

ISSUES IN INTERDISCIPLINARY STUDIES
No. 34, pp. 164-182 (2016)

DEVELOPMENT STUDIES AS AN INTERDISCIPLINARY FIELD: RESEARCH, TEACHING, AND INSTITUTIONAL BUILDING IN URUGUAY

by

Rodrigo Arocena
Professor of Science and Development, Faculty of Sciences
University of the Republic, Uruguay

and

Judith Sutz
Professor and Academic Coordinator of the University Research Council
University of the Republic, Uruguay,

Abstract: The need that emerged in Development Studies to trespass across disciplinary boundