egypt, such as harpoon heads, were obviously influenced by the manufacturing know-how of the fishermen of Ishango. From there, this knowledge would have evolved and been transmitted to the civilisation of ancient Greece, then to Roman civilisation and finally to our western civilisation.

3. Proposal for the Oath of Ishango

Today, it is beyond dispute that the Ishango rod is the oldest mathematical object found in the cradle of humanity [9-10] and was used for a form of calculation, whether as a calculation tool, as a lunar calendar or as a tracking tool. This allows us to consider the Ishango rod as representing a first prehistoric scientific activity of Homo Sapiens.

Starting from this idea, this rod leads us directly to reflect on the evolution of our ancestors. The path of this evolution is breath taking! Starting from this prehistoric tool of the Upper Palaeolithic period, humanity has gained ability to travel through space and explore other planets and consider their future exploitation.

The world, which we have rapidly constructed, has become rich in the diversity of its cultures and nations, but it also has many flaws. We have long since lost our notion of a single starting point. It is becoming increasingly difficult to manage harmoniously all the land resources that should be available to the entire human population.

We must remember our past and our sources which gather in the African cradle, in order to take into consideration, the values which advance humanity. We are one great family of the same strain living on this Earth and everything that some do must not harm others. Today's scientists have an increasingly important role to play given their implicit position as actors of the future in each of

their own disciplines. Their role and responsibility to direct research towards a better world, united for the well-being of all living beings, is increasingly a part of their duties!

The idea that scientists should take an oath has already been proposed and defended by others [11-12]. Precedents are provided by the Hippocratic Oath [13] for doctors and the Archimedean Oath [14] for engineers and technicians. A group of scientists now propose that the principle of an 'Oath of good ethical conduct' for scientists should be debated and constructed on the basis of proposals and reflections on the values that this oath should defend, on the terms to be used, and on the values that should be promoted.

In any case, this 'Oath of good ethical conduct' would be dedicated to the first prehistoric scientific instrument: the Ishango rod. This Oath should commit scientists to respect the values of the Ishango rod, although these have yet to be defined. What could these values be? An initial reflection among a small number of scientists, including this author, has revealed the following ethical values, a list which is far from being exhaustive:

- the safeguarding of life, peace and freedom;
- respect for democratic principles and human rights as expressed in the Universal Declaration of Human Rights;
- respect for the environment and the present and future resources available to humanity;
- probity and scientific honesty;
- etc.

A first draft of the text, the fruit of this first reflection, is presented in Appendix 1. This text is far from final and needs to be submitted to reflection to be enriched by the debate among scientists and also incorporating suggestions from young people and students.

Other avenues for further reflection are also proposed in Appendix 2

4. Conclusion

It goes without saying that this undertaking of defining an oath involving scientists cannot be accomplished all at once and will have to involve many discussions and reflections.

That is why we invite African scientists to be the first to reflect on this important commitment for Africa, for the world, for our planet Earth and for the future.

Acknowledgements

The important contributions of Ms Perin Turgay, economist, and Prof. Dirk Huylebrouck, in the elaboration of the draft text of the Oath, and Mr Patrick Crehan for the various proposed reflection lines, are warmly acknowledged.

References

[1] Cammaert L., "Connaissez- vous Ishango?", *Association pour la Diffusion de l'Information archéologique (ADIA)*, Museum, Royal Institute of Natural Sciences of Belgium, Brussels, 2018.

[2] de Heinzelin de Braucourt, J. "Ishango", *Scientific American*, 206, 6, 105–116, June 1962.

- [3] de Heinzelin de Braucourt, J. "Exploration du Parc National Albert", Fascicule 2, *Les Fouilles d'Ishango*, Instituts des Parc Nationaux du Congo Belge (Institutes of National Parks of Belgian Congo), Brussels, 1957.
- [4] Pletser V., Huylebrouck D. "The Ishango Artefact: the Missing Base 12 Link" *Forma* 14-4, 339-346, 1999. <http://www.scipress.org/journals/forma/pdf/1404/14040339.pdf>
- [5] Pletser V. "Does the Ishango bone indicate knowledge of the base 12? An interpretation of a prehistoric discovery, the first mathematical tool of humankind", *ArXiv:1204.1019v1* <http://arxiv.org/ftp/arxiv/papers/1204/1204.1019.pdf> , 4 April 2012.
- [6] Pletser V., Huylebrouck D. "An interpretation of the Ishango rods", *Proc. Conf. "Ishango, 22000 and 50 years later: the cradle of Mathematics?"*, D. Huylebrouck ed., Koninklijke Vlaamse Academie van België voor Wetenschappen en Kunsten, KVAB, 139-170, 2008.
- [7] Pletser V., Huylebrouck D. "The Ishango Artefact: the Missing Base 12 Link." *Proc. Katachi Univ. Symmetry Congress (KUS2)*, T. Ogawa, S. Mitamura, D. Nagy & R. Takaki (ed.), Paper C11, Tsukuba Univ., Japan, 18 Nov. 1999.
- [8] Pletser V., Huylebrouck D. "Research and promotion about the first mathematical artefact: the Ishango bone", *Proc. PACOM 2000 Meeting Ethnomathematics and History of Mathematics in Africa*, Cape Town, South Africa, 1999. <http://www.math.buffalo.edu/mad/AMU/amuchmapdf/amuchma24.pdf>
- [9] D. Huylebrouck, 'L'Afrique, berceau des mathématiques' (Africa, the cradle of mathematics), *Pour la Science*, Dossier 47, April-June 2005 (6 pages).
- [10] D. Huylebrouck, 'Mathematics in (central) Africa before colonisation', *Anthropologica et Praehistorica, Bulletin of the Royal Belgian Association for Anthropology and Prehistory*, 135 – 162, Vol. 117, 2006.
- [11] Verdo Y., "Les scientifiques doivent-ils prêter serment ?", *Les Echos*, France, 4 March 2013 (see Appendix 3).
- [12] See also: <https://euraxess.ec.europa.eu/jobs/charter> ;
<https://euraxess.ec.europa.eu/jobs/charter/european-charter> ;
<http://www.globethics.net/> ;
<http://www.clubofrome.eu/events/article/no-sustainable-future-without-ethical-values> ;
last consulted 12/03/2018.
- [13] See for example https://en.wikipedia.org/wiki/Hippocratic_Oath, last consulted 12/03/2018.
- [14] See for example https://en.wikipedia.org/wiki/Archimedean_Oath, last consulted 12/03/2018.

APPENDIX 1

THE OATH OF THE OF ISHANGO ROD

First draft

Note: The text below is a first draft of the Oath of Ishango. It is far from final. It is submitted to reflection and criticism to be enriched by the debate among scientists and also incorporating suggestions from young people and students.

I hereby pledge that the purpose of my research will always be to promote progress for the welfare of humanity and the safeguarding of our planet.

All scientific research in which I engage myself will have as final object to contribute to the elevation of the whole of humanity in an ethics of equality, freedom, peace and respect for life.

Any results and/or intellectual property rights of my research and scientific results may under no circumstances be used for the destruction, violence, abuse and exploitation of human beings or social classes, and inappropriate exploitation of natural resources damaging the natural balance of our planet and/or any living systems or ecosystems.

I pledge to always act as a scientist inspired by the core values of the Ishango rod and to put them above my personal interests and beliefs, and national, political, cultural considerations.

I pledge myself to work for the material and moral progress of humanity, without harming it or the environment; in an approach of international collaboration and open-mindedness, without considerations of religion, nationality, race, gender, social or political level, unless these contravene one or more of the above values.

I undertake to assume responsibility for all actions taken, writings published and speeches delivered, including all their future consequences, keeping in mind a long-term vision of their impact, with the aim of avoiding any devastating slippage and/or use by malicious persons and/or contravening one or more of the above values.

Name, first name, title, date and signature

APPENDIX 2

SOME POINTS FOR REFLECTION ON THE OATH OF ISHANGO

Patrick CREHAN
Ishango Milele Foundation,
www.ishango-milele.com
Email : pcrehan@ishango-milele.com

1. Summary

The oath of Ishango may be best addressed as part of a more ambitious project that deals with

- The role of science and technology in society,
- The moral imperative to ensure that society is adequately informed,
- The practical need to support rational and critical debate,
- The practical need to support this with a whole system of ETHICS, that covers VALUES, PRINCIPLES and codes of BEHAVIOUR, based on TOOLS, EDUCATION and TRAINING aimed at professionals, managers in the public and private sector as well as citizens.

2. Background and Emerging Issues

2.1 Genetic Engineering

This is a complex and rapidly evolving set of technologies based on the use genetic data and on the manipulation of genetic material. First generation techniques have rightly been associated in the minds of many people with unacceptable forms of risk-taking and the manipulation of public opinion. Some private companies have betrayed the public trust. Some NGOs supposed to defend the public interest are also guilty of mis-information and illegal activity, being driven more by ideology than hard science. Science moves on relentlessly and thanks to the ultra-low cost of obtaining genetic data and the increasing availability of safe, precise life-science techniques such as CRSIPR/CAS9 and RNAi spraying, there are very real opportunities to tackle hard problems related to food security, plant disease and human disease not to mention tackling a wide range of crime and security related issues. African scientist will play a role in this, but the relation between science and the general public must move on to a more constructive approach with less polemic and more open constructive and rational debate.

2.2 Fake News

Dealing with fake news is a global problem. A lot of news is generated by automation using robots. Fake news is often created in bad faith by people intending to confuse the public, influence public opinion. It has the power to influence decision making by citizens, politicians and other elites. It is a threat to the serenity and integrity of democracies, economies and communities and individuals. This is an issue for all societies and economies. It suggests a need to beyond a simple concept of “literacy” and adopt a more nuanced concept of “information literacy.” This could have an impact on our understanding of Sustainable Development Goals. Perhaps it is wise to integrate the achievement of information literacy as a goal for schools at primary and secondary level, and of course at tertiary level.

2.3 Algorithms and Artificial Intelligence

An increasing number of decision making processes that have a material impact on the lives of individuals are automated and managed by algorithms. A hot topic for debate right now is the ability of algorithms to reinforce prejudice and inequality. This can easily happen in good faith and there are many examples where chat-bots that learn by observing real conversation between adults, innocently learns to respond in ways that are clearly bigoted, crass and even overtly racist. This has alerted us to a new source of systemic risk that accompanies the most powerful kinds of unsupervised machine learning. There is also the very real possibility that some people may wilfully misuse such as systems, hiding behind automated processes that provide them with the protection of plausible deniability. This is not just an issue for the most advanced economies, given the rapid adoption of mobile telephone technologies throughout the African continent, it an important issue for Africans as well.

2.4 Personal Data

A very important source of information with commercial value is the many data bases kept by private companies and public-sector organisations about the clients and networks of individuals with which they interact. The EU has created legislation regulating such personal data that elevates almost to the level of a human right, the ability of individuals to know about access and control the use of data stored about them by companies and other organisation. The legislation which comes into force in May 2018, is called the GDPR or General Data Protection Regulation. This legislation has global reach and places an obligation on companies to contact those about whom personal information is held to inform of the information being gathered about them, who it will be shared with and how it will be used. Companies that do not do this wherever they are based are subject to very strong sanctions if they violate these principles.

3. How to Address these Issues

Addressing these issues requires a clear set of VALUES that appeal to and make sense to African people.

These values need to be translated into ETHICS a set of guiding principles that create rules for living, that are easy to understand and that are compatible with major belief systems, both political and religious. Principles alone are not enough. It is also necessary to “operationalise” principles using TOOLS for discussion and animation, vision-building and road-mapping, dealing with verbal and intellectual conflict, techniques such as those of non-violent communication.

The profession of such ethics can be made explicit via the taking of an OATH, the Oath of Ishango. There may be a need for several of these, differentiated according to the nature of the profession involved. The discussion about values and ethics, principles and tools should become the subject of professional literature, dealing with case studies and good practice as well as access to insight needed to support constructive debate with stakeholders and decision makers.

Making this work will require efforts by scientist and teachers and by the various professions, the people responsible for decision making such as engineering, management and public administration.

This should become part of the general culture through a system of EDUCATION and TRAINING that touches upon primary, secondary and tertiary education as well as vocational education and training. This involves the development of curricula, innovation in new pedagogical techniques

and activities intended to develop social skills, for collaboration, communication across religious national and ideological divides, as well as the training of teachers,

Professionals in science and technology are best placed to inform the general public about important developments and explain in clear terms what these are, and how they could impact business, the economy, society and the planet.

Those in higher education and in the training of professionals are well placed to teach about values and ethics and good “professional conduct” providing the members of professions and those privileged with higher education and knowledge ore up to date and deeper than that which is easily available to the wider public, to identify potential conflicts of interest and threats to the public good, and behaviour in ways that allow open, respectful and constructive debate that will improve the understanding of the public of how the world is being transformed through science and technology, as well as helping decision makers in private and public life to make decision that are “good.”

4. How to proceed?

The Oath is thus not only a text, the text is only the representation of a SYSTEM. It is this system that gives the oath its meaning and moral weight.

- This system is based on VALUES
- The values are made operational by PRINCIPLES
- that help to define PRACTICES that respond to important and real situations
- We can call all the practices CODE of CONDUCT or CODE of ETHICS
- It is a "whole" whose integrity is defended by an INSTITUTION

Objective of the Oath

- What is the purpose of the "Oath"?
- What values does it represent?
- How will we see that the objective is achieved?

Visibility of the Oath

- How do we find the persons and institutions who adhere to the Oath?
- Does the Oath remain a purely personal matter?
- Or does it engage the public?
- How do we know who lent the Ishango Oath?

Professional Responsibility, Accountability and Transparency

- What are the obligations of the person who lends the Ishango Oath?
- What can the public expect from him?
- What to do if the person does not respect the codes of conduct?
- How to question or punish the person who wanders in his behaviour?

Tools, Methods, Practices

- What are the difficult problems (conflicts) that can be faced?
- What tools can be applied?
- How can the person be trained?

Accession and Adoption

- What kind of system (structure, governance, funding)?
- What would be the role of universities (presidents, deans, etc.)?
- What would be the role of the research centres (director, researchers and visitors, etc.)?
- What would be the role of education, training and teaching institutions?
- What would be the role of professional associations and bodies?
- What would be the role of international donors and institutions?

APPENDIX 3

LES SCIENTIFIQUES DOIVENT-ILS PRETER SERMENT?

[DO SCIENTISTS HAVE TO TAKE AN OATH?]

Yann Verdo - Les Echos, 04/03/2013

Note: This is an article that was published in French in the French Newspaper "Les Echos" in 2013. An English translation follows.

Les chercheurs sont de plus en plus appelés à s'exprimer sur les sujets de société. Mais la question de l'éthique est trop souvent absente des cursus. D'où l'idée d'une prestation de serment.

Est-il encore possible, en 2013, de trancher un grand débat de société sans s'en remettre pour consultation - quand ce n'est pas davantage - à l'avis des experts, c'est-à-dire de la science ? Devons-nous interdire les OGM ? Fermer nos centrales nucléaires ? Autoriser l'exploration d'éventuels studios de radio, entre deux politiques, un spécialiste de la biologie moléculaire (qui peut aussi se doubler, cela s'est vu, d'un militant pro ou anti-OGM...), un autre de la fusion atomique, un troisième des nappes phréatiques. L'entrée dans le Code civil du « mariage pour tous » change-t-elle en profondeur la notion de filiation ? Demandez à un sociologue de la famille ou à un pédopsychiatre. La controverse autour de l'ouverture de la procréation médicalement assistée (PMA) aux couples de femmes enfle-t-elle au point d'embarrasser le gouvernement ? Le président du Comité consultatif national d'éthique (CCNE), Jean-Claude Ameisen (médecin immunologiste) déclare qu'une « réflexion de fond » sur la PMA devrait prendre au moins six mois, retirant une belle épine du pied des pouvoirs publics, qui saisissent aussitôt l'occasion de s'en remettre prudemment au verdict des « sachants ».

Loin de se distendre à mesure que s'accroît la spécialisation dans tous les champs de la connaissance, le lien unissant le scientifique à la société ne cesse au contraire de se resserrer. A ses missions traditionnelles, qui ont toujours été de chercher et d'enseigner, s'ajoute de plus en plus souvent celle d'éclairer le débat public. A la lumière des connaissances dont lui et lui seul dispose, bien entendu. Mais aussi de ce que lui dicte sa propre conscience. L'éthique personnelle des scientifiques est devenue, pour une bonne part, l'affaire de tous.

Même les maths

A l'occasion d'un récent colloque organisé par la commission française de l'Unesco sur la « formation à l'éthique des scientifiques », l'astronome Pierre Léna a remis à l'honneur une idée vieille de vingt ans (lire ci-contre) : celle d'instituer un « serment du scientifique », analogue au serment d'Hippocrate des médecins ou à celui que prêtent magistrats et avocats lors de leur entrée en fonction.

Dans la bouche de Pierre Léna, pareille proposition n'est pas une parole en l'air : au milieu des années 1990, il a participé, aux côtés des philosophes des sciences Michel Serres et Nayla Farouki, à la réflexion collégiale qui a abouti à proposer en 1998, pour la première fois en France, une formulation d'un tel serment. Après quoi, de 2003 à 2007, il a présidé le comité d'éthique du CNRS, créé en 1993. « *Avant de commencer à m'intéresser à la question, je pensais naïvement que l'éthique concernait surtout la biologie, pour laquelle il existe des lois de bioéthique spécifiques, se rappelle-t-il. Mais c'était une erreur.* »

De fait, souligne-t-il, des problèmes éthiques se posent dans toutes les disciplines - même les plus éloignées de la recherche médicale -, et ce n'est pas par un simple effet de mode que la plupart des grands organismes de recherche se sont progressivement, dotés dans les années 1990, dans le sillage du CNRS, de leur propre structure de réflexion en la matière. A l'image du Centre national d'études spatiales (Cnes), où le philosophe et théologien Jacques Arnould anime depuis douze ans la réflexion autour de thèmes tels que la multiplication des débris spatiaux ou la contamination planétaire. « *Nous savons aujourd'hui que les hommes qui se sont posés sur la Lune lors des missions Apollo l'ont inséminée. Mais nous espérons ne pas faire la même chose sur Mars* », indique Pierre Léna à titre d'exemple.

Et que dire des actuels projets de géo-ingénierie visant à limiter le réchauffement climatique, comme cette idée du prix Nobel de chimie Paul Joseph Crutzen (découvreur du trou dans la couche d'ozone) d'injecter du soufre dans l'atmosphère afin de la refroidir ? « *Peut-on ainsi modifier ad libitum l'atmosphère, le climat ? Sommes-nous bien sûrs de connaître tous les effets de telle ou telle solution ?* » s'interroge l'astronome.

Même une science aussi abstraite que les mathématiques n'est pas épargnée. Il n'est que de se souvenir de la tempête médiatique déclenchée par les propos de Michel Rocard en novembre 2008. Dans une tribune, l'ancien Premier ministre s'insurgeait contre ces « *professeurs de maths qui enseignent à leurs étudiants comment faire des coups boursiers* », allant même jusqu'à parler de « *crime contre l'humanité* ». Sans tomber dans l'outrance, on ne peut que constater que les produits financiers toxiques ayant plongé l'économie mondiale dans la crise sont le fruit de recherches mathématiques.

Les lignes bougent

Face à tous ces dangers, personne ne peut croire qu'une cérémonie de serment instituée par exemple lors de la délivrance du doctorat constituerait à elle seule un garde-fou efficace. Les détracteurs de cette idée - et ils sont au moins aussi nombreux que ses partisans - dénoncent une mesure purement cosmétique, « pour la galerie ». Ethicienne en titre de l'Institut Pasteur, Virginie Pirard est bien consciente de ces critiques. Ce qui ne l'empêche pas d'y être favorable. « *L'intérêt potentiel d'une telle cérémonie est de créer un moment de conscientisation des enjeux de la recherche.* » Or, constate la jeune femme, de tels moments sont rares, surtout en début de carrière. « *Les doctorants et les post-doctorants ont peu de temps pour s'interroger sur ce qu'ils font autrement que sur le plan technique. Ils sont soumis à une forte pression : ils doivent publier, décrocher un poste permanent, stabiliser leur carrière* », reconnaît-elle. Pierre Léna va plus loin encore, faisant un parallèle entre la course à la publication dans laquelle sont forcées de s'engager toutes les jeunes recrues des laboratoires et... le dopage cycliste !

L'idée d'instituer un serment du scientifique soulève d'innombrables questions : faut-il le décliner par disciplines ou s'en tenir à un texte unique ? Le centrer sur les valeurs universelles (celles, par exemple, de la Déclaration universelle des droits de l'homme) ou y inclure des éléments de bonne pratique ? Le réserver aux seuls scientifiques ou l'étendre aux ingénieurs ? Et d'ailleurs, comment articuler la prestation d'un serment avec les impératifs économiques de l'entreprise ? Même en laissant de côté les ingénieurs, il n'en reste pas moins qu'en France, plus de la moitié (56 %) des chercheurs travaillent dans des laboratoires privés, une différence notable avec les professions assermentées.

