ELSEVIER

Technology in Society 25 (2003) 263–273

Technology In Society

www.elsevier.com/locate/techsoc

Science, politics, and democratic participation in policy-making: a Latin American view

H. Vessuri *

Dpto. Estudio de la Ciencia, Instituto Venezolano de Investigaciones Científcas (IVIC), Apartado 21827, Caracas 1020-A, Venezuela

Abstract

How can science respond to the particular needs of Latin American societies? How can regional funding of regional science positively influence its growth? The answers to such questions rest on analyses of the configurations of state and politics, relations between instrumental science and the democratic process, and the demographic features of science and technology. The extent to which one can expect a better future through science in Latin America and the Caribbean depends as much on political problems and history as on scientific and technological development alone. True development will only come with significant political and economic change.

1. Introduction

How can science and technology respond to the specific needs of Latin American societies? What is the best way to fund and to influence the growth of science in the region? There is a growing body of empirical knowledge produced by sociologists and historians of science and economists of innovation that is related to the incidental details of science, technology, and development in Latin America. But real answers to such questions require a more synthetic understanding of the many ingredients of development, and they have persistently eluded the region, as witnessed by the great defeats and uncertainties surrounding efforts so far. The present paper will not attempt this major synthetic task, but more modestly seek to identify some of the social trends that have accompanied the institutionalization of science

* Corresponding author. Fax: +58-212-504-1092.
E-mail address: hvessuri@hotmail.com (H. Vessuri).

0160-791X/03/$ - see front matter © 2003 Elsevier Science Ltd. All rights reserved.
doi:10.1016/S0160-791X(03)00020-4

in Latin America at a time when it was becoming a leading productive force in the world.

Two main theses underlie my argument:

- The limited and frustrated development of science and technology (S&T) capacities in Latin America and the Caribbean (LAC) after the Second World War was part and parcel of a broad process of economic and political change set in motion to manage a post-colonial world, and must be viewed in that context. To a large extent, research grew in teaching institutions that were often distant from industry, and did not make major demands on local scientific institutions. Thus the region turned out some good scientists and engineers, although domestic research systems did not reach a critical size and national innovation systems lacked density. Particularly when it was funded with monies from development aid, research tended to focus on technical fixes rather than on helping the countries to increase their self-sufficiency.
- The new conditions of globalization (in addition to the particular contexts in which the countries in the region function after 50 years of "development"), point to the fact that LAC is entering a new territory, one not yet on the maps but whose culture (all optimistic rhetoric to the contrary) is characterized by growing exclusion and concentration. One novelty is that research and development (R&D) seems no longer to be considered by international aid agencies as a luxury of developing countries, but rather a fundamental component of economic success. Obviously, scientific activities per se cannot achieve anything unless there is a long-term commitment to development. To ensure a more active participation in the new international scenarios, the region must strengthen its S&T infrastructure. But there is still more rhetoric than action in North/South research cooperation and few efficacious recipes available. Private capital has replaced development aid as the main external funding source, while lobbies for science in Latin America remain weak.

2. State and politics

There exist today strong pressures to adopt neoliberal policies to remove the state from theoretical debates about economic development. By contrast, there is a "bring the state back in" movement that sees successful industrial policymaking as heavily dependent on political elites being accessible to and working closely with entrepreneurs and corporations. Instead of the Weberian tradition that would insulate political bureaucratic elites from class interests and social groups, some blend of autonomy and integration is now admitted as crucial to formulating and pursuing policy goals in a coherent and systematic manner in order to yield desired results.

The state usually establishes the institutional context for economic activity, and economic outcomes are influenced by the constraints and incentives that political elites create for entrepreneurs and firms. Different state structures create different capacities for state interventions, which thus define the range of roles for state

actions. Developmental outcomes depend on whether these roles fit the social context and how well they are executed. It has been persuasively argued [1] that states must enjoy embedded autonomy in order to provide appropriate incentives for entrepreneurial firms to flourish and become strong enough to compete effectively in the global marketplace. But the institutional arrangement of the business community, i.e., firms and entrepreneurs, is just as important as the state structure in facilitating the policies so crucial in newly industrializing countries. Adjustments by both state and capital are needed to make good use of scientific and technological progress.

