

## What does a “National Science” Mean? Science Policy, Politics and Philosophy in Latin America

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Recent scholarly work on the history of the reflections about twentieth-century science and technology have pointed out that a research agenda, which consolidated in the 1970s under the umbrella of science and technologies studies (STS), has its historical roots in discussions going back to the 1930s. The recent history of the STS is mainly associated with the notion of social construction of knowledge that emerged in radical interpretation of Thomas Kuhn’s work, which was furthered by bringing in sociological and anthropological approaches and methodologies (i.e. Latour and the ethnography of modern laboratory). But this recent work points to another tradition: Aronova and Elzinga, among others, argue that STS were originally studies on science policy.<sup>1</sup> John D. Bernal’s seminal work in the 1930s and then the debates in the journal *Minerva* in the 1960s can be identified as constituting the first stage in understanding the relationship between science, politics, and society, in which key scientists

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and intellectuals such as Alvin Weinberg, Michael Polanyi, and Stephen Toulmin, took part. This preceded further debates on social nature of scientific knowledge, which have taken center stage in later years.

It is important to recall this political dimension in the longer history of science studies before proceeding to the matter of this chapter—the history of the reflections on science and technology in the so-called “peripheral countries” during the Cold War period. Among the philosophers of science and science studies scholars, there is a growing interest in reconsidering the links between philosophy of science and science policy.<sup>2</sup> Yet, these discussions have been mainly centered on the Global North and, mainly, the Western context. By having presented the previous discussion, this essay sheds light on how these issues have been analyzed by the actors on the fringes of global political and science system.

My intention is to portray the distinctive features that these reflections had in Latin America where they were entangled in the local political debates. Although these reflections on science resembled those in the USA, Western Europe, and within the Socialist Bloc, they were also driven by a specific set of issues related to Latin America’s positioning in the Cold War, which constituted a space ripe for tensions and competition between the two superpowers. The 1959 socialist revolution in Cuba and guerrilla groups operating in the region on one hand, and the CIA operations in Central America and the US-led *Cóndor Operation* aimed at weakening pro-socialist governments on the other, transformed Latin America into a Cold War battlefield.<sup>3</sup> This political situation set the stage for intellectuals’ debates at the time.

The role of science and technology in “development” was one of the issues discussed by the intellectual elite. Yet, these debates were not restricted to science policy in a narrow sense. They included themes that would normally be studied by philosophers of science. This close interrelation between political and philosophical aspects is reminiscent of the “Unity of Science” philosophy of science’s movement during the 1920s and 1930s. The de-politicization process that the historian of philosophy George Reisch described in that context was not fully accomplished in Latin America up until the military dictatorships and the ideological persecution of the late 1970s.<sup>4</sup>

This chapter examines the debate on what was termed “national science” and the relationship between national goals and scientific research. In what follows I describe the development of science policy in Latin America from the 1930s on and its relationship with debates on global science policy. Then I focus on the debates on “national science” in

Argentina in the late 1960s and early 1970s, and the ways these debates informed both philosophical and political perspectives. Argentinean intellectuals such as Mario Bunge, Gregorio Klimovsky, and Oscar Varsavsky, among others, contributed to this discussion, mainly through the journal *Ciencia Nueva*.

### A POLICY FOR LATIN AMERICAN SCIENCE

Similarly to what happened in other regions of the world, the institutionalization of science policy in Latin America occurred after World War II (WWII). Before that, there were some initiatives in the 1930s led by scientists who sought to advance in “pure” scientific research. For instance, in 1933 the Argentinean Association for the Progress of Science (AAPC) was created and its first chairman was Bernardo Houssay. Years later, Houssay received the Nobel Prize in Physiology and Medicine for his research on glucose regulation and the pituitary gland. This Association promoted private funding of science through local philanthropy, mirroring what occurred in the USA during the interwar period.<sup>5</sup> It also advocated establishing private universities in order to boost scientific research activities, especially since public universities focused on the training of professionals and did not engage in scientific research consistently. The project to create new universities failed, but the AAPC did manage to receive funding from international philanthropists like the Rockefeller Foundation. The authorities behind the 1943 military coup and Peron’s government that was elected in 1946 did not agree with Houssay’s emphasis on freedom of research and he and his associates were excluded from universities. Their research activities were then carried out in private research institutions and funded mostly by the Rockefeller Foundation and local philanthropists. This situation changed after 1955 when a new military coup changed government’s perspective on science. Houssay was then appointed as head of the newly created National Research Council in 1958.<sup>6</sup>

In the years between 1945 and late 1950s, science policy was inspired by the ideology derived from the “linear model of innovation,” a theoretical framework that resurfaced in the aftermath of the WWII. The idea that improving technological and socioeconomic development first required strong capabilities in basic research was well received by Latin American scientists in need of resources. The linear model also provided a rationale for demanding public support for science, since it acknowledged basic research as too risky an investment for the private sector. As it occurred globally, the 1950s in Latin America represented a time for trust in the power of science.

Its potential for war had been tragically demonstrated in the previous years and it was now time to show its potential for peace and economic development. This “policy for science” in Latin America was sponsored by a new international organization: the United Nations Educational, Scientific, and Cultural Organization (UNESCO). During its first general conference in 1946, a network of regional offices for scientific cooperation in South-East Asia, Middle and Far East, and Latin America was created. The network assisted scientists that were isolated from research centers and searching for updated information. It also helped them to be in contact with colleagues.<sup>7</sup> The UNESCO’s policy was shaped by a universalist worldview, promoting science as part of a Kantian cosmopolitan project of global understanding, in tune with the postwar cultural atmosphere.<sup>8</sup>

At the 2nd UNESCO general conference, which took place in Mexico in 1947, its representatives organized a meeting of experts in order to assess how the organization could better contribute to the “advancement of science in the region.” Bernardo Houssay chaired the session, and held a follow-up meeting in Montevideo in 1948. Following its recommendations, a Science and Technology Regional Office for Latin America and the Caribbean was established in that city in January 1949. The office would play a very important role in the expansion of science policy studies in the coming years.<sup>9</sup> The first national institutions to promote scientific activities were thus created. In 1950, Argentina established the National Directorate for Scientific and Technological Research (that was re-organized as CONICET in 1958), Brazil created the National Research Council (CNPq), while Mexico set up the National Institute of Scientific Research (INIC).<sup>10</sup>

### THE EMERGENCE OF A REGIONAL SCIENTIFIC BUREAUCRACY

By the 1960s, the science policy scene started to change. The trust in the linear model and the *science push* framework weakened while the *national* dimension gained prominence. Universalism yielded to an emphasis on localism and *realpolitik*. Based on the management of “big science,” Weinberg’s well-known article “Criteria for scientific choice,” published in 1963, showed a shift on science policy perspectives.<sup>11</sup> According to Weinberg, internal criteria were based upon the readiness for exploitation and scientists’ competence in the field. On the other hand, external criteria referred to scientific merit (relevance to neighboring areas of science),

technological merit (the feasibility of a desired technological aim), and social merit (relevance to human welfare and the values of man). This discussion showed the desirability of criteria for scientific choice that went beyond the assessment of academic peers. Internal criteria were deemed necessary but not a sufficient condition for funding. The resource shortages and the need to prioritize certain research domains introduced an idea of relevance that favored *national* interests over academic communities and the individual scientists' aspirations. The discussion of these issues would later be included in what Weinberg called “trans-science,” a realm in which questions can be posed by science but whose answer science cannot provide. The coordination of scientific activities and its linkage to national goals was one of the main issues raised in the debate developed in *Minerva*. Edward Shils, the journal's editor, argued that “every country which has a substantial amount of scientific activity, even many of those which have very little, has something like an empirical science policy or, perhaps it would be more accurate to say, science policies. It is not, however, unjust to say that none has a rational and comprehensive science policy.”<sup>12</sup>

International organizations played a key role in promoting the construction of a *rational* science policy at a national level in the developing world. In Latin America, UNESCO and the Organization of American States (OAS) helped in the diffusion of new institutional models for the organization of scientific research. As Finnemore argued, in the late 1950s the political changes inside UNESCO resulted in greater power given to the member states.<sup>13</sup> Thus, in the sciences, UNESCO consulted those countries that sought to consolidate their scientific institutions, as it was the case for Belgium in 1957. However, by the beginning of the 1960s the organization refocused its attention on the developing countries ceasing to work on-demand. Instead, it started an active campaign aimed at convincing the national governments that every country, regardless of their size and economic and scientific development, needed a research bureaucracy. In Latin America, UNESCO sponsored a seminar held in Caracas in 1960 to discuss the organization of scientific research (Houssay, 1960). In its final declaration, known as “Carta de Caracas” it was concluded that “taking into account the benefit they brought to the nations were they exist, the creation of National Councils of Scientific and Technical Research must be encouraged.”<sup>14</sup>

By the 1960s, UNESCO's policy was not a mere follow-up on the previous initiatives to promote national research councils as instruments

of local scientific communities. The new bureaucracies that were part of the new UNESCO policy for developing countries as different as Zambia, Brazil, and Lebanon, were not regarded as just an instrument of scientific communities. Rather, the new policy sought to integrate these scientific institutions with the objectives of national development planning. These initiatives were in tune with the pro-American stance and the theoretical framework of modernization theory, which stated that a country should go through pre-established stages in order to attain development.<sup>15</sup> Even to the countries with already established scientific institutions, such as Brazil, Argentina, and Mexico, UNESCO's representatives suggested that their councils should adopt new strategies based on research plans. In 1969, Argentina created a new institution, National Council of Science and Technology (CONACYT), to coordinate all research institutions in the country.<sup>16</sup> In Brazil, CNPq changed its name from the former National Research Council to the National Council for Scientific and Technological Development (though keeping its acronym unchanged). In Mexico, a new CONACYT replaced in 1971 the former INIC. Between 1960 and 1970, new scientific institutions were created in other Latin American countries such as Peru, Colombia, Ecuador, Costa Rica, Uruguay, Bolivia, and Venezuela.<sup>17</sup>

The OAS also played an important role in the development of science policy in the region. OAS activities were closely related to the Alliance for Progress, a regional initiative of the Kennedy administration presented in 1961 to help Latin America's development and contain the expansion of communism.<sup>18</sup> Science and technology would play an important part in this initiative as being considered key factors for national developing planning. OAS's main activities included the funding of science policy studies in academic centers and international methodological seminars. It also sponsored a Conference on the Application of Science and Technology to the Development of Latin America (CACTAL) in Brasilia in 1972.<sup>19</sup>

### THE INTELLECTUALS' REFLECTIONS ON SCIENCE POLICY IN LATIN AMERICA IN THE 1960S

With these developments of the science policies, the critical voices followed, fomenting the beginning of the local tradition in science policy studies. These reflections are usually referred as the Latin American Thought on Science, Technology and Development (PLACTED), which gained influence in the late 1960s. Jorge Sabato, Amílcar Herrera, and

Oscar Varsavsky are pointed as the main minds behind the movement.<sup>20</sup> These intellectuals advanced a critical reflection and the reappraisal of the first science policies in the region, which promoted scientific activities, regardless of local knowledge demands. They referred to those policies as “offertist” in that they concentrated on producing (“offering”) basic scientific knowledge and neglected the local demands that could have led to research agendas closer to the actual needs.

Against this backdrop, Sabato proposed a model named “IGE triangle.” Each of the corners represented an actor needed for technological development: scientific infrastructure (I), government (G), and industrial structure (E). According to his diagnose, Latin American countries had weaknesses in each vertex of the triangle, and lacked articulation between them. He concluded that the interaction between the different sectors should be increased.<sup>21</sup> Sabato also remarked the importance of “technological autonomy” and claimed that Latin American countries should have a leeway to define which technology they want to import and which to produce locally. But “autonomy” must not be confused with autarky or self-sufficiency, which is not desirable—Sabato argued. It is not about producing *every* needed technology locally, which is not always viable. It is rather about having the political, economic, and technical means not to lose decision-making power.<sup>22</sup>

Amílcar Herrera was an Argentinean geologist who, after the 1966 military coup, went into exile in Brazil. At the State University of Campinas, he founded the Department of Science and Technology Policy, one of Latin America’s leading academic institutions in the field. He critically discussed the first stage of institutionalization during the 1950s and claimed that the early pioneers of Latin American science did not address the issue of relevance of research to local needs. In his main work, *Science and Politics in Latin America* (1971), he stated that:

The structure of the current development of science is determined by the directions imposed by the needs of the most advanced countries and not by a sort of “natural law” that inexorably determines the modality of scientific growth. Intending to blindly imitate those models of developments means to become subsidiaries of systems conceived for other necessities and resources.<sup>23</sup>

Imitation does not just imply that a scientific institution would fail to integrate with a local network. It also means that it could effectively be

integrated into an international network and contribute to a knowledge production system ruled by foreign interests.

To contribute to the general advancement of science, Latin American countries have no obligation to obsequiously follow research directions and developed countries' agendas. On the contrary, they can accomplish a much more effective action by picking subjects in accordance to their own needs. That would help the advancement in research areas that might be neglected because main international players lack interest in them.<sup>24</sup>

While globally the 1960s can be characterized by the emergence of a perspective that valued the importance of organizing scientific research attuned to national goals, in Latin America this discussion gained greater attention since it was not just about reorganizing and allocating resources more efficiently. In the periphery of the global science system, it was actually a question of power and colonialism. Research conducted in a developing country was regarded as functional to the research agenda of developed countries. It was then not about moving from a universalist to a local view. Rather, it was about becoming aware that the universalist framework concealed an imperialist relationship of domination. Sabato and others thus advocated a process that enlarged the autonomy of local actors and encouraged freedom from foreign agendas.

Their ideas also related to the development of a Latin American critique of the modernization theory in the social sciences, or dependency theory. According to this framework, Latin American underdevelopment does not constitute a "previous stage" in the path toward development, as Rostow might have argued.<sup>25</sup> On the contrary, it was a structural condition of peripheral economies that are disadvantageously inserted in the international markets as providers of raw materials. This situation was not independent from the position of developed countries but functional to it, since they had taken advantage of those terms of trade. Traditional *desarrollistas* (developmentalist) recipes that did not acknowledge this dependency relationship were regarded as unsuitable. New pathways for a different integration in the world trade system should then be sought.<sup>26</sup> This issue remarkably erupted during the discussion on foreign research funds granted by the Ford Foundation for developing social research. Scholars discussed whether it was possible to carry out research that was critical of capitalism with US funding.<sup>27</sup>



## A SPECTRUM OF CRITIQUES: THE DEBATE ABOUT A “NATIONAL SCIENCE” IN LATIN AMERICA

By the end of the 1960s, political radicalization was a global issue. The opposition to the Vietnam War, the emergence of a pacifist movement, environmentalism, feminism, and the confirmation of a critical stance inside academia are some main examples of changes occurring in the cultural scene. A more radical agenda around science emerged with authors like Paul Feyerabend that sought to introduce relativism with regard to scientific truth and contributed to the appreciation of other knowledge traditions.<sup>28</sup>

In Latin America, the radicalization processes had specific regional dimensions compared to what happened in other countries. In the case of Argentina, the 1966 military coup deeply impacted the scientific field. A number of researchers and university scholars who had developed material and symbolic conditions for scientific research had to exile both inside the country and abroad. The USA sought to expand its presence through military governments, trained in the “national security doctrine,” and claimed that armed forces should be used in the persecution of dissident persons and organizations in their own countries.<sup>29</sup>

US policymakers tried to contain resistance to capitalism that arose in Latin America as part of the “expansion wave” of the 1959 Cuban Revolution in countries like Nicaragua and Chile, which could mean the enlargement of Soviet influence in the region. The discussion about science and society in Latin America cannot be isolated from this political context, in which anti-US imperialism and the role of developing countries in the global political system were central to the agenda. Political, economic, and cultural liberation from dependence became one of the main objectives for progressive intellectuals. Issues broadly related to “quality of life,” like environmentalism, derived from the radicalization in the developed countries, were not, although often mentioned, a priority in the politically contentious Latin America.<sup>30</sup>

The debate on science and politics started as a reaction to, and a critique of, “offertist” policies advanced by research councils. It gained a bolder geopolitical localization by the beginning of the 1970s. The universal status of research agendas was deeply criticized and a controversy about the concept of “national science” developed. Is it possible to have a “national science?” What does this mean? Is this about science dealing with local problems using universal methodologies? Or should a national

science also criticize the methods and propose specific methodologies for every national reality? Analyzing the concept of national science added a philosophical dimension to the previous political discussion about research agendas, since it was philosophy of science the discipline that dealt before with the rationale of research methodology.

Different stances regarding the link between the science's methods and economic and cultural dependence were thus formulated. The central texts in this discussion are taken from the book *Ciencia e ideología. Aportes polémicos* that contains articles originally published in the early 1970s in *Ciencia Nueva*.<sup>31</sup> The journal published regularly between 1970 and 1973 and worked as the voice for organizations like the *Grupo de trabajadores de la ciencia* [Science workers group] that held a leftist view on science, politics, and society. At the same time, the journal achieved to receive the radical perspectives from developed countries through the publication of Spanish translations of articles from the US radical journal *Science for the people*.<sup>32</sup>

Assuming the risk of losing the specificity of each author, I have ordered these stances in three groups: (a) universalist perspective that prefers to avoid local issues and agendas, (b) recognition of the importance of local agendas but defense of universal methods and, (c) intention to reform scientific methodology according to historical–political conditions.

## A UNIVERSAL SCIENCE

When it comes to identify different positions in the debate about a national science, one should begin by describing one of the extremes: universal science. This position denies that local characteristics shape scientific activities. Accordingly, there cannot be something like a “national science.” On the contrary, science is one, and should be practiced with the same methods, standards, and agendas worldwide. Thematic interests are determined by mankind's common search for truth and the enlargement of the endless knowledge frontier, and not by local characteristics or demands. These assertions echo Polanyi's “Republic of science” in which scientists are represented as citizens of one unique global republic of researchers.<sup>33</sup> As I mentioned, during the first stage of the institutionalization of science policy in the 1950s, this was the dominant ideology in Latin America. Later, even with a change of conceptions within organizations like UNESCO, scientific communities kept this ideological framework alive through and their participation in research councils. Houssay, the leading representative of this universalist stance, remained influential in the region until his

death in 1971. Mario Bunge, an Argentinean philosopher of science based now at McGill’s University (Montreal, Canada), also shared a similar perspective when he claimed that “science is universal, or it is not science but folklore (...) the requirement to restrict research to native issues results in a dramatically lower research quality, since the objective of science is to find knowledge of the general, not to describe idiosyncrasies.”<sup>34</sup>

From a philosophical perspective, this universalist view was fully compatible with the logical-positivist consensus in philosophy of science. What singles out science is its method, and it is universal. Local characteristics may arise in the context of discovery but they should be clearly absent in the context of justification that deals with the relationships between theory and empirical data.<sup>35</sup> From a political perspective, the linear model of innovation and the emphasis on universal science might also be regarded as a form of cultural containment of communism. Individual scientists acting in a framework of “freedom of inquiry” and “free enterprise” were more akin to the image of capitalism than planning and priority setting in science.<sup>36</sup>

### A SCIENCE WITH “NATIONAL TRAITS”

Universal science represented one of the poles within the range of possibilities in the 1970s debate about science and nation. A second choice was a position that can be described as science with “national traits.” For supporters of this position, science keeps working with a universal method, but engages too with an agenda on local issues. The importance of science in dealing with local problems is then recognized, but solutions only follow from a universal method.

Many intellectuals shared this point of view. Amílcar Herrera, to whom I referred earlier, remarked that:

The idea of scientific development oriented by national needs should not be confused with the absurd conception of a ‘nationalistic’ science in the narrow sense of this expression, which deals only with local problems and is more or less isolated from the international context. The methods and the aim of science are effectively universal, and the continuous exchange and a close connection with the world science system is the only guarantee of a quality level that suits modern scientific work. There cannot be a ‘Latin American’ science. What might exist and should exist is a science whose orientation and general objectives are in line with the need to solve the multiple problems that the development of the region demands.<sup>37</sup>

This text clearly shows the distinction between the two dimensions mentioned earlier: one related to the research agendas, legitimately interwoven with local interests, and a second one related to research methods that are regarded as universal. In addition, Herrera highlighted the importance of not losing the connection to the international scientific system, since it is the sole guarantee of local production's quality. In a similar vein, some years earlier, Mario Bunge stated that:

The election of problems of national interest should be stimulated but it should also be insisted that they are treated in an international level. It would be absurd to miss the chance to measure cosmic rays in Chacaltaya, to do biology of tropical areas in the Amazon, or to study Motilon indigenous people in Venezuela. National characteristics should receive special attention, both for the enrichment of universal knowledge and for their possible utilization. But all object or typical problem must be treated with the method and the universal aim of science. (...) In sum, a science with national traits, yes; nationalistic science, no.<sup>38</sup>

A discussion about time dedicated to local issues and the importance of global agendas also emerged. But the general stance maintained that science should not be completely taken by local issues and it should keep some room for basic science in a classical fashion. Bunge, for example, declared that “whoever claims to restrict scientific activity of some area to the study of its typical features and forgetting the universal, is claiming actually the return to previous centuries, when autonomous disciplines within science existed. This provincialism is a thing from the past.”<sup>39</sup> Gregorio Klimovsky, an Argentinean mathematician and philosopher of science argued that:

If I am asked about the social responsibility of scientists (...) I think the ideal could be represented by somebody who dedicates 50 % of his time to basic research but invests the other 50 % in the gathering of information related to the national problems that exist, how they have been resolved before and what could be done to frame them in new ways.<sup>40</sup>

Many authors agreed in that this “science with national traits” should not only be involved with local problems but also deal with universal issues, as a way of not losing contact with the standards of science in developed countries. But some authors like Klimovsky went further in their justification of the importance of basic science. He believed that there could also be a political (anti-imperialist) justification for basic research. Reflecting on

the trajectory of the Department of Computer Science at the University of Buenos Aires he commented that:

Some companies took over the studies of scientific computing, changing the contents of the degree. It was no longer aimed to educate applied mathematicians at a very high level, not only in computing but also in all fields of numeric calculus. It became a career that just trained a person in some techniques of programming, since that is the only knowledge of interest for those companies. Undoubtedly, they are not going to promote the teaching of certain things they keep for their headquarters and not for the colony they think we are.<sup>41</sup>

In this quote, the “geopolitical” perspective appears as part of the criteria for making choices about research agendas. Klimovsky’s argument was used to support the claim that a focus on basic knowledge can be more politically liberating. Local demands might be too narrow and not require higher technical or scientific skills but only applied and low level knowledge. In this context, the development of basic research contributed to Latin American autonomy and liberation, even if it is not directly linked to local demands. Transnational companies to which Klimovsky referred to could indeed keep advanced research activities near headquarters and only transfer to third world countries simple technical needs. It was then necessary to promote research in its highest depth in Latin America and not just be restricted to applied research, which even if it was close to some local demands, might in the long run create even more dependence.

In another passage, Klimovsky insists in the same argument of Herrera and Bunge about national science:

Regarding so-called “national science” I think it is useful to make a distinction. If by it we refer to special methods to design research, test hypothesis or infer conclusions from premises, methods that relate to our idiosyncrasy and national spirit, then this idea is absurd. Not only absurd, it is also dangerous, as Hitler’s ambitions for German science. But if “national science” means awareness about our problems, the study of techniques that might solve them, the detection of hypothesis and theories that might help us, then this idea matches the characterization of the tasks a scientist must perform in our time.<sup>42</sup>

As the quote demonstrates, the philosopher Hans Reichenbach’s distinction between the “context of justification” and the “context of discovery” was clearly accepted by Klimovsky. In his view, the only national

element that might be present in science relates to the local selection of research problems according to national priorities in a vein similar to that of Alvin Weinberg's external criteria for scientific choice. By contrast, there can be no local or national distinctive feature when we consider the methods used for testing hypothesis—which would fall within Reichenbach's "context of justification." Klimovsky expressed this idea using this same terms: "I do not find ideological aspects that affect objectivity of knowledge, from the perspective of the context of justification."<sup>43</sup> He was in fact one of the scholars who introduced logical-positivism in Argentina, together with Mario Bunge.<sup>44</sup> Moreover, he was interested, especially in light of the wrongdoings of Nazi science, in defining national science as aligned to a strategy for Latin American liberation and autonomy. In a similar vein, Jorge Sabato, in his introduction to a volume about science, technology, development, and dependence in Latin America, maintained that the discussion about national science was like dealing with "old problems in new words." He referred to Johannes Stark's *Nationalsozialismus und Wissenschaft* (1934): "Jews have particularly helped in the diffusion of the idea that science is international. No, science is not international, it is as national as art."<sup>45</sup> Another polemist, Thomas Moro Simpson also linked this discussion with the Lysenko affair and the protection of theories based on patriotism and nationalism.

The positions of intellectuals like Herrera, Sabato, and Klimovsky about the issue of national science can then be summarized as follows. They held that the methods and the agenda of scientific research could be considered separately. Regarding methods (falling within the realm of the "context of justification") there can be no characteristics that emerge from geopolitical situations. Nevertheless, local needs and knowledge demands can—and should—influence the selection of research topics. This does not mean that basic research should be neglected. On the contrary, it is the key to autonomy and development. Although the national needs are important in shaping the research agenda, a radical stance should be avoided since it resembles Nazi science and the Lysenko affair.

## NATIONAL SCIENCE AND REVOLUTIONARY PROJECTS

Oscar Varsavsky's figure gained prominence as the most radical position in the debate on national science. Varsavsky obtained his PhD for his work on the foundations of quantum statistics and held a professorship

at the Department of Mathematics at the University of Buenos Aires. In the early 1960s, he was one of the most radical critics of the *desarrollista* (developmentalist) position. *Desarrollistas* were those who willingly accepted foreign research funds and thought that science in a peripheral country should reach developed nations' level of achievement with the same standards. To accomplish that, *desarrollistas* supported the education of scientific graduates in traditional American and European universities, and insisted on their return to Argentina to share the knowledge gained during their stay abroad. Varsavsky objected to this usual practice within the scientific community. He claimed that this practice strengthened the cultural dependence and was a proxy for the reproduction of research agendas unrelated to local realities. He also distrusted the ideological commitments embedded in foreign funding. In the late 1960s the Camelot Project, a social research study funded by the US Army on domestic armed conflicts that was going to be implemented as a pilot in Chile, had caused great unease in the academic community.<sup>46</sup> Scholars and researchers perceived the study as similar to previous cases at the University of Buenos Aires when research grants had been made available by the Ford Foundation.

After the 1966 military coup in Argentina, Varsavsky was exiled in Venezuela, from where he started to reflect about his previous experience and developed his critique of *desarrollismo*. The *locus classicus* for this critique was his book *Ciencia, política y cientificismo* (“Science, Politics and Scientism”), published in Buenos Aires in 1969. He had discussed some of his ideas before in a short article published in the *American Behavioral Scientist*.<sup>47</sup> Varsavsky claimed that the only way to break the colonial links that the *desarrollismo* (also referred as “scientism”) position builds was through a radical change in how science is done. He developed the notion of *styles* of scientific development. In his book *Hacia una política científica nacional* (“Towards a national science policy”), he distinguishes between three scientific styles: neocolonialism, developmentalism, and creative socialism. Neocolonialism implies that less developed countries would support basic science even though it was “useless” for technological application and social and industrial development.<sup>48</sup> Varsavsky believed the pursuit of this type of research as equating to colonialism insofar as the agenda for basic research is disguised in less developed countries and rooted in the needs of developed countries. Only their epistemic objectives are explicitly mentioned. In other words, to put it simply, it is colonial

because it is “sold” to underdeveloped as basic research whereas in fact it has an agenda that is being disguised and invisibly shaped by the needs and interests of the companies and governments of developed countries. In contrast, *desarrollismo* recognizes the importance of science for development, but takes the USA as social model and praises the postwar industrial development based on technological innovation. But “its hidden premise is that men and society will remain essentially as in current developed countries and the possibility of a New Man in a new society is not even mentioned.”<sup>49</sup> The third option, creative socialism, states that current science is more value-laden than what the *desarrollistas* acknowledge. It includes some pro-capitalist agendas (e.g. social psychology for advertising) and excludes other more revolutionary ones (as research about social transformation and the New Man).<sup>50</sup> In this respect, he points to the need to develop social sciences under a revolutionary perspective. It is in the social sciences where the main breakthroughs still have to be made. He also critiqued the technological development in the Socialist bloc, claiming that the USSR had achieved great advances in natural science and engineering (the Sputnik, the elimination of hunger and epidemics) but “many of us still have doubts that the Soviet man, now in its second generation, is indeed ‘new’.”<sup>51</sup>

If neocolonialism represents in general terms a universalist vision of science, the *desarrollista* approach recognizes the importance of science for development but does not make a broader critique of society or the internal structure of science, as alluded earlier. For Varsavsky, who endorsed a Marxist radical viewpoint, science should become part of a project of revolutionary political change. He critiqued the perspective of Klimovsky and Herrera, since they still maintained that science is a universal tool that could be used for different political objectives. In his view, science should be completely transformed for revolutionary purposes. The economic, political, and cultural requirements of socialism in developing countries demand a new scientific style that can be termed as a “national science.”<sup>52</sup> In contrast with the views of the authors previously discussed, this style does not only refer to agenda-setting issues. It includes also considerations about the context of justification:

Scientists now accept without great questioning the ideological uses of science, which were dramatically demonstrated by the atomic bomb. They reluctantly also accept that the selection of research proposals and subjects can be determined by extra scientific considerations (...) but by no means



they can accept that a doubt be cast on the neutrality of “scientific method”, of truth criteria, of everything that in “empiriologic” language is called “context of justification”, as different from the contexts of discovery and application. We will see however, that with a closer look to the elements and components of this scientific method many different possibilities immediately appear for each one, all of which are not easily adapted to all styles of development.<sup>53</sup>

In open opposition with Bunge and Klimovsky, Varsavsky claimed that the scientific method can have variability according to the development style of a given society. The standards for hypothesis validation will not be the same for a neocolonial, developmental, or socialist style. Varsavsky’s critique was mainly directed to the social sciences. The methodology used in those disciplines carries out biased assumptions and does not promote social change, whereas social sciences able to serve a socialist style make use of a methodology fitting that objective. “I am not saying that the methods usually used are bad for everything. They are bad to deal with the problem of social transformation. Neither am I maintaining that they necessarily bring about false results. The point is that the methods might not be the most adequate and that their utilization delays the results.”<sup>54</sup> Criticizing the social sciences’ methodology, he pointed out, for instance, to the uncritical use of statistics, the reliance on “trendy” theories (game theory, cybernetics) and the simplistic application of mathematics and topology to the understanding of society. According to Varsavsky, society is more complex and these frameworks fail to capture its complexity. His proposal was not to deny the importance of quantitative methods. He proposed instead to redefine them. Until his death in 1976 he worked in “numerical experimentation” methods to help the planning of a socialist society.

In addition, Varsavsky focused on another issue, which was a key to his conception of justification of scientific theories. According to the logical-positivist view, the acceptance or rejection of a theory or hypothesis should be based in the analysis of empirical data and its logical relations to theory. Varsavsky, on the contrary, maintained that this decision should be made on the basis of three criteria: “importance, ethical value and credibility (a more sincere word than ‘truth’ or ‘probability’), which is only possible if the hypothesis is integrated with others in a system, which is immersed in an environment.”<sup>55</sup> Rather than separating the contexts, as Klimovsky did, Varsavsky intended to join the philosophical epistemic dimension with ethics and politics. In his holistic system, a hypothesis could not be

assessed separately from its context; its credibility was always related to its importance and ethical value.

Finally, Varsavsky confronted Klimovsky's emphasis on basic science as a means to achieve political autonomy. He boldly rejected "recreational" basic research: "The definition of a technological policy is previous to any consideration of science policy: the latter depends on the former. Only after deciding—in general terms—the style and technological strategy, it is possible to judge the functionality of scientific research and assign priorities."<sup>56</sup> The definition of a style of society or a "national project" (as he calls it in further works) happens first, and then, based in that decision, it will follow the adoption of a suitable technological and scientific style.

### PHILOSOPHY AND SCIENCE POLICY: CONCLUDING REMARKS

The debate about national science has many relevant aspects. On the one hand, it draws attention to the role of political drivers in the first wave of the reflections on science, technology, and society in the twentieth century. It also shows a thematic confluence of the issues discussed in the same years in the USA and Western Europe; for instance, the questions of the priorities for scientific research and the role of public funding in it. The feature that distinguished the Latin American debate was the emphasis on the regional situation and the analysis of the impact of imperialist practices and "imitative behaviors" on science funding and research communities. In the intellectual scene of the Cold War, discussions about science and politics were interwoven with the conflict between the capitalist and the socialist blocs. Latin America was deeply entrenched in the global power dispute between the USA and the USSR. While the former funded and supported pro-American military regimes, the latter supported a guerrilla war through Cuban influence. Within this framework, for someone like Varsavsky, "national" science that would take part in the liberation of Latin America from economic and cultural dependency was inseparably linked to the vision of a revolutionary political change. The transformation he envisioned was deemed to overcome the shortcomings of the Soviet model as it advocated the idea of a "new man"; an anthropologic shift that did not take place in the Soviet Union. Other authors like Klimovsky and Herrera did not see the need of a revolution, or even a philosophical reform, as they believed it possible to reform science and include developmental instances without compromising its universality.

The debates examined in this chapter also had influence on the actual policies that were developed in Latin America. At the university level, during the early 1960s in Buenos Aires most professors in the research schools adopted the approach I termed “a science with the national traits.” Importance was given to the improvement of material conditions for research (more full-time professorships, scholarship for postgraduates, funding for equipment) and also social commitment and political involvement with national issues was praised and encouraged through popular education and university outreach.<sup>57</sup> More radical approaches such as Varsavsky’s emerged within the context of the discussion of foreign funding for academic research by the Ford and Rockefeller Foundations.<sup>58</sup> Varsavsky helped to increase awareness about the ideological load of some of the research policy proposals, targeting mainly the social sciences. Till today, Varsavsky’s figure is an icon of anti-imperialist science studies in the region and he is quoted as an inspirer of socialist science policies by Hugo Chávez’s administration in Venezuela.<sup>59</sup>

Moreover, technical accomplishments can be seen as a consequence of reflections on autonomy and anti-imperialism. The local development of a research reactor and the inclusion of local suppliers for the construction of the first nuclear power plant in Argentina could not have been possible without a strong political commitment.<sup>60</sup> However, it should be also noted that the changing political landscape in Latin America during those years prevents from making a global analysis. The military and civil administrations that held office had different views on science and technology that were specific for each country and technological field.

Besides the political issues that this discussion raises, the inclusion of the philosophical dimension is particularly interesting. It is not usual in the field of science policy even nowadays to discuss research priorities and political uses of research along with the nature of scientific method. On this, I believe that the Latin American debate was ahead of its time. Today only a few philosophy of science would accept that non-epistemic values play a role in the context of justification.<sup>61</sup> In fact, although it may share some holistic framework with Kuhn, Varsavsky’s view is closer to this current research agenda than to the radical views of the philosophers of his time (like Feyerabend). His opponents discuss with him and defend the objectivity of the context of justification; they attack him as if he were a representative of irrationalism or relativism. But his critics did not hit the target since Varsavsky was not contesting the whole building of science

and its rationality. He maintained the need to recognize variability in the context of justification and reconsider how we assess empirical evidence. So his philosophical perspective on science was not as radical as his political views. While he claimed that Latin American societies needed a deep political (anthropological even) transformation, that in the realm of science should not be so deep.

Summing up, the Latin American discussions of national science give an important insight on the larger context of the political and philosophical debates in the late 1960s and early 1970s, providing an interesting comparative dimension to our current research agendas. These discussions show that the first wave of the reflections about science and technology was driven by political and geopolitical issues. These political concerns had set the stage for the intellectuals' philosophical analyses. With the professionalization of science policy along with the apolitical drift in philosophy of science these connections between philosophical analyses of science and the political concerns became less and less tangible. Yet, as this chapter shows, the philosophical debates were started as the response to the ongoing debate on the role of science in the development of Latin American nations.

## NOTES

1. Elena Aronova, "The Congress for Cultural Freedom, Minerva, and the Quest for Instituting 'Science Studies' in the Age of Cold War," *Minerva* 50 (2012): 307–337; Aant Elzinga, "The Rise and Demise of the International Council for Science Policy Studies (ICSPP) as a Cold War Bridging Organization," *Minerva* 50 (2012): 277–305.
2. See Philip Kitcher, *Science, Truth and Democracy* (New York and Oxford: Oxford University Press, 2001); P. Kitcher, *Science in a Democratic Society* (New York: Prometheus Books, 2011); Heather E. Douglas, *Science, Policy and the Value-Free Ideal* (Pittsburgh: University of Pittsburgh Press, 2009).
3. Gilbert Joseph and Daniela Spenser, eds., *In from the Cold: Latin America's New Encounter with the Cold War* (Durham: Duke University Press, 2008).
4. George Reisch, *How the Cold War transformed Philosophy of Science* (New York: Cambridge University Press, 2005).
5. Robert E. Kohler, "Science, Foundations and American Universities in the 1920s," *Osiris* 3 (1987): 135–164.
6. Diego Hurtado and A. Busala, *Ideales de la universidad científica. Elitismo y función social de la ciencia, 1931–1959* (Buenos Aires: Libros del Rojas,