Sur toutes ces questions, le débat est ouvert. Il est cependant un point sur lequel tous les « pro-serment » se rejoignent : celui-ci doit être l'aboutissement d'une formation ne misant pas tout sur la technique, mais faisant aussi la part de la réflexion sur les enjeux sociétaux et culturels de la science étudiée. C'est encore loin d'être le cas : à l'Institut Pasteur, où cohabitent des scientifiques de plus de 50 nationalités, Virginie Pirard s'étonne que peu d'entre eux aient entendu parler du « procès des médecins » impliqués dans les horreurs de la Shoah. *« Ce n'est pas leur culture personnelle qui est en cause. Ce qui leur manque, c'est d'avoir reçu au cours de leur formation une sensibilisation spécifique concernant les risques et responsabilités éthiques associés à leur discipline »* estime la philosophe.

Mais les lignes bougent. A l'Université catholique de Lyon, le recteur Thierry Magnin, spécialiste des problèmes d'éthique posés par la biologie de synthèse, est en train de mettre sur pied avec son équipe pédagogique une licence « sciences de la vie et humanités », destinée aux futurs biologistes, mais dans laquelle il est autant question du principe de responsabilité de Hans Jonas que des manipulations génétiques de Craig Venter. Un exemple à suivre.

Le serment du scientifique, genèse d'une idée

1993 L'Ecole polytechnique fédérale de Lausanne prend une initiative inédite en encourageant fortement ses jeunes diplômés à prononcer le « serment d'Archimède », inspiré du serment d'Hippocrate des médecins.

1995 Dans le discours qu'il prononce à l'occasion de la réception de son prix Nobel de la paix, le physicien polonais Joseph Rotblat, fondateur du mouvement Pugwash pour le désarmement nucléaire, reprend à son compte l'idée d'un serment du scientifique.

1998 Dans « Le Trésor, dictionnaire des sciences » ouvrage collectif dirigé par les philosophes Michel Serres et Nayla Farouki, les auteurs proposent une version du serment. Michel Serres en donne lecture dans une vidéo accessible sur YouTube.

DO SCIENTISTS HAVE TO TAKE AN OATH ?

Yann Verdo - Les Echos | 04/03/2013

Researchers are increasingly called upon to express themselves on social issues. But the question of ethics is all too often absent from curricula. Hence the idea of taking an oath.

Is it still possible, in 2013, to decide on major societal issues without referring for consultation, especially when the situation require expert input or scientific insight? Should we ban GMOs? Should we shut down our nuclear power plants? Should we authorize radio debates to explore policy choices, bringing together a specialist in molecular biology (who may also double as a pro or anti-GMO activist, another one expert in atomic fusion, a third expert in hydrology? Does the introduction of "Marriage for all" into the Civil Code fundamentally change the notion of parental rights and obligations? Shouldn't we ask a family sociologist or child psychiatrist? Does the controversy surrounding access to assisted reproduction (ARP) to women's couples cause so much disruption as to embarrass the government? Jean-Claude Ameisen, President of the National Consultative Ethics Committee (NAC), says that a "fundamental reflection" on ARP would require at least six months of debate, but would remove a fine thorn from the feet of public authorities, who could then seize the opportunity to cautiously rely on the verdict of the "Scholars".

Far from loosening as specialization in all fields of knowledge increases, the ties between scientists and society are becoming ever tighter. To its traditional missions, which have always been to teach and carry out research, the task of informing public debate is increasingly added. In the light of the knowledge that they and they alone possess, as well as by what their own conscience dictates, the personal ethics of scientists have to a large extent become everyone's business.

Even Mathematics

On the occasion of a recent colloquium organized by the French National Commission to UNESCO on "the training of scientists in ethics", the Astronomer Pierre Léna revived the twenty-year-old idea of instituting a "scientific oath", analogous to the Hippocratic oath taken by medical doctors or that which magistrates and lawyers take when they take office.

