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Introduction: science, technology and society studies - from the European and American north to the Latin American south

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Abstract

This introduction has two intentions. First, against a broad science, technology, and society (STS) studies background, it provides a brief description of state-of-the-art of STS studies in Ibero-America (that is, Latin America plus Spain and Portugal), as well as a reflection on some difficulties and recent initiatives linked to the promotion of such studies in the region. STS is a product of countries with high levels of economic and technological development, with dual aims of social criticism and deconstruction. Its transfer to peripheral countries raises problems and challenges concerning both education and research. Second, the set of papers that make up this special symposium issue are briefly summarized herein and then related to both the STS Ibero-American context and STS studies themes derived from Europe and the United States. © 2003 Elsevier Science Ltd. All rights reserved.

Let us begin with some general observations about the interpretation and meaning of the STS acronym in the European and American North context. The study of the social dimensions of science and technology can interpret STS as either "Science and Technology Studies" or "Science, Technology, and Society." In both cases there is an approach to scientific-technological phenomena or techno-science that stresses the societal context. However, the former phrase emphasizes the social conditioning of techno-science as itself a social activity whereas the latter is more concerned with the societal or environmental consequences of techno-science. Each approach assumes the need to marshal conceptual and methodological resources from a multi-

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tude of disciplines: the history and philosophy of science and technology, the sociology of scientific knowledge, political theory, and the economics of technical change. But the balance within this interdisciplinary matrix will vary from one STS to another, and the broad multidisciplinary STS landscape is a well-contested geography. To confirm this, one need only examine a standard STS handbook, such as Jasanoff [1], and two recent introductions [2,3] and their reviews.

As more than one commentator has noticed, STS is characterized by a tension between two STS subcultures. Juan Ilerbaig [4] and Steve Fuller [5] have famously characterized these as "high-church" and "low-church" STS. Members of the former are those scholars who strive for academic respectability and support the approaches and rigorous standards of the social sciences; members of the latter rely more on disciplines from the humanities and attempt to preserve its normative and activist horizons. Low-church STS is strongly committed, for instance, to technology assessment work. These two STS traditions originated in Europe and in the United States, respectively, and they echo the Science and Technology Studies versus Science, Technology, and Society distinction, although the mapping of one onto the other is not a complete topographical fit. The high-church and low-church approaches further tend to be advanced by different professional organizations: the Society for the Social Studies of Science (4S) and the European Association for the Study of Science and Technology (EASST) on one side, and the U.S. National Association for Science, Technology, and Society (NASTS), on the other.

Since their origins in the United States and the United Kingdom in the late 1960s and early 1970s, and stimulated by an increasing institutional and public concern for social and environmental issues related to science and technology, the STS subcultures expanded during the late 1970s to other countries in continental Europe, such as France, Germany, the Netherlands, and the Scandinavian countries, as well as to Canada and Australia. It is in these countries that STS achieved an important academic and educational consolidation, which transformed them since the 1980s into producers of programs, materials, and studies on the social dimensions of science and technology.

During the 1990s STS studies were closely associated by many with what came to be called the "science wars," which were stimulated by reactions from scientists to some of the propositions from a specialized version of STS called "science studies." Scientists claimed that their work was being misrepresented, and in pernicious ways that could undermine public support for science. One of the most contentious issues was a science studies principle at the foundation of the "strong program" in the sociology of scientific knowledge (SSK). This principle, simply put, is that a historical or sociological analysis of any scientific debate or controversy (such as Lavoisier's discovery of oxygen, Darwinian evolution, or the truth of Einstein's theory of relativity) cannot simply assume, asymmetrically, that one position is true and others false, and then proceed to explain only the social forces producing the false beliefs and their resistance to the truth, while ignoring the social forces supporting the true beliefs (since these are assumed to be caused by nature or reality rather than social influences). Instead, the consistent and rigorous SSK scholar will avoid asymmetry by symmetrically identifying the social or "non-scientific" factors operative in both

sets of beliefs. This principle, also called "methodological relativism," has served as the basis for a whole tradition or school of STS research, sometimes called social constructivism—which functions in practice as a kind of deconstruction of science.