The persistence of the free market, the imperatives of profit, the demands of extensive capital, and property reproduction are the bulwarks of capitalism. As such, these reinforce ideas of continuity, consolidation, and adjustment within already-established powers. An alliance between power factors jointly determines the policies for ensuring, through the persistence of mechanisms such as those just mentioned, the flow of capital to foster innovations and the applications of scientific progress to meet global economic competition. Science policy is not powerful by itself. Often its main result is the operationalization and legitimization of decisions that have accumulated or were made by reasons foreign to science policy. But in the processes that shape and drive current science, there is power involved, frequently subordinated to economic and technological forces that try to impose their particular rationalities on science. Under conditions in which science policy has institutionalized the subordination of science to "interests," the classic relationship formulated by Francis Bacon according to which "science is power," has been turned on its head since power has established itself over knowledge. In fact, the weakness of the local lobbies for science in confrontation with the resources and power of foreign interests as represented by the "Washington consensus" has actually led to a worsening of conditions for R&D in Latin America [2].

The different parties involved resort to experts to dissolve disputes or decide on scientific-technical projects. One of the elements weakening scientific authority is that when a project stumbles, its promoters can almost always find some expert to assure the public that everything is in competent hands. To the extent that expertise may be contradicted by counter-expertise or that scientific councils require a proportional representation in the guise of a political parliament, one enters a dense and impenetrable forest of agreements and compromises that weaken both political and the scientific justifications.

Traditionally, the basic strategy of science policy referred to the general level of R&D resources. It assumes that there exists a subordination with regard to some unknown—and may be unknowable—social optimum. The fundamental purpose has been the aggregate maximization of the budget [3]. So far in Latin America, budget distribution held very little concern for those in charge of designing policies and planning S&T, except when forced by political and economic decisionmakers. Decisions relied more on historical quotas and stakeholder pressures than on calculations of marginal productivity for comparative uses of research money. At the same time, in the multiplicity of existing specialized scientific groups, there has not been a clear theoretical basis for establishing a scientific order or hierarchy of priorities among different scientific fields. In part, this is why bureaucracies are always asking

for more resources. Their ability to do something new depends on receiving new funds, because in general they have been unable to redistribute historically allocated funds.

In the symbiosis between the state and business in the most advanced countries, the rhetorical privilege of knowledge, rationality, and full disclosure of information, is particularly significant, painting a picture in which there is little interference by the power configurations through which this knowledge becomes socially applied. The political dimension is juggled in what is depicted as the triumph of depoliticization. Science and politics are conceived as overcoming classical opposition via the scientification of society, that is, they appear to have finally resolved their historical antagonism through the subordination of politics to science. But, of course, politics is alive and well. And the successful resolution of the problems of development varies according to political possibilities, the capacity to adapt to the new global dynamics, and the assertion of political will.

The development of capitalism at the world level has exposed nations on the peripheries to forces that have brought increasing disorder to them. Politics in the latter is hostage to multiple restrictions imposed by a power system in societies that have to manage at the same time the macro-economic order, economic scarcity, and social inequality. Politics in LAC must overcome numerous obstacles. It cannot be ignored that one out of four Latin Americans still live on less than one dollar per day and inequity in income distribution is more marked in this region than in any other. The provider state is in perpetual crisis and in the underdeveloped version current in LAC it is unable to respond to multiple social needs. Administrative disorganization and disorder as well as fiscal restrictions affect state performance. This does not mean that less government is needed but that the regulatory and welfare functions of the public sector ought to assume a different aspect, with greater ability to confront both the organizational and disorganizational capacities of both the public and the private domains.

Linked to this is the syndrome of short-term demands: immediate electoral dividends seem to be the rule in the current political game. Even when they have a genuine democratic concern, politicians are wholly absorbed trying to resolve the concrete and immediate problems of their constituencies. It is not easy for them to pay to look long range, which is nevertheless what is essential for industrial and S&T strategies and for the constitution of a broad educated social base, given the uncertainties of technology investment prospects, the displacement of the labor force by technology, and the technological impetus underlying the creation of large corporate groups.

3. Instrumental science and the democratic process

The old model of the relationship between science and society was a contractual one, as if between two autonomous entities that agreed on certain principles of exchange in order to achieve independent but mutually beneficial aims. While not comprehending the precise content of science itself, society was ready to be blindly

deferential to its internal workings, casting scientific responsibility in simple regulations of scientific boundaries. For a long time the "use-abuse" model implied that whatever knowledge or innovation emerged from the black box of science, it was socially neutral unless and until societal actors put it to beneficient or nefarious use. At most, public concern over scientific responsibility concentrated on the classic examples of atomic scientists and other war-related researchers. Otherwise the model accepted scientists as trusted individuals and self-regulation as adequate for protecting scientific integrity through systems of social and technical norms thought to reinforce individual integrity and openness, collegiality, and the appeal to evidence (e.g., Merton [4]).

But after several decades of increasing disparity between the rhetoric and the practice of science, a new model of science and scientific practice has emerged, one that promotes a different relationship between science and society. Science has become a leading productive force. However, this is not a science that simply produces abstract truths about the natural world but rather *instrumental science*, resulting from a prolonged process of knowledge subordination to the imperatives of economic activity. Modern scientific ideas, which began developing from around 1600, took almost three centuries to find extensive economic application [5]. Industry did not begin to rely seriously on scientific explanation until around 1875.

Since then, science has acquired increasing strength in the United States and the rest of the industrialized world, and at present it depends to a large extent on the patronage of an organized type of power—the industrial corporation. The presence of (multiple and conflicting) interests in the research enterprise is confirmed by the existence of the new scientist-entrepreneur, the incubation of technology- or science-based firms in academic realms, the transformation of university institutions, and other incentives to harness a scientist's personal ambitions to profit, technical progress, and economic gain.

Knowledge resulting from instrumental science is fundamentally information that increases possibilities for the control of both nature and people, that multiples the power of controllers across a wide spectrum of activities ranging from business to defense. As control potential is greater than ever, the extent to which society can expect to control innovation has itself come to occupy a prominent place in science policy debates in the advanced countries [6,7].

At the same time, socioeconomic inequity reflects the inability of significant segments of the population to appropriate the benefits of public investment in R&D. Alienation reflects the inability of individuals or groups to control the impacts of R&D on their lives. The democratic process, from local protests to grass-root interest groups and eventually to legislation, appears as the natural avenue for change. A unifying theme that emerges from the rapidly evolving social context is the need for democratic control over science and technology. Instrumental science requires democratic forms of participation and accountability to ensure integrity and responsibility.

Technologies with the ability to dramatically widen social access may nevertheless be used predominantly on behalf of particular social groups. For example, in Great Britain it has been shown that members of the new virtual middle classes are the

predominant users of virtual community care and thus gain a systematic advantage [8]. Social exclusion is not limited to lack of on-line access. The case of the Venezuelan higher education community also illustrates that it may arise because already-advantaged people are able to engage with the technology in ways that advantage them even further. Systems of wired welfare tend to advantage people who have the time, reflexivity, inclination, and resources necessary to act [9]. Democracy presupposes political actors who use all available information and knowledge more intensely and are capable of unleashing experimentation and learning processes in a variety of domains, from the school system to exports, from government institutions to universities, from hospitals to communication industries. What is ultimately needed is not just a reduction in some physical gap separating ordinary citizens from science, but their acquisition of the means to form an opinion about the practices and politics that affect their daily lives and then to take action on the basis of these opinions.

The relationship between science and public opinion is a complex precondition for the functioning of modern mass societies. But in the depoliticization of the bulk of the population and the crumbling of the public domain in the current order, what obtains is an alliance between technical expertise and a manipulatively influenced public, with the distorted resonance that scientific information provokes in the gigantic body of a deformed public opinion [10]. Although in LAC the mass media, particularly TV, has an immense influence, ironically enough public deliberation about fundamental options has become practically impossible. Instead of open democratic communication, there is bare-knuckle competition for control of the issues that will reach public agendas. The relative poverty of political information degrades ever further the democratic climate, fostering cynicism, isolation, and rejection within the public, while only a few groups intervene in deliberations and public decisionmaking. The middle-class consumer has grown enormously in most countries of the region, but it is the consumer who feels threatened by current difficulties and uncertainties and who continues without assuming the voice of the citizen [11].

How can the R&D community contribute to a more democratically responsive S&T policy in LAC? In the late 20th century, individual scientists created new organizations, such as the Sociedade Brasileira para o Progresso da Ciencia, the Asociación Venezolana para el Avance de la Ciencia (AsoVAC), and the Asociación Colombiana para el Avance de la Ciencia (ACAC), to help them act as citizens, although they hardly shed the special mantle of their expertise. Governments likewise chartered new scientific advisory committees to communicate scientific propositions and inform political positions, and it became part and parcel of scientific responsibility to advise government from a presumably neutral standpoint. In LAC, special ethics and bioethics committees sprang up although most still lack strength and seem to be more ritualistic and imitative ornaments rather than genuine representatives of responsible public opinion.

The idea of a more democratic R&D policy understandably generates fear and resistance among some scientists worried about the history of failed and immoral attempts to exert political control of science. But it is undeniable that scientists as a social group have historically identified themselves more often than not with elitist

views and postures. Thus when claims are made equating a more democratically responsive R&D system with an authoritarian regime, with populist dictatorship, or with blunt ignorant attacks on science, the concept of democracy is itself undermined. Scientists usually work under the assumption that either there is broad consensus in society for scientific inquiry of any kind, or that the extant mechanisms of funding, priority setting, and conducting research are sufficiently consensual. Rendering this assumption true means that assuring the presence of democratic forms in decision making about research must occur prior to discussions about limiting—or for that matter, before conducting research. Increased democratic input into R&D policy decisions can in fact empower science by creating stronger linkages between research goals and societal goals, linkages that then ensure strong public support well into the future.

But public opposition may also reflect a rational desire for more democratic control over technologies and institutions that profoundly influence daily life. The option, in fact, is not between good science in itself (returning to the spirit of the 19th century) and science for development. Neither should science be presented as affording ready-made solutions to problems that may have a variety of causes. Things are not so simple, particularly when they concern development. Unless the trend toward increased socioeconomic inequity is successfully redressed in LAC, it is likely that politicians will no longer be prepared to support S&T funding, since social welfare expenditure will yield a higher electoral payoff, let alone the fact that clearly large segments of the population have not benefited and will not benefit from the national investment in science and technology. Therefore, the standard argument that only scientists are qualified to determine appropriate priorities and directions for research is intrinsically self-serving and thus politically unconvincing—and not only in Latin America.

The distribution of wealth in Latin America has grown increasingly inequitable over the past two decades. Income disparity between the top and bottom 10% of households is higher than ever. Poverty and misery have reached unexpected levels in countries like Argentina, which has had a relatively significant R&D infrastructure. If broader (instead of the current limited) democratic regimes were in power in the region, it could be the case that the vast majority of the poor might eventually dismiss as vacuous the promises that economic development programs, when successful in creating wealth, will eventually trickle down with effects on job creation, better education, housing, and health. A biomedical R&D effort that focuses on diseases of affluence or old age may be seen as failing to serve the public health needs of the poor. Such a conclusion could stimulate political action that would support different biomedical R&D priorities or a shifting of funds from R&D to other programs.

The participation of citizens in the assessment of new technologies or the inclusion of diverse interests in scientific advisory committees is not yet a common feature in LAC. But there are a number of social experiments that aim at what some scholars have labeled the “co-production” of science [12], generally meaning that what counts as science, and what makes science reliable, is its production by a collaboration of scientists and non-scientists who incorporate values and criteria from both communities.

Mere observation shows that many of the few who do science and technology in the region often multiply themselves to produce relevant research in the best sense of the term, and there is ample evidence that when scientists work cooperatively with knowledgeable activists from outside the research community, science as well as society can benefit. Increased sensitivity about social, cultural, and economic factors all reflect the input of groups motivated by societal rather than scientific interests.

Consider a couple of illustrations in a special issue on relevant science in Latin America published by the journal *Interciencia*. The first concerns Brazilian agronomists, botanists, eco-physiologists, other scientists and technologists as well as producers, who have managed to "build" soil fertility in the immense Brazilian *cerrados* to achieve an efficient and profitable agriculture. As a precondition for success, research relied on experimentation to create new production conditions and on farmers for implementation of the recommended agricultural practices [13]. Another example is the research carried out by a public institution in Costa Rica on specific poisons of Central American snakes. But it is also devoted to the local production of antidotes whose distribution is coordinated with the health ministries of the Central American countries to guarantee an adequate distribution of antidotes to all the region, undergraduate and graduate education, and a broad social intervention to establish training programs for prevention and handling of ophidian accidents [14].

4. Latin American S&T demography in the context of globalization

There are comparatively few scientists and engineers in LAC, some 130,000 full-time equivalent (FTE). The United States has eight times this number (962,000). Almost two out of five Latin American S&T researchers are in Brazil (50,000), which also has 90,000 graduate students—20,000 in doctoral programs. Argentina has 28,500 researchers, with a growing graduate enrollment but still with limitations on the number of available fellowships (some 3850 graduate scholarships granted in 1997). Mexico had close to 20,000 researchers in 1996 and 18,070 graduate scholarship-holders. Chile, Venezuela, and Colombia have less than 10,000 researchers each, and even fewer graduate students, although all three are working to increase these numbers. When the population active in the labor force is considered, LAC has on average 0.77 FTE researchers for every thousand economically active persons (EAP). Argentina has the highest indicator, with almost two researchers per thousand EAP, followed by Chile, Cuba, and Costa Rica, each of which surpasses one per thousand. This contrasts with the US, which has an index of 7.4, or even Portugal, with 2.4.

There is an insufficient local development in undergraduate and graduate S&T education, and an important number of university students who complete their studies in advanced countries do not return to their country of origin, joining the many highly qualified LAC professionals who have already emigrated. It is estimated that between 1961 and 1983, 700,000 professionals and highly qualified persons emigrated to the US, Canada, and United Kingdom—equivalent to almost four times the total number of scientists who carry out full-time research activities in the region, and the flow has increased since then.

The reasons for this continuous drain of the region's professionals toward the developed countries are fundamentally structural in nature. Estimating the minimal cost of a tertiary education in LAC to be US$25,000, the emigration of professionals during the last 35 years has cost LAC US$30 billion. Since the region annually invest US$3 billion in S&T activities, the resulting loss through expatriation of its professionals represents ten years of regional investment, and nine times more than the direct investment of the Inter-American Development Bank (IDB) in the region's S&T since 1961 [15].

During the 1990s, some Latin American countries started programs of higher-education reform aiming to adjust training to the new market conditions. An instrumentalization of knowledge institutions can be observed in their production and reproduction of scientists, professionals, and technologists to satisfy market demands. In general, education is driven increasingly by the development of marketable skills in the professional competence market. As the numbers of researchers and engineers grew, it coincided with and fed the emergent internationally mobile labor market. The better higher-education institutions served as incubators of local and foreign innovative businesses, and local university graduates increasingly sought posts abroad. This contributed to increasing vulnerability of the local labor market.

The flight of competencies has become an urgent matter for designers of public policies who have responsibilities to meet current and future national needs by managing the productive retention of human resources. What has happened in LAC, Africa, and Southeast Asia shows that in order to produce more development, it is not enough to establish the structural bases of capitalism. The process is far more complex and involves exchange, financial, cultural, and other mechanisms linked to the production and utilization of knowledge.

The profound inequalities and asymmetries in LAC societies present serious ballast for any international collaboration that seeks a more-balanced and less-distorted world. The current gap in scientific knowledge and technological know-how between the advanced countries and LAC can only be overcome through concerted national and international effort. It has become so obvious that the new world order is more based on science, that backward countries naturally appear as a new frontier for the development of international S&T. However, international research collaboration, particularly that funded from development aid, tended in the past to focus on technical short-term fixes, and was insufficient if not counterproductive for helping the southern countries to increase their self-sufficiency through the construction of local research capacities.

Wealthy countries are thus altering their positions toward international projects to improve the scientific capabilities of developing ones. New international collaborations are promoted by the World Bank, for example, which previously considered research a luxury for developing countries. Today the Bank backs the development of knowledge, including science. Direct support of research in developing countries is now seen as a priority, as a fundamental component of economic success, on the assumption that in order to be competitive developing countries need to build knowledge-based industries. Scientific lobbies from LAC for the "coordination of research efforts," the "construction of research capabilities in the South," and "equal partner-

ship" are finally getting a hearing in North American and European institutions where the policies of development aid are designed.

Yet for the problems to be correctly grasped by both sides, it is necessary to negotiate the terms of collaboration. How LAC and other developing regions respond to the new strategy will be crucial to promoting an effective transformation. This is why it is important to debate the *what* and the *how* now. Among wealthy countries, it has been common to think simply in terms of S&T knowledge transfer, although there is growing reluctance by providers of sophisticated technologies to transfer them without restrictions. Even when problems are adequately understood by one side at the negotiating table, it is still necessary to transmit the correct message to the other side.

It is also the case that lobbies for science remain weak in developing countries, where politicians are rarely prepared to attend meetings for negotiating on research matters. What is most missing is a more powerful and efficacious lobbying for LAC science and technology as a basic component of public policy in developing countries so that they are in a better condition of being equal partners with associates in other regions.