- 2003); Diego Hurtado and María José Fernández, “Institutos privados de investigación pura versus políticas públicas de ciencia y tecnología en Argentina (1943–1955),” *Asclepio. Revista de Historia de la Medicina y de la Ciencia* 65/1 (2013): 1–17.
7. Adriana Barreiro and Amílcar Davyt, *Cincuenta años de la Oficina Regional de Ciencia y Tecnología para América Latina y el Caribe de la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (ORCYT/UNESCO) Un análisis histórico de la cooperación en la región* (Montevideo: UNESCO, 1999).
  8. Martha Finnemore, “International Organizations as Teachers of Norms. The United Nations Educational, Scientific, and Cultural Organization and Science Policy,” *International Organization* 47 (1993): 565–597. See also Perrin Selcer, “Patterns of Science. Developing Knowledge for a World Community at UNESCO,” PhD dissertation, University of Pennsylvania, 2011.
  9. Barreiro and Davyt, *Cincuenta años de la Oficina Regional de Ciencia y Tecnología*, pp.26–30.
  10. Óscar Gustavo Retana Guiascón, “La institucionalización de investigación científica en México,” *Revista UNAM Ciencias* 94 (2009): 46–51. See also Diego Hurtado, *La ciencia argentina: un proyecto inconcluso* (Buenos Aires: Edhasa, 2011); Rafael de Brito Dias, *Sessenta anos de política científica e tecnológica no Brasil* (Campinas: Editora da UNICAMP, 2012).
  11. Alvin Weinberg, “Criteria for scientific choice,” *Minerva* I (1962), 158–171. Aronova and Elzinga; Aronova, “The Congress for Cultural Freedom, Minerva, and the Quest for Instituting ‘Science Studies’ in the Age of Cold War,” 307–337; Aant Elzinga, “Features of the current science policy regime: Viewed in historical perspective,” *Science and Public Policy* 39 (2012): 416–428.
  12. Edward Shils, ed., *Criteria for Scientific Development. Public Policy and National Goals* (Cambridge, MA: MIT Press, 1968), x.
  13. Finnemore, “International Organizations as Teachers of Norms. The United Nations Educational, Scientific, and Cultural Organization and Science Policy,” 565–597. This does not mean that cosmopolitanism and universalist ideology disappeared. A group of international experts, members of an elite that shared norms and values, did emerge. But the “world community” did not become the popular and vivid representation of unity of mankind that was originally envisioned. See Selcer, *Patterns of Science. Developing Knowledge for a World Community at UNESCO*, 415–420.
  14. Quoted in Barreiro and Davyt, *Cincuenta años de la Oficina Regional de Ciencia y Tecnología*, 46.
  15. Walt Whitman (W.W.) Rostow, *The Stages of Economic Growth. A non-communist Manifesto* (Cambridge: Cambridge University Press, 1960).

- Selcer points out that it cannot be sustained that UNESCO did itself become an instrument of American foreign policy. American foundations, such as Ford and Rockefeller fulfilled that purpose more explicitly. P. Selcer, "The View from Nowhere. Disciplining Diversity in post-World War 2 International Social Science," *Journal of the History of the Behavioral Sciences* 45/4 (2009): 309–429.
16. Adriana Feld, "Planificar, gestionar, investigar. Debates y conflictos en la creación del CONACYT y la SECONACYT (1966–1969)," *Eä Journal* 2/2 (2010): 1–43.
  17. Barreiro and Davyt, *Cincuenta años de la Oficina Regional de Ciencia y Tecnología*, 50.
  18. Michael Latham, "Ideology, Social Science and Destiny: Modernization and the Kennedy-era Alliance for Progress," *Diplomatic History* 22/2 (1998): 199–229. See also Diana Marcela Rojas, "La Alianza para el Progreso en Colombia," *Análisis Político* 23/70 (2010): 91–124.
  19. A. Feld, "Las primeras reflexiones sobre la ciencia y la tecnología en la Argentina (1968–1973)," *Redes* 17/32 (2011): 185–221.
  20. R. Dagnino, H. Thomas, and A. Davyt, "El Pensamiento Latinoamericano en Ciencia, Tecnología y Sociedad. Una interpretación política de su trayectoria," *Redes* 3/7 (1996): 13–51. See also O. Galante, M. Marí, R. Carnota, F. Vasen, and O. Benso "La Escuela Latinoamericana de Pensamiento en Ciencia, Tecnología y Desarrollo: proyecto de recuperación histórica y documental," Paper presented at the 13th *Encuentro ALTEC*, Cartagena de Indias (Colombia), 2009.
  21. Jorge A. Sabato, and N. Botana "La ciencia y la tecnología en el futuro de América Latina," in *El pensamiento Latinoamericano en la problemática ciencia-tecnología-desarrollo-dependencia*, edited by J.A. Sabato (Buenos Aires: Biblioteca Nacional, 2011 [1975]), 215–234.
  22. This distancing from autarky could be showing a critical appraisal of traditional anti-imperialist approaches like those of Franco's Spain or Fascist Italy (see Norton Wise and Tiago Saraiva, "Autarky/Autarchy: Genetics, Food Production, and the Building of Fascism," *Historical Studies in the Natural Sciences* 40/4 (2010): 419–428). Since the reflection is taken from a text of 1982, it could also point to a retrospective critique of the more radical positions that also emerged during the 1960s in Latin America. Jorge A. Sabato, "Reflexiones sobre ciencia y tecnología," *Informe Industrial* 70 (1983): 14–17.
  23. Amílcar O. Herrera, *Ciencia y política en América Latina* (Buenos Aires: Siglo XXI, 1971), 72 [my translation].
  24. *Ibid.*, 97.
  25. Rostow, *The Stages of Economic Growth. A non-communist Manifesto*, 4–16.

