

New paradigms and ethics

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When reading the Editorial “The Road to Balanced Oversight” (Science, Volume 313, page 831), one cannot help remembering that Oswaldo Cruz, a Brazilian scientist who had to face a war against yellow fever with inadequate scientific tools and who proposed a new paradigm - vaccination -, more than a century ago, was publically persecuted for his effort. History proved him right. The Hinxton Group (1) rightly concluded that scientists should be free to work in any country as long as they obey the laws of the country where they are working. It would be unethical, however, for them to take advantage of lack of laws to do their work. If society, as stated above, should be free to regulate science independently in any country, it is biased to say that those laws that are less restrictive are permissive. It is the same as saying that restrictive laws are always right and less restrictive laws are always wrong. New paradigms often face negative public reactions not always for ethical or sound scientific reasons. The advances in DNA synthesis indicate that science may be able to create microbes *in vitro* (2). Reinart and then Steward, half a century ago, produced plant embryos from somatic plant cells (3). Now we know that perhaps few genes in animals confer embryonic potential (4). Developmental biology is telling us that soon we will be able to produce animal embryos

from somatic cells which may be as totipotent as plant cells. What are we going to do if we learn to manipulate human somatic cells so that they become embryonic cells? Should we stop doing science with any human living cells which we have been studying for a century? Should we prevent the production of human embryos from somatic cells, embryos needed for the advancement of science for ethical reasons? We can of course prevent the use of these embryos to generate human beings. Laws must be very restrictive when science goes beyond this threshold. A clear difference can be established between a human embryo and a human being, this being dictated by cell lineage differentiation and the laws of developmental biology. Perhaps we should focus on what the ethical purpose of science is and, rather than preventing the flow of scientific knowledge, we should try to reach a global scientific consensus on biological concepts. This achievable task may turn out to be less difficult than pursuing consensus on moral issues, which may delay the development of new scientific paradigms, historically justifiable to assure the survival of humanity. Where should society draw the line that will say no to the flow of scientific knowledge? The route chosen to interfere with the safe advancement of science in any field may be extremely dangerous.

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