One need not adopt the SSK stance, however, to note that there is another kind of asymmetry present in STS studies: that between the center (European and North American scholarship, especially in the English language) and the periphery (STS in developing countries such as China and Latin America, in both of which it registers some presence). These latter countries—often generally, although with some geographical license, termed the South—are peripheral not only in economic or political and techno-scientific terms, but even in STS. Work by STS scholars in the South is accorded less attention and respect than work by their colleagues in the North. The present symposium represented by this special issue is designed to call attention and take some initiative to remedy this situation.

1. STS studies transfer: the Ibero-American experience

Spanish reproduces the conceptual if not the linguistic ambiguity concerning how to interpret and translate the English STS acronym. Some translate it as it would be widely understood in a typical 4S or EASST conference, that is, as Science and Technology Studies or Estudios sobre Ciencia y Tecnología (ECT); others take it to stand for Science, Technology and Society or Ciencia, Tecnología y Sociedad (CTS), as it would be normally be understood in a NASTS meeting. Thus, in Spain there is some mirroring of the distinction between two STS subcultures: on the one hand, an academic subculture focused on the study of techno-scientific change as a social process, that is, on the social factors responsible for shaping such a change (to use the constructivist jargon); on the other, an activist subculture more focused on techno-social change, that is, on the social and environmental effects of techno-scientific production, and on techno-scientific education and politics.

The more common interpretation in the Ibero-American context is nevertheless Science, Technology, and Society. Indeed, the most common Spanish acronym is CTS, as is also the case in that other major language of the Iberian peninsula and Latin America, Portuguese, where CTS serves as the abbreviation for Ciência, Tecnologia e Sociedade. But it is important to note that CTS, although strongly attached to the social and educational dimensions proper to the low-church tradition, is in Ibero-America also inclusive of that academic subculture associated with the high-church tradition. What is in Europe and North America not just an ambiguity but also an opposition, is in Spain, Portugal, and Latin America both unambiguous linguistically and more inclusive conceptually. This fact must be included in an narrative of the historical transfer of STS to Spain and Latin America and its subsequent reinventions there.

It was during the 1980s that STS was initially transferred from its original home in the highly developed countries of Europe and North America to educational institutions of the more economically peripheral areas such as Latin America. To emphasize the Ibero-American case, it was only during the late 1980s that such issues as

technology assessment, social constructivism, and new trends in science education began to be pursued in Spain, Colombia, or Cuba. Indeed, the academic and institutional consolidations of STS did not arrive in the region until the 1990s, and even then in a slow and hesitant way that extends into the present. There are, of course, exceptions: for example, the strong arrival of STS to the Spanish high school system or to Cuban higher education since mid-1990s. But as always exceptions only throw the general situation into brighter relief.

2. The cases of Cuba and Spain

The Cuban case is particularly interesting. Following the end of the Cold War, educational reforms began taking place in Cuba. Under the title of "Social Problems of Science and Technology," STS subject matter made an impressive expansion in the higher educational system of the island. Today STS is taught in practically every university specialty and constitutes a compulsory examination for Ph.D. aspirants and all scholars seeking promotion in the faculty system.

Two factors account for this expansion. First is Cuba's higher education system, in which the classic divide between scientific facts and human values, underlying most disciplinary and institutional separations between the sciences and the humanities, is openly rejected, while social concerns are strongly present in all university programs of instruction. STS, which also tends to question the fact/value divide, naturally finds a sympathetic ear in such a system. Second is the exhaustion of standard Marxist ideology. In the Cuban university education and promotion system of today, STS now largely occupies the locus formerly belonging to philosophy subjects or exams, that is, to Marxism. Presently, an STS Masters program developed at the University of Havana, drawing its content from both STS international scholarship and the Latin American tradition of critical social thought, serves as a general platform for the formation of teachers and researchers throughout the island [6].

As to the Spanish experience, an institutional reform in the high school system undertaken during the early 1990s by the Spanish Ministry of Education introduced full-blown CTS both as a new optional subject (with a low-church orientation) and as a complementary component in science subjects during the last segment of secondary education. This produced a reaction from the university, where a number of CTS research and education initiatives rapidly developed. Presently, the latest reform of the high school system and the transfer of educational administration to federal regions have to some degree weakened the situation, although a good number of scholars and research teams at the university continue orienting their work toward CTS.

3. STS as cultural artifact

Actually, STS can be understood originally as a cultural artifact, as a product of countries with a higher economic and technological development. It aims to produce

an appropriate response to certain social demands, such as alterations in the academic image of science, or the scientific literacy of citizens, or more widespread and effective science education, or calls for greater public control over the effects of technological change, or the social accountability of science and technological policies. Its transfer to the peripheral Ibero-American countries, in spite of the differences that exist between them, has traditionally confronted a number of problems.

First, an obvious but important fact is that many of the above-mentioned social demands, socio-political conditions, and academic antecedents out of which STS emerged thirty or more years ago in the Anglo-American world, do not exist as such in most countries of Ibero-America. Without a consolidated political democracy, or even with no democracy at all, it is impossible to make claims for an extension of democratic processes into science policy formation and the assessment or regulation of technology. In a similar way, with large, illiterate social segments, it is utopian to ask for increases in the scientific literacy of the general population. And without a significant spread of the classical sociology of science, an academic interest in the sociology of scientific knowledge is unlikely to develop.

Second, the constitution of a critical mass of STS scholars in every country requires a solid and flexible research infrastructure related to the natural and social sciences, normally linked to higher education, that is, it requires reasonable input and output indicators in these fields as well as an institutional structure that makes possible interdisciplinary research initiatives (or at least significant disciplinary reorientations). If STS is anything in any of its forms, it is interdisciplinary. Unfortunately, most Ibero-American countries have traditionally exhibited major deficits in both respects, due to well-known endemic factors proper of those nations outside the developed world. With regard to the lack of science, it is noted that Latin America's scientific inequality in relation to other regions is even stronger than its much better known economic inequalities, as is well-documented by a variety of indicators such as funding, number of science students, active researchers, scientific publications, patents, etc. [7]. Regarding the difficulty of interdisciplinary practice, the rigidities of the traditional university model in Latin America make introductions of new approaches or research areas extremely difficult.

Third, aggregating small groups of STS scholars in order to achieve a critical mass at some regional, national, or transnational level (such as the Southern Cone) has traditionally faced serious difficulties because of severe restrictions on the development of academic networks. Lack of financial support and an excessive peripheral focus, on say the Anglo-American center, have only erected further barriers.

In this respect there is an interesting anomaly in the relation between Spain and Ibero-America. Spanish STS scholars tend to read English-language STS literature produced by U.S., U.K., or French authors, thus largely ignoring what their cultural neighbors are doing in Venezuela, Colombia, or even Portugal. The paradox has become so pronounced that quality contributions from national colleges often come to be known and respected only to the extent they appear now and then in the English literature published abroad.

Overall, the significance of science and technology (including STS) in Spanish-speaking countries may be encapsulated in the fortunes of a single ironic and dismiss-

ive phrase: "¡Que inventen ellos! (Let them do the inventing!)" In other words, "let others [for instance, the British and Americans] be inventors; we Spaniards have better things to do." These words originated with Miguel de Unamuno (1864-1936), one of the most influential Spanish intellectuals of the so-called "'98 generation," and a major contributor to existentialist philosophy. The year 1898 was a traumatic one for Spain, in which it lost Cuba and the Philippines, the last significant remnants of its former colonial glory, and thus abruptly became aware of being, itself, on the periphery of history. British and American technologies were conquering the world. Que inventen ellos! attempted to make a virtue of reality by affirming the traditional marginalization of science and technology. Self-knowledge and culture were offered as superior to a science of the external world and the technology of its control. While there may well be some truth to this point — after all, we do need knowledge of ends before utilizing means—the concrete result was to create structural weaknesses concerning human, financial, and institutional resources—not to mention self-knowledge and culture under the new techno-scientific conditions. Nothing replaced invention, and even the effort to study the role of invention in human affairs in order to ground the possible search for alternatives to British, American, or other invention regimes, languished. What might have been the basis for a distinctive STS was used instead to justify a flight from STS [8].