26. Fernando H. Cardoso and Enzo Faletto, *Dependency and Development in Latin America* (Berkeley: University of California Press, 1979 [1968]).
27. Silvia Sigal, *Intelectuales y poder en Argentina. La década del sesenta* (Buenos Aires: Siglo XXI, 2002); see also María Elina Estébanez, “La modernización en Exactas: los subsidios de la Fundación Ford durante los años ‘60.” in *La construcción de la ciencia académica. Instituciones, procesos y actores en la universidad argentina del siglo XX*, edited by Carlos A. Prego and Oscar Vallejos (Buenos Aires: Biblos, 2010), 253–268.
28. On Feyerabend’s radicalism, see the chapter written by Ian Kidd in this volume.
29. J. Patrice McSherry, “Tracking the origins of a state terror network,” *Latin American Perspectives* 29: 1 (2002): 38–60.
30. These issues were not completely absent from the pages of the journal *Ciencia Nueva*. Feld and Kreimer point out that environmental discussion did have its place (Adriana Feld and Pablo Kreimer, “La science en débat en Amérique Latine. Perspectives « radicales » au début des années 1970 en Argentine,” *Revue d’anthropologie des connaissances* 6 (2012): 29–58). It can also be reminded that the Latin American World Model developed by Herrera et al. in 1976. Amílcar O. Herrera et al., *Catastrophe or New Society? A Latin American World Model* (Ottawa: IDRC, 1976) openly contested environmental arguments put forward in *Limits to Growth*. See Dennis L. Meadows et al., *The Limits to Growth. A report for the Club of Rome’s Project on the Predicament of Mankind* (New York: Universe Books, 1971). But environmental issues remained marginal to the political debate on science.
31. Gregorio Klimovsky et al., “*Ciencia e ideología. Aportes polémicos*,” Buenos Aires: Ciencia Nueva, 1975.
32. Feld and Kreimer, “La science en débat en Amérique Latine. Perspectives « radicales » au début des années 1970 en Argentine,” 29–58.
33. Michael Polanyi, “The Republic of Science: its Political and Economic Theory,” in *Criteria for Scientific Development. Public Policy and National Goals*, edited by E. Shils (Cambridge, MA: MIT Press, 1968 [1962]), 1–20.
34. Mario Bunge, “Filosofía de la investigación científica de los países en desarrollo,” in *El pensamiento Latinoamericano en la problemática ciencia-tecnología-desarrollo-dependencia*, edited by J. A. Sabato (Buenos Aires: Biblioteca Nacional, 1975), 75–85, on 78. [my translation].
35. The context of discovery relates to the origin and construction of scientific hypothesis. In contrast, the context of justification deals with the process of acceptance or rejection of hypothesis based on logical reasoning and empirical data. According to the traditional philosophical point of view, while the discovery process can be influenced by non-epistemic values, justification remains value-free. See Paul Hoyningen-Huene, “Context of Discovery and Context of Justification,” *Studies in the History*

- and Philosophy of Science* 18 (1982): 501–515; Jutta Schickore and Friedrich Steinle, eds., *Revisiting Discovery and Justification: Historical and Philosophical Perspectives on the Context Distinction* (Dordrecht: Springer, 2006).
36. Naomi Oreskes, “Science, Technology and Free Enterprise,” *Centaurus* 52 (2010): 297–310.
  37. Herrera, *Ciencia y política en América Latina*, 97. [my translation].
  38. Bunge, “Filosofía de la investigación científica de los países en desarrollo,” 83. Bunge can be situated in an intermediary position between the universalist stance and this second perspective. He acknowledges the existence of a local agenda, but denies the existence of a relationship of “domination” of the peripheral science by the center. He also distrusts an excessive localism [my translation].
  39. *Ibid.*, 83.
  40. Gregorio Klimovsky, “Ciencia e ideología,” in *Ciencia e ideología. Aportes polémicos*, edited by G. Klimovsky et al. (Buenos Aires: Ciencia Nueva, 1975), 11–37, on 35. [my translation].
  41. *Ibid.*, 30.
  42. *Ibid.*, 37.
  43. *Ibid.*, 28.
  44. Alberto Cordero, “Philosophy of Science,” in *A Companion to Latin American Philosophy*, edited by Susana Nuccetelli, Ofelia Schutte, and Otávio O. Bueno (London: Wiley-Blackwell, 2010), 370–382.
  45. J. Sabato, “Nota introductoria a la sección ‘ciencia e ideología’,” in *El pensamiento Latinoamericano en la problemática ciencia-tecnología-desarrollo-dependencia*, edited by J. Sabato (Buenos Aires: Biblioteca Nacional, 2011[1975]), 33–37, on 34. [my translation].
  46. George E. Lowe, “The Camelot Affair,” *Bulletin of the Atomic Scientists* 22/5 (1966): 44–48. See also Marc Solovey, “Project Camelot and the 1960s Epistemological Revolution Rethinking the Politics-patronage-social Science Nexus,” *Social Studies of Science* 31/2 (2001): 171–206.
  47. Oscar Varsavsky, “Colonialism in the Hard Sciences,” *American Behavioral Scientist* 10 (1967): 22–23; O. Varsavsky, *Ciencia, política y cientificismo* (Buenos Aires: Centro Editor de América Latina, 1969).
  48. O. Varsavsky, *Hacia una política científica nacional* (Buenos Aires: Periferia, 1972).
  49. *Ibid.*, 46.
  50. The idea of the New Man is part of Ernesto Che Guevara’s revolutionary humanism, who claimed that it was necessary to build a new revolutionary subjectivity, deprived from all individualism. Michael Löwy, *The Marxism of Che Guevara. Philosophy, Economics and Revolutionary Warfare* (Lanham: Rowman & Littlefield, 1973).



51. O. Varsavsky, *Hacia una política científica nacional*, 50. [my translation].
52. O. Varsavsky, “Bases para una política de ciencia y tecnología,” in *Ciencia e ideología. Aportes Polémicos*, edited by G. Klimovsky et al. (Buenos Aires: Ciencia Nueva, 1975), 52–57. [my translation].
53. Varsavsky, *Hacia una política científica nacional*, 59. [my translation].
54. O. Varsavsky, “Ideología y verdad,” in *Ciencia e ideología. Aportes Polémicos*, edited by G. Klimovsky et al. (Buenos Aires: Ciencia Nueva, 1975), 41–51. [my translation].
55. *Ibid.*, 44.
56. Varsavsky, “Bases para una política de ciencia y tecnología,” 56. [my translation].
57. C. Rotunno, and E. Díaz de Guijarro, eds., *La construcción de lo posible: la Universidad de Buenos Aires 1955–1966* (Buenos Aires: del Zorzal, 2003).
58. M. E. Estébanez, “La modernización en Exactas: los subsidios de la Fundación Ford durante los años ‘60,” 253–268.
59. C. Maggi, “Palabras de apertura” in *Ciencia y revolución. Homenaje a Oscar Varsavsky* (Caracas: People’s Ministry of Science and Technology, 2008).
60. Manuel Marí, *Evolución de las concepciones de política y planificación científica y tecnológica* (Washington: OAS, 1982).
61. See the discussion in John Dupré, Harold Kincaid, and Alison Wylie, eds., *Value-Free Science? Ideals and Illusions* (New York, Oxford: Oxford University Press, 2007). See also Heather Douglas, *Science, Policy and the Value-Free Ideal* (Pittsburgh: Pittsburgh University Press, 2009).