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Ethics and scientific integrity in a world lacking morality

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Ethics and morals are mentioned every day in casual conversations between people and the daily news in newspapers and on the internet, especially when referring to public figures' dubious or dishonest acts. It would seem that corruption has invaded the modern world and that principles and morals are lacking. However, do we really know what ethics and morals are? Do we know what they are for? If we surveyed people, we would be surprised (or perhaps it is not a surprise) that most people would find it difficult to clearly define ethics and/or morals, even when such terms are widely known, used and have been internalised by everyone.

We all have a sense of morals and agree that this enables us to recognise what is and what is not acceptable within a determined context and that such context facilitates differentiating what we consider good from bad. Nevertheless, notions of good or bad are influenced by many internal factors pertaining to every human (i.e. attitude, aptitude, knowledge), along with external ones (i.e. social, cultural and traditional aspects). Having/asserting universal moral values regarding particular things is thus difficult and this is where ethics (a branch of philosophy studying the good and/or evil nature of actions) can help in creating a type of knowledge acting as a guide for rational human action, according to basic principles such as beneficence, justice and freedom.

Humans are moral beings by nature; the brain houses a functional network regarding morality. Evolution has led to us developing a specialised frontal cortex housing a neural arrangement differentiating us from other animals, in addition to the opposable thumbs which characterise us. This is not because humans have special and unique abilities, such as being able to talk, reason and/or feel (it has already been shown that many animals have such abilities and also have others which are lacking in humans), but rather that such characteristics in humans have another level of complexity. Human beings have a unique attribute (for the moment) – free will, this being the ability to decide with full freedom of choice. However, such attribute entails deep reflection regarding the consequences of our actions and therefore requires that we take full responsibility for our decisions. Clear guidelines can be formulated concerning the acceptance of our own and others' behaviour if this is done so as a society. It is worth clarifying that morality is evolutionary; experiments on monkeys, crows and dogs have shown that these animals have notions of justice, cooperation and consolation that were considered unique to human beings until quite recently.

Humanity has become used to making declarations and massively accepting them, such as those regarding human rights, objectives for sustainable development and the Declaration of Helsinki (statement of ethical principles for medical research involving human subjects - 1964), the Singapore Statement on Research Integrity (2010) and the Brasilia Declaration (2010) in the field of science. Nonetheless, it is worth considering whether we come up to the expectations specified in our declarations as it is one thing to declare something (implying understanding and internalising it) and quite another to act on it (requiring commitment to a stated purpose and the will to do something about it).

Modern science has highlighted the need to salvage old values and virtues since we live in a demoralised world; this refers to the fact that people have lost hope and concepts regarding morality. We have normalised acts which are reprehensible regarding recognised codes of conduct or sets of principles (i.e. ethics). Inventing, falsifying or altering data, plagiarism, not

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declaring a conflict of interest, irresponsible mentoring or undeserved authorship are some of the many corrupt acts going against scientific integrity which are occurring more and more frequently.

Regarding authorship, it should be stressed that, according to international editorial guidelines, at least four of the following criteria must be met (without exception) to be the author of a scientific article: having made an intellectual contribution, a significant contribution, given final approval of the manuscript and accepting full responsibility. It is thus very clear that all the authors whose names are listed at the head of a publication are equally responsible for ensuring methodological rigor, honesty, transparency and professionalism, along with good management of the whole research process, implying compliance with current regulations.

Another aspect which I would like to highlight concerns recognising the individual value of being; I do not mean just human beings, but also the many animals used in all types of research and who die invisibilised, being referred to as an "n" or a code. Although forming part of research methodology, they require special attention as they are sentient beings according to the Cambridge Declaration on Consciousness (2012) and it is thus our responsibility as scientists to ensure strict compliance with the famous 3Rs: reducing the amount of animals required (using an appropriate experimental design and robust statistical tools), replacing animal models with other types of model if they exist (e.g. computational models or *in vitro* cell cultures) and refining processes (i.e. making them better and better, following good laboratory practice (GLP) regulations and paying special attention to the level of risk for the animals involved, especially those carrying a greater risk of causing pain or suffering). Likewise, invasive procedures such as surgery, implanting organs/tissue and pharmacological treatment must be supervised by a qualified veterinarian (i.e. the only professional ethically qualified for such procedures). Failure to meet these standards could lead to scientifically incorrect, morally reprehensible and legally questionable research results.

Experience serving on ethics committees and Institutional Animal Care and Use Committees (IACUC) has shown that many students, teachers and even recognised researchers lack conceptual clarity regarding ethical aspects and that guidelines are being violated/disregarded due to simple ignorance. This is where ethics finds its niche as a decisive tool for ensuring scientific quality, especially at a moment in the history of humanity demanding that universally accepted moral values be cultivated, such as justice, truth, truthfulness, kindness/goodness and cooperation.

Like all crops, harvesting the fruit will require time, care, patience and discipline; this is why ethical and moral education are required. Ethics is a pending and fundamental subject regarding training/education at all levels; it is fundamental in PhD studies for managing and ensuring scientific integrity in today's world. We most sow values and virtues in young people so that they are able to cultivate and harvest an integral nature regarding all aspects of life, including that related to research. Perhaps the world will not be demoralised in the not too distant future and ethical principles will provide clear guidelines for humanity's daily work which would lead to saving many important resources by increasing trust and creating optimal cooperative work environments for the efficient use of available resources.

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