4. Transfer and adaptation of a cultural artifact

Today the situation in many Ibero-American countries and across the region as a whole has significantly changed. Ironically enough, it was the Franco regime in Spain (1939-1975) which, although rhetorically opposed to many aspects of modernization, in practice led the way. Its post-World War II support for technocratically flavored initiatives in industrial and infrastructure development yielded achievements that have served well the post-Franco democracy. Invention is alive and well in Spain—or is it? Some scientists, for instance, claim that Que inventen ellos! has simply been replaced with Que inventen ellos, pero que parezca que lo hacemos nostros (Let them do the inventing, but let us take the credit) [9]. Certainly it could be claimed that there is something of this "smoke and mirrors" phenomenon at work not only in contemporary science and technology but in social science and humanities reflections on and criticism of techno-science, that is, in STS. Despite a number of serious STS publications in Spanish (see a selected list in the Appendix), in contrast with other academic fields such as history or philosophy, STS remains a seriously underdeveloped but nevertheless promising area.

The goal for Ibero-America, however, should not be to imitate whatever STS paths have been followed in the North. Instead, the cultural artifact that is STS must be adapted to existing and diverse realities in the Ibero-American world. With this caution in mind, consider two main challenges of the region.

First, there is the challenge of stimulating endogenous STS research within Spanish- and Portuguese-speaking countries. This is all the more difficult insofar as techno-science and techno-scientific development as practiced in other countries are seen

as unqualified solutions for problems in Ibero-America. STS research arose precisely because of questioning such a techno-scientific ideology; yet the tendency in less-developed countries is too often to ignore the questioning and attempt to proceed in catch-up mode full speed ahead. To uncritically imitate, whether in techno-science or in STS reflection on techno-science, can only lead to serious shortcomings for such fields as science education or the development of science literacy, where progress will exhibit a strong proclivity to repeat both foreign failures and foreign successes. Norwegian cars, French electric vehicles, California computers, Massachusetts biotechnology, and New York art museums are all interesting and attractive, but often alien and irrelevant to local conditions, both natural and cultural, and are experienced as such by both students and citizens—although not necessarily by tourists.

Second, as already implied, there is a serious gap in Ibero-American STS education due to a complex nexus of factors: lack of basic research and case studies of a national or regional interest, lack of teaching materials, and lack of programs and institutional initiatives. Obviously, this second challenge—STS education—is linked to the first, STS research. Educational programs can be a strong stimulus to research, and vice versa. As mentioned above, the introduction of a subject called "CTS" throughout the Spanish high school system was at one point a key motivation for the development in Spain of CTS university research.

5. Recent Ibero-American initiatives

At present, in response to increasing recognition of such challenges, some interesting initiatives addressed to promoting CTS research and education in Ibero-America have been undertaken by inter-governmental organizations such as the Organización de Estados Iberoamericanos (OEI or Organization of Ibero-American States, founded 1949) and UNESCO, national or regional associations of science teachers (in countries such as Chile, Mexico, and Portugal), and national ministries of education (as in the cases of Cuba, Uruguay, and Spain).

Among these initiatives, one of the most vigorous has been supported by the OEI since 1998, creating as it were a new "'98 generation" cadre of CTS scholars. The OEI depends on the ministries of education of the Spanish- and Portuguese-speaking countries of the Americas, plus Spain and Portugal. CTS defines one major component in its present science program; the other component is innovation studies. The core of this working program has been the construction of a network to promote CTS endogenous scholarship in the Ibero-American region while stimulating a dialogue with international leadership in the STS field. Activities that are part of this OEI-supported program include a series of CTS publications in Spanish and Portuguese, course development with electronic dissemination, and regional CTS conferences and meetings [10]. From there the program draws applications to the fields of science education, communication, and management.

For example, in the field of science and technology management, the OEI has promoted the use of CTS network results. Administration and management courses

organized post-1998 generally incorporate a strong CTS component. Such courses are addressed to young administrators in Latin American ministries of science (or whatever ministry holds science policy competencies) as well as national agencies responsible for science policy in the region. The inclusion of CTS content in these courses, customarily at rates of between 15 and 20 percent of class time, has received a generally favorable response.

