



The human ark in a DELUGE OF DATA

Workshop discusses potential of eScience
and affirms the important role of the humanities

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For certain scientists, the Gordian knot in developing their theories is that they require ever more data and that new ideas cannot be tested due to a lack of equipment or technology. For others, such as genomics researchers and astronomers, their anguish is due precisely to an overabundance: data are collected so quickly that they overwhelm the ability to analyze, validate and store the information. To address this flood of information, eScience, a tool that aims to increase our ability to analyze the large volumes of data generated by research, involves creating software capable of handling the information collected.

FAPESP and Microsoft sponsored the 2013 Latin American eScience Workshop last month in São Paulo to discuss the development of this tool. “Space telescopes, genetic sequencing machines, and particle accelerators are all generating unprecedented volumes of data. To deal with this phenomenon and allow scientists to manipulate and share data, we need various types of computer science technologies and tools that will allow us to carry out scientific research faster

and with greater impact,” explains Tony Hey, Vice President of Microsoft Research.

“We have high expectations for eScience. If we learn how to use it properly, it can support major advances not only in research, but in how scientific research is carried out,” says Carlos Henrique de Brito Cruz, scientific director of FAPESP, at the opening of the workshop, when he announced that the institution intends to create a program to support eScience research soon. “We are convinced that one of FAPESP’s important roles is to be at the forefront of innovation and knowledge, and we believe supporting research in eScience is very important, not only because its application to areas such as the environment is unmistakable, but also because of its great potential in the humanities, for example,” says Celso Lafer, president of FAPESP. Proof of this concept is that the workshop was closed with a speech by historian Chad Gaffield, President of the Social Sciences and Humanities Research Council of Canada (SSHRC), for whom the great question of the technological age is determining what makes us human.



Specialists believe that Brazil cannot remain on the sidelines of this movement, which seeks to transform research practices through computational thinking using scientific instruments driven by computers that transform the instruments into universal amplifiers. The idea might not seem so new: remember Darwin and his network of correspondents. However, whereas scientists worked alone or with a few colleagues in the past, the idea is that from now on, they can work on projects with hundreds of colleagues anywhere in the world in international networks of collaborators.

The attendance of a group of 54 graduate students from Europe, North America, Latin America (including Brazil), Asia and Africa gave the workshop a youthful, globalized feel. The students, who were mostly master's or PhD students, were chosen from among 240 applicants from around the world who participated in the event's selection process. For example, the Indian bioinformatician Angana Chakraborty, a PhD candidate at the Indian Statistical Institute in Calcutta, works on developing new algorithms capable of exploiting the "intelligence" of machines to speed up the process of analyzing gene sequences.

This type of research, notes Hey, shows that we will need to restructure scientific culture to integrate biological, physical, and social sciences into engineering, creating an interdisciplinary movement that brings together the creation and use of knowledge. Amid all of this change, the researcher notes, the focus must be on issues such as ethics, privacy and cybersecurity. "Important advances in science need to be placed in a larger social context by the humanities and the arts," says Hey.

In the talk *Big Data, Digital Humanities and the New Knowledge Environments of the 21st Century*, Canadian Chad Gaffield defended the centrality of the humanities in these new times because these areas are responsible for the ideas, methods and professionals that affect the industries whose primary input is the knowledge that comes from the "hard sciences." "The new innovation model integrates technological invention in a social context and therefore increases the need for and value of research on individual groups and societies," explains the researcher.

For this historian, understanding technology is understanding human thought and behavior, or why we do what we do and what makes us change or remain the same. According to him, research shows that technology is not just another tool, contrary to what Bill Gates said a decade ago. Technologies and cultures mingle and interact to determine economic growth and competitiveness, social cohesion and engagement, as well as quality of life.

Gaffield warns that as a society, we have to recognize that we must understand the social and human implications of our discoveries, even if they appear to be primarily scientific or technological. We have to understand the impacts of innovation, whether they are related to ethical issues, such as the use of stem cells, or human behavior, as in the case of the recent economic crisis, which was the result of individual, financial and governmental choices.

"Recognizing this complexity is realizing that building the future is not a matter of magic pills, miracle drugs, technological fixes and easy solutions. The meaning of a technology now depends on its relationship with its environment. Society matters, and technology depends on the

context, which brings meaning to new ways of doing things,” the historian says.

Thus, he notes further, the Internet economy no longer belongs to the builders of the framework that made the digital age possible. The torch has been passed on: the future now belongs, at least equally, to those who use the technology, including creative people; content providers; servers; and everyone who has learned to share pictures, sounds, ideas and concepts digitally.

Gaffield explains, “Just look at the interdisciplinary collaborations between philosophers, biologists, engineers and artists to interpret the ethical, legal and aesthetic dimensions of biomedical technologies; geographers, together with demographers and economists, rethinking agriculture policies; entrepreneurs identifying critical issues to be researched by sustainable development scholars.”

The Canadian then proposed a new way of thinking about the technological age in which we live. “A new way to understand these profound changes is to rethink what it is to be human,” he says. If the humanities are to assume this task, they must also be suited to the times. Gaffield argues that we must redefine teaching and research. In projects that he undertakes with his group, the old distinctions between pure and applied research and between strategic and presumably non-strategic research are being abandoned. His group also rejects any hierarchy of types of research activities in terms of prestige or importance.

The same applies to expanding academic contributions beyond the familiar emphasis on articles in scholarly journals or books, including various forms of knowledge mobilization on and off campus. According to the researcher, research must be redefined from an epistemology of specialization to “multiple epistemologies”; the digital humanities are now asking themselves how one can interpret 1 million books.

Until recently, notes Gaffield, humanities scholars thought that sharing their knowledge with non-experts amounted to lowering themselves. Today’s academics recognize that effective communication beyond specialized groups is a complex rhetorical challenge. New professors are specializing in using the potential offered by the digital age. Thus, in addition to writing for colleagues and students, more and more scholars now provide audiences with online courses, podcasts and social media content to disseminate information, stimulate debate and advance knowledge.

The researcher believes that in the future, students will no longer see a dividing line between working in the humanities and technology. As a result of new networks and access to information,

undergraduate degrees are quickly becoming research degrees, at least at universities that want to prepare their students for the challenges of this century.

Gaffield believes that, until recently, the dominant global flow occurred in one direction, with former colonies and developing countries looking to metropolises to lead research efforts and educate their best students. Now, flows are multinational and not clearly distributed. The leaders of the old, prestigious institutions know that they can be left behind. At the same time, new talent and knowledge developing in other regions can help to build societies in the new era that are no longer subject to the old circuit of knowledge. In other words, according to Gaffield, the internationalization of education and research has become the central feature of national strategies in the twenty-first century.

The researcher stresses the observation made in the 2012 OECD Global Science Forum Report on Data and Research Infrastructure for the Social Sciences, entitled *New Data for Understanding the Human Condition*: “The national research support agencies need to collaborate internationally to provide resources to researchers in order to foster the necessary potential and develop new methods for understanding the opportunities and limitations offered by new forms of data and technologies, which will allow them to keep up in important research areas.” Among the key issues, insists Gaffield, is the discovery of what makes us human. “This is the question that has never been answered adequately and is at the center of this new era in which we live,” he warns. ■

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For Chad Gaffield,
one way to
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