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Comment

Science museums in a knowledge-based society*

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What is the role of science museums nowadays? If we want to answer this question, we need to understand the historical period we are living and what role(s) museums can play. We are undoubtedly at the beginning of a new age based on a new relation between science and society, a concept which has been explained and repeated by sociologists and economists over and over again and is confirmed by statistics.

2006, for instance, was a significant year for science: for the first time ever, investments in research and development (R&D) exceeded 1,000 billion US dollars (with equal purchasing power), i.e. nearly 2% of the world's GDP. For the first time over the last century, China has invested more in R&D than Japan (136 billion) and is now the world's second largest investor in research and technological development. Likewise, India has invested more than Great Britain, while Spain and Italy have been overtaken by "small" South Chorea in absolute terms. For the first time in history, Asiatic countries have invested more in R&D than North America. However, the United States are the world's most important investor.[1,2]

2006 was undoubtedly a record year for the international scientific community. This trend perfectly mirrors that long-term process that was started more than two decades ago and during which three major events contributed to changing the general situation, as reported by the US National Science Foundation.[3]

First: the world's investments in R&D are now threefold, with equal purchasing power.

Secondly: investments in R&D from private investors are increasing at a higher pace than investments from the public sector. In this respect, the 2:1 ratio does not only concern the United States, but involves, at different levels, all countries in the world.

Lastly: a transfer has taken place from bipolar research to an at least three polar one: all through the 20th century, scientific research was merely limited to the two Atlantic shores, namely Europe and North America, with the exception of Japan. China, India and another ten Asiatic countries started to "believe in science" and invest in research and development far later. The merely transatlantic nature of scientific research has developed into a mainly indo-pacific one: 75% of the world's expenditure in R&D takes place in countries on the Pacific and/or Indian Oceans, while "only" 55% in countries on the North Atlantic shores. Up to twenty years ago, percentages were exactly the opposite.

Of course, not only Asia, North America and Europe are to be considered. In a discreet, yet significant way, many countries in South America started a process of "development through research", of which Brazil is an example.

These figures and the changed geopolitical context suggest that a knowledge-based society and economy have definitely taken root, which is further confirmed by the fact that the production and marketing of highly knowledge-based products are two of the most dynamic sectors of the world's economy. According to experts, competitiveness will, in the future, take the shape of a triangle, the "triangle of knowledge", outlined by three innovative technological sectors: information technology, biotechnologies and nanotechnologies.

However, that the new era of knowledge will be a triumphal ride to progress and prosperity is not to be taken for granted. If the period we are living in is to be understood and resources to be sensibly addressed to achieve a desirable future, some questions have to be answered. What does exactly *knowledge-based society* mean? Who does knowledge exactly belong to? Is knowledge – and therefore

* From the introduction of *La scienza in mostra. Musei, science centre e comunicazione* by Matteo Merzagora and Paola Rodari, , Paravia Bruno Mondadori Editore, Milan, 2007.

science – acceptable if it generates new inequalities? Is it not necessary to reaffirm the ancient Baconian ideal, according to which science cannot be a prerogative of few people, but must benefit the entire humankind?

In addition, control issues come into play. If the main question in the social and political realms of the industrial era was "who controls means of production?", the major question in the era of knowledge is "who controls means of invention?"

In the techno-age– considered to be autonomous and self-propulsive – another issue to be addressed is what man can do with technology. Or, perhaps, one should simply surrender to Umberto Galimberti's question of what technology will do with man?[4]

Mankind became aware of their changed relation with nature and their new role on the planet about two decades ago. They know they are global environmental actors who can influence the great biogeochemical cycles of the Earth, accelerate the pace of global climate changes and contribute to the erosion of biodiversity. Their being environmental protagonists unavoidably means that expectations arise about scientific communities, urged to produce new knowledge, better define global dynamics and minimise undesirable effects of human acting on environmental balances.[5]

Therefore, science acts as both the main lever for the growth of the "wealth of nations" (to use an expression by Adam Smith) and as major tool for the environmental sustainability of the growth of the "wealth of nations".

Scientific and technological developments are accompanied by heated cultural and bioethical debates, thus making national and international agendas increasingly and unprecedentedly complex. Science has left its "ivory tower", and relations among societies are becoming more and more intertwined.[6,7,8]

Within this context, the way scientists work has changed. In exchange for unprecedented resources and a socioeconomic role of primary importance, scientific communities around the world – differently from what was the case until recently – have to make important decisions for the development of their research activities together with non-scientific people, such as politicians, bureaucrats, managers, ordinary people.

As a consequence, in what has been defined as the post-academic age, scientists feel a greater need for public approval (especially political) of their activities. Moreover, there is an increasing need within scientific communities to tackle the issue of "social responsibility of science".[9] Communicating with and explaining science to non-scientific audiences has also proved to be a manifest – and less and less avoidable – necessity for researchers.[10] In so doing, they should also – or at least try to – remain apolitical, which was one of the fundamental principles of the "Republic of Science" in 1600s.[11,12]

On the other hand, due to the relevant influence scientific culture and its technological consequences have on society, the urgent need has arisen to govern science and address it towards a desirable future.[13] Science has become a major driving force in a knowledge-based society and disseminating it has grown into a social need,[14] a fundamental element in modern democracies.

An attempt to answer the question made in the opening of this article may, at this juncture, be made. If this is the present scientific context, what is the role of science museums? What is their mission?

There are no clear-cut answers or normative solutions. Each individual can (and has to) create a museum as they like it. However, one thing is undoubtedly sure: a museum having "communication effectiveness" as a mission, without connecting it with knowledge-based society and the major issues arising from it, is likely to have a short life. Science museums need to have more ambitious and concrete targets, i.e. to become one of the main places where the new "scientific citizenship" is created.[15]

Cultural aspects also play a decisive role. Scientific citizens are informed ones and the role of science museums is to contribute to their scientific information-building process. Therefore, museums need to be educational and have to tackle both the issue of "communication effectiveness" and that of "globalization of knowledge". Everyone needs to learn how to live in a context where science is not produced in any particular region (be it Europe, or North America), but everywhere in the world, and where competitiveness is not asymmetric – i.e. existing between countries having knowledge and countries not having it – but at least tending to be symmetric – i.e. among countries having the same degree of knowledge, in that they all produce it –.

Social and political aspects cannot be forgotten either. Knowledge cannot be an advantage for few, but for the whole human kind. Everyone must, at least in principle, have the chance to access new knowledge. Nowadays, science museums can be, together with schools, universities and other private

and public institutions, a place where a "knowledge-based democracy" is forged, where anyone can access knowledge.

On the other hand, scientific citizenship means dialogue. Museums must contribute to make communication easier between experts and non-scientific audiences and, more in general, between shareholders and stakeholders. Scientific citizenship means democratic possibility to choose. Museums have to be public places where issues are discussed and a shared view is reached among representatives of different, legitimate interests.

The financial dimension is a further aspect playing an important role. Scientific citizenship means economic democracy of knowledge. Museums have to become places where scientific knowledge is not only disseminated, but where a transfer of knowledge takes place between those producing it (scientists) and those using it to increase wealth (enterprises). A further task of science museums thus becomes apparent, i.e. to create new knowledge-based enterprises, experiment and develop a democratic and environment-friendly economy "from below", because knowledge cannot be a social dividing factor, but an opportunity for everyone to reinforce sustainable development, both from a social and environmental point of view.

Translated by Silvia Agostini

Notes and references

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