Another related initiative is the creation of CTS+I Chairs in Ibero-America (the "I" stands for Innovation). Presently, chairs have been established in El Salvador, Colombia, Argentina-Uruguay, Cuba, and Costa Rica; they in the process of being established in Spain-Portugal, Mexico, Brazil, and Peru. The basic idea is to provide institutional support, both from OEI and national agencies involved with science and technology, for the constitution of national university networks focused on CTS and innovation studies. Each country (or pair of adjacent countries) brings together from eight to fifteen leading universities, both public and private, which then collaboratively create opportunity spaces for sharing resources in the development of CTS+I research and educational initiatives.

Just in the last year the influence and popularity of the CTS+I initiative has persuaded Cambridge University Press to begin publication of "Ciencia, tecnología, sociedad e innovación" series in collaboration with the OEI, focused on interdisciplinary work that spans social sciences and humanities efforts to understand and help guide science and technology. Initial volumes in the series have appeared on biotechnology and society [11], changes in university-society relations [12], and the politics of forests [13]. Future titles will deal with themes such as innovation in developing countries, teaching science and technology, and genetic engineering. If the series proves as successful as initial indications suggest it may be, Cambridge University Press is considering bringing out English-language versions of some texts.

6. Implications

Consider now some implications of the relationship between these two OEI science programs—CTS and innovation. This is also a modest argument about the shape that may best suit STS as it is diffused and reinvented in Ibero-America, a region where the importance of wide participation in public affairs is perhaps only comparable to the importance of economic development in the region.

Briefly stated, the kind of STS we believe is best fitted to an Ibero-American context is one that emphasizes the dimension of practice. In Latin America especially, STS needs to have as much practical value as possible. A pragmatism that emphasizes the practical "cash value" of STS is sorely needed. Thus Latin American STS should aim to open science and technology to the understanding and values of the public, while pointing up clearly their epistemological-educational and ethical-political components. Especially important in this regard is the promotion of multilevel public participation—from the schools and communications media to commercial activities and political debates—because it is only though such broad participation that the research and development system will be oriented toward the real social needs of the populations and nations of the Ibero-American region.

Although it is true that economic growth does not necessarily equate with social well being, economic development is still an urgent need of the region. Such a development requires the encouragement of science and technology within the frame of national systems of innovation. In other words, not all countries can afford a "socially constructed" science, that is, the orientation of STS toward a strong sociological deconstruction of the techno-scientific process. In regions excluded from the affluence of the industrialized world, where the institutional standing of science and technology is either precarious or tightly coupled to the interests of wealth and power within the region or beyond it, every effort must be undertaken to promote science and technology among the disenfranchised or weak through popular science education, techno-scientific job creation, and both market and political pressures that will tie research and development to the most legitimate human needs of environmental sustainability, public health, and economic stability. This is not to say that the "high-church" emphasis on a strong social constructivism and its progeny should be excluded from Ibero-American STS; we would argue simply that the predominant orientation should not be high church.

Thus the idea is to connect economic and social efficiency in techno-scientific development. Technological innovation is needed for the economic development of Ibero-American nations and the provision of the material means that make possible, among other things, a participatory culture. At the same time, social participation is necessary to legitimate and consolidate a national project of innovation. It is this link, particularly clear from the peripheral viewpoint that justifies adding an "I" to classical "STS", thus associating STS studies with regional development priorities and establishing a unique framework for the adaptive transfer and re-invention of STS as a cultural artifact.

7. The papers in this special issue

It was in the context of these emerging developments in both Spain and Ibero-America that, in April 1998, the University of the Basque Country hosted a conference on "Norte y Sur de Ciencia, Tecnología y Sociedad." The intent of the conference, as well as of the papers that grew from it for this special issue, was to stimulate an open discussion of some of the issues and arguments raised above, especially the meaning of STS and its contemporary challenges, its proper location in the academic world, and the reflexive implications of contemporary STS developments in the South for STS in the North, and vice versa. One implicit thesis, as well, is that Spain itself stands at a pivotal position between these two worlds.