5. Conclusion

In a region such as Latin America, the resonance of that mythological vision of a harmonious and rich future thanks to science and technology declines today under the weight of the economic crisis. But the attraction of a technological society persists, despite or perhaps because real technological changes have been accompanied by so much deprivation, conflict, and maladjustment. The expectation is that techno-scientific society will miraculously solve intensely painful transformations produced by industrial capitalism, making it unnecessary to worry about the present marked by the lack of equity and social justice.

In the last analysis, the question is whether one may expect a better tomorrow in LAC through science, whether political problems and history suggest the adoption of a good dose of skepticism when facing our scientific-technical prospects. True reform will only come with significant political and economic changes. Original social practices and new theoretical categories are needed that allow the construction of visible and desirable futures, custom-made for social groups and their problems, needs, and expectations. In the future, there will certainly be an important place for science and technology, but their direction will be given as a result of achieving a more complete humane social project. In this attempt, LAC society will probably change beyond its current shape. Some of these changes are already clear, but making them possible in a world of necessity is our challenge.

References

[1] Evans P. Embedded autonomy: States and industrial transformation. Princeton, NJ: Princeton University Press, 1995.

[2] Katz J. Cambios en la estructura y comportamiento del aparato productivo latinoamericano en los años 1990: Después del 'Consenso de Washington', ¿qué?" Conference prepared for the 25th Anniversary of Universidad Autónoma Metropolitana of México, 1999.
[3] Averch HA. A strategic analysis of science and technology policy. Baltimore, MD: The John Hopkins University Press, 1985.
[4] Merton RK. Science and democratic social structure. In: Merton RK, editor. Social theory and social structure. New York: Free Press, 1949.
[5] Rosenberg N, Birdzell L. How the West grew rich: The economic transformation of the industrial world. New York: Basic Books, 1986.
[6] Remington JA. Beyond Big Science in America: The binding of inquiry. Social Studies of Science 1988;18(1).
[7] Epstein S. Impure science: Aids, activism, and the politics of knowledge. University of California Press, 1996.
[8] Virtual Society Programme. Virtual society? The social science of electronic technologies. Economic and Social Research Council, CRICT. Uxbridge, UK: Brunel University, 1999.
[9] Plaz Power I, Vessuri H. La telematización de la educación superior en Venezuela, entre la equidad y la exclusión. Educación Superior y Sociedad 2000;11(1 & 2):157–80 (in Spanish).
[10] Stompka P. Science and democracy. World Social Science Report. Paris: UNESCO, 1999.
[11] Brunner JJ. América Latina y el Caribe frente al nuevo milenio. 1999. Colección Documentos. La visión de las nuevas generaciones. <<http://www.vision99.com/brunner>> (in Spanish).
[12] Jasanoff S. Beyond epistemology: Relativism and engagement in the politics of science. Social Studies of Science 1996;26:397–418.
[13] Paterniani E, Malavolta E. La conquista del 'cerrado' en el Brasil. Victoria de la investigación científica. Interciencia 1999;24(3):173 (in Spanish).
[14] Gutierrez JM, Rojas G. Instituto Clodomiro Picado: Ciencia y tecnología endógenas en la solución de un problema de salud pública en Centroamérica. Interciencia 1999;24(3):182–6 (in Spanish).
[15] Lema F. ERL viaje de Ulises: itinerarios y retornas de la inteligencia emigrada. In: Lema F, editor. Pensar la ciencia: los desafíos éticos y políticos del conocimiento en la posmodernidad. Caracas: IESALC/UNESCO, 2000.

Hebe Vessuri is a senior researcher in the Department of Science Studies at the Instituto Venezolano de Investigaciones Científicas, Caracas, Venezuela. An Argentine-born Venezuelan anthropologist, she is interested in problems of scientific and technological learning in developing countries and has written extensively on the sociology and social history of Latin American science in the twentieth century. Her books include *37 modos de hacer ciencia en América Latina* (with H. Gómez and H. Jaramillo, 1997), and she was a contributor to UNESCO's World Science Report 1998 (1998) and 2000 (2002). She has recently edited issue 168 of International Social Science Journal devoted to "Science and its Cultures" (2001;168:195–368) and a special issue of Science, Technology & Society on "Innovation Context and Strategy of Scientific Research in Latin America" (2002;7(2):201–378).