Coming from the mouth of Pierre Léna, such a proposal is more than empty words. In the mid-1990s, alongside the Philosophers of Science Michel Serres and Nayla Farouki, he took part in a collegial reflection that in 1998 led to the formulation of such an oath for the first time in France. After that, from 2003 to 2007, he chaired the ethics committee of the CNRS (*Centre National de la Recherche Scientifique*), French National Research Centre), created in 1993. He remarked that *"before I started to get interested in the issue, I naively thought that ethics was primarily about biology, for which there are specific bioethical laws,"* he recalls. *"But this was a mistake."*

He points out that ethical problems arise in fact in all disciplines, even in those furthest away from medical research. It is not an arbitrary trend that, since the 1990s, most major research organisations have gradually set up their own structures for reflecting on these issues, following

the example of the CNRS. Like the *Centre National d'Etudes Spatiales* (CNES, the French Space Agency), where for the last twelve years the Philosopher and Theologian Jacques Arnould has led a reflection on topics such as the increase in space debris and the possibility of planetary contamination. "*We now know that the men who landed on the Moon during the Apollo missions contaminated it. But we hope not to do the same thing on Mars*" says Pierre Léna for example.

And what about current geo-engineering projects to limit global warming? Paul Joseph Crutzen, discoverer of the hole in the ozone layer and winner of a Nobel Prize in Chemistry, proposes injecting Sulphur into the atmosphere to cool it down. "*Can we thus modify ad libitum the atmosphere, the climate? Are we sure we know all the effects of this or that solution?*" wonders the Astronomer Pierre Léna.

Even a science as abstract as mathematics is not spared. One only has to recall the media storm triggered by the remarks of Michel Rocard's in November 2008. The former Prime Minister railed against "*math professors who teach their students how to do good stock market stunts*", even going so far as to speak of "*crimes against humanity*". Without going too far, we can only conclude that the toxic financial products that plunged the world economy into crisis are the result of mathematical research.

The lines are moving

Faced with all these dangers, no one can believe that an oath taking ceremony instituted for example at the time of the awarding of the doctorate, would on its own provide an effective safeguard. Critics of the idea of an oath, and there are at least as many as its supporters, denounce it as a purely cosmetic measure "*for the gallery*". Virginie Pirard, an Ethicist currently at the Pasteur Institute, is well aware of these criticisms. They don't prevent her from supporting it. "*The potential interest of such a ceremony is to create a moment of awareness of research issues.*" However, she notices that such moments are rare, especially at the beginning of a career. "*Ph.D. students and post-doctoral fellows have little time to think about what they do other than technically. They are under a lot of pressure: they have to publish, get a permanent job, stabilize their careers*" she points out. Pierre Léna goes even further drawing a parallel between the race for publication in which all young laboratory recruits are forced to get involved and... doping in cycling!

The idea of instituting an oath for scientists raises innumerable questions. Should it be broken down by discipline or should it be confined to a single text? Should it focus on universal values (such as the Universal Declaration of Human Rights) or include elements of good practice? Should it be reserved only for scientists or extended to engineers? Moreover, how do you link the taking of an oath with the economic imperatives of enterprise? Even leaving engineers aside, the fact remains that in France, more than half (56%) of researchers work in private laboratories, a notable difference from the sworn professions.

On all these issues, the debate is open. There is, however, one point on which all the "pro-oath" people agree. The oath should be the outcome of a training course that does not rely entirely on technology, but also reflects on the societal and cultural stakes of the studied science. This is still far from being the case. At the Pasteur Institute, where scientists of more than 50 nationalities

work together, Virginie Pirard is astonished that so few of them have heard of the "doctors' trial" implicated in the horrors of the Shoah. *"It is not their personal culture that is at stake. What they lack is to gain awareness during their training of the specific ethical risks and responsibilities associated with their discipline,"* says the Philosopher.

But things are changing. At the Catholic University of Lyon, Rector Thierry Magnin, a specialist in the ethical issues raised by synthetic biology, is in the process of setting up with his pedagogical team a "life sciences and humanities" degree, intended for future biologists, in which the principle of responsibility of Hans Jonas as well as the genetic manipulations of Craig Venter are discussed. Theirs is an example to follow.

The oath of the scientist, genesis of an idea

1993 The *Ecole Polytechnique Fédérale de Lausanne (EPFL)* takes an unprecedented initiative by strongly encouraging its young graduates to take the "Archimedes' oath", inspired by the Hippocratic oath of the doctors.

1995 Polish Physicist Joseph Rotblat, founder of the Pugwash Movement for Nuclear Disarmament, takes up the idea of a scientist's oath in his speech at the reception of his Nobel Peace Prize.

1998 In "*Le Trésor, dictionnaire des sciences*", a collective work directed by the Philosophers Michel Serres and Nayla Farouki, the authors propose a version of the oath. Michel Serres reads it in a video available on YouTube.