The eight papers herein, presented in alphabetical order as determined by the lead author, provide an introduction to the contemporary worlds of STS, North and South. One remarkable feature of this collection is how much contributions from the South independently emphasize themes that are integral to STS studies in the North—the attempt to recover unrealized promises in techno-scientific progress, the need to de-idealize science and technology, the centrality of contextualization, and the normative claims for public participation in the governing of science—while simultaneously deepening our understanding of these themes and adding to them.

The first two papers present views from the South. The first, "Inequality and Innovation as Seen from the South," by Rodrigo Arocena and Judith Sutz—a mathematician-social scientist and engineer-economist, respectively, at La Universidad de la Republica, Uruguay—points toward a third way in STS that draws on work by the influential Irish physicist J. D. Bernal to develop a socialist-based "science of science" and on contemporary theories about national systems of innovation. Two of their main contentions are the need to recognize equality as an unrealized potential in techno-economic development, and the usefulness of much more nuanced contextual analyses. Indeed, it is just such careful contextual analyses that raise questions about the easy claims for inequality as propadeutic in the early stages of techno-scientific developmental take-off, with the reassurance that inequalities will wither away as development proceeds. Arocena and Sutz reference empirical evidence that demythologizes this view and argue that a recovery of the promise of equality is a precondition for self-sustaining development.

Ignacio Avalos and Rafael Rengifo's paper, "From Sectors to Networks: The Venezuelan CONICIT Research Agendas," offers a case study by two participant observers of an attempt to institutionalize a new social contract for science. Both authors have worked with the Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT). Avalos was head of CONICIT until the 1998 election of Hugo Chávez as President of Venezuela, and in this capacity Avalos originated a unique experiment in public participation in the governing of science, which this article attempts to describe. The "Agendas" program was intended to open the scientific process from the very beginning of problem definition and not limit participation to the end phases of application and utilization. Even before the World Conference on Science, and its call for a new social contract with greater public participation, CONICIT was experimenting with ways to address this need for public participation in the governing of science that have been a hallmark of STS arguments and were also broadly supported by documents originating from Budapest. Yet it is difficult to escape a sense of something naïve and idealistic about the Agendas program, and it is unclear to what extent its normative claims did or even could be grounded in the real world of science policy practice.

The third contribution, from Michel Callon and Vololona Rabeharisoa, "Research 'in the Wild' and the Shaping of New Social Identities," presents a collaboration between one of the leading STS scholars in France and a colleague from Brazil. Both currently work at the Ecole de Mines in Paris. Like Avalos and Rengifo, Callon and Rabeharisoa describe new and somewhat idealistic forms of technoscience-society interactions, but ones that are taking place "in the wild," that is, outside established institutional structures, and are nevertheless quite effective. For them, primary instances of such organizations are patient lobbying groups that seek to transform research agendas and treatment practices so as to make them more directly relevant to their illnesses. Such groups refuse to accept the unrealized promises of science, and insist on becoming non-technical participants in decision making about what science should be done if not how it should be done. What is revealed is a kind of dialectic between the de-idealization of autonomous science or science on the inside and a re-idealization of science from the outside.

The shift in contextualization in this paper echoes an argument by another STS scholar, Robert Frodeman, in a book that attempts to take the philosophical examination of geology out of the lab and into the field. Fieldwork is different from laboratory work, and as Frodeman deftly points out, what one takes as a paradigmatic site for science will have implications for unrealized promises and de-idealizing descriptions. "Relying upon examples of science taken from the heavens [that is, astronomy] and the laboratory [whether of physics, chemistry, or biology], rather than the field [that is, geological and environmental field work], philosophers of science have perpetuated a dangerously unrealistic image of science" [14]. For Frodeman, as for Callon and Rabeharisoa, stepping outside the well-ordered laboratory looks like stepping into the wild, when in reality it may only disclose another site for science.

The fourth paper proposes a draft comprehensive framework for analyzing how values influence decision-making in techno-science. This technically formulated paper, "Science, Technology, and Values: Toward an Axiological Analysis of Techno-scientific Activity," is by Javier Echeverría, a leading philosopher of science based at the Consejo Superior de Investigaciones Científicas (CSIC) in Madrid. Building on the key STS insight that the union of science and technology constituting techno-science is a world-transforming phenomenon with diverse elements, Echevarría first proposes that any contextual analysis of the structure of techno-scientific behavior must distinguish at least agents, actions, objects, instruments, scenarios, initial conditions, rules, goals, results, and consequences. Then, within this structure, he identifies a spectrum of interacting values—cognitive, technological, economic, ecological, political-social, ethical, religious, military, aesthetic, and basic—which may themselves be parsed in terms of their influence on primary (nuclear) and secondary (orbital) values. As Echeverría himself emphasizes, this is but a first approximation that begins to recognize the complexity of factors that enter into decision making with regard to techno-science, and may thus properly influence, for instance, the dimensions of public participation.

In the fifth paper, Steve Fuller, a leading STS scholar from the United States currently based in the United Kingdom at the University of Warwick, steps outside the STS case-study tradition to present a broad examination of the university as social technology. The university, by virtue of its very name, claims to be the guardian of universal knowledge. But if university knowledge is truly universal, then why is it found only in elitist institutions? Fuller's critical overview of the history of ideas about the university—that is, of university ideals—that have attempted to respond to this question, and which thus directly or indirectly addresses as well the problem of the relation between expertise and the general public, provides a more expansive framework for considering some of the issues implicitly raised by all three previous papers. What is also striking about Fuller's work is its bold bridging of the high- and low-church traditions, deconstructing the social technology of the university while making normative proposals for its reform.

The sixth contribution is a historical study by Andoni Ibarra and Thomas Mormann on "Engaged Scientific Philosophy in the Vienna Circle: The Case of Otto Neurath." According to Ibarra and Mormann (two philosophers of science, one from Spain, the other from Germany, both presently teaching at the University of the Basque

Country), the philosophy of science of the Vienna Circle is nothing like it has often been presented—an attempt merely to develop a clear, logical epistemology for empirical scientific practice. Instead, at least in Neurath's case, it represented an attempt to appreciate the rich social-contextual and social-practical character of science. It was, indeed, a kind of STS before STS, from which STS can now learn, especially with regard to current tensions between academic and activist factions.

The seventh paper is another quasi-case study by North American STS philosophy scholar Carl Mitcham, currently based (like Callon and Rabeharisoa) at another School of Mines, this one in Colorado. In "Professional Idealism Among Scientists and Engineers: A Neglected Tradition in STS Studies," Mitcham moves outside the laboratory (also like Callon and Rabeharisoa) to explore a different kind of activism in the wild: what he terms "professional scientific idealism." With brief sketches of the work of such public activist science organizations as the Federation of American Scientists (FAS), the Bulletin of the Atomic Scientists, International Pugwash, the Union of Concerned Scientists (UCS), and the Committee on Scientific Freedom and Responsibility (CSFR) of the American Association for the Advancement of Science (AAAS)—none of which can be found referenced in any standard STS handbook, encyclopedia, or introductory text—it is argued that STS studies have overlooked a significant aspect of techno-scientific experience.

In the last paper, "Science, Politics, and Democratic Participation in Policy-Making: A Latin American View," Hebe Vessuri, an anthropologist from Argentina currently working in Venezuela, points up how despite neo-liberal arguments for the removal of politics from the economy, there are necessarily movements that engage politics with other dimensions of society, especially (if indirectly) science. She is especially insightful about the need to demythologize the idea that techno-science can replace politics. In too many instances, science covers up politics only to become the pursuit of politics by other means. Vessuri also provides empirical data about the weight of science and technology in Latin American countries that helps to flesh out some of the problem statements found in previous contributions.

Together with the introduction, this collection of papers thus represents the work of thirteen scholars from nine countries: four European (France, Germany, Spain, and the U.K.), four South American (Argentina, Brazil, Uruguay, and Venezuela), and one North American (U.S.). Weighing the Latin American South against the European North, the number of countries and contributors represented are even, while the author count comes up seven to six or one in favor of the South. The effort in this special issue, however minor, is to pursue a new symmetry in STS scholarship.

8. An expanding context: the World Conference on Science

As mentioned above, the conference from which this collection of papers originally emerged was held in 1998. In two papers, the reader will also find explicit references to the World Conference on Science held in Budapest from June 26-July 1, 1999. Another three papers implicitly reference ideas from that conference. The reason is that not only were preparatory meetings for the Budapest conference

already taking place in 1998, but in many respects the ideas and arguments expressed in Budapest bring into the open and to maturity some of the main issues that STS in an Ibero-American context is committed to exploring.

The Budapest meeting, organized by UNESCO (United Nations Educational, Scientific and Cultural Organization, founded 1945) and ICSU (originally the International Council of Scientific Unions, founded 1931, but now called simply the International Council for Science, although it retains its well-known acronym), was one in a series of meetings on various dimensions of science policy reaching back to at least the 1974 UNESCO General Conference in Paris, which adopted a "Recommendation on the Status of Scientific Researchers." At that time, as this document title suggests, one of the concerns within science policy circles was establishing and protecting the independence and autonomy of science in accord with what has come to be called the "social contract for science." Give scientists public support and independence, free them from the shackles of politics, and social benefits will automatically flow from the scientific enterprise. Other documents and conferences in this tradition of concern include the ICSU "Statement on Freedom in the Conduct of Science" (Paris 1989) and the Conference on Academic Freedom and University Autonomy (Sinaia, Romania 1992).

Over the course of the last twenty years, however, the terms of the social contract for science have come into question, and the Budapest Conference was organized to reconsider its terms, qualifying them when appropriate, in order to reintegrate scientists back into society. The Latin American and Caribbean preparatory meeting at Santo Domingo in spring 1999, for instance, stated the need for explicit attention to issues of STS such as the democratization of science and of innovation. As Federico Mayor, then Director-General of UNESCO, said in one of his letters of invitation to Budapest:

> We must face up to the fact that there is no longer an automatic assumption that benefits will flow from undirected scientific research. . . . It is now up to science and scientists to show themselves ready to respond to society's needs and to calls for more accountability. . . . Indeed, encouragement of science communication in all its forms must be a central component of a new "contract" between science and society. [15]

The Budapest meeting on the theme "Science for the 21st Century" brought together some 2,000 participants from more than 150 countries. These participants included representatives from over 100 government ministries in charge of science and technology; high-level representatives from leading inter- and non-governmental organizations such as the OEI, the Food and Agriculture Organization, the Organization for Economic Cooperation and Development, the World Health Organization, and the World Meteorological Organization. Most participants were scientists and science administrators, but STS scholars also were a significant if minor presence. For instance, a reading of the "Introductory Note to the Science Agenda-Framework for Action," which aimed to help educate conference participants about some of the new challenges facing science, revealed the influence of STS studies.

The two main documents to come out of the Budapest Conference were a "Declaration on Science and the Use of Scientific Knowledge" and a "Science Agenda-Framework for Action." The former outlines principles, the latter suggests (although still in the most general manner) strategies for implementation. The "Declaration" calls upon "the scientists of the world . . . to acknowledge the urgency of using knowledge from all fields of science in a responsible manner to address human needs and aspirations without misusing this knowledge" [16, para. 1], and for interdisciplinary work that bridges traditional separations between the natural sciences, the social sciences, and the humanities. Indeed, scientific practice needs to be informed by "enhanced public debate" [16, para. 22], and "Science curricula should include science ethics, as well as training in the history and philosophy of science and its cultural impact" [16, para. 41]. The "Framework for Action" reiterates these points, especially the need for public education and participation, while also acknowledging that "Innovation is no longer a linear process arising from a single advance in science; it requires a systems approach involving partnerships, linkages between many areas of knowledge and constant feedback between many players" [17].

This effort to outline a new social contract for science, one no longer based simply on scientific autonomy and the idea of a linear, automatic, beneficial application of science for societal benefit, nevertheless remains mostly at the level of generalization. As the headline of the news report in Science magazine indicated, Budapest documents were "High on Ideals, Light on Details" [18]. One way to begin working out some of these details, it may be suggested, is the pursuit of further STS research, North and South, precisely of the kind indicated in the papers in this special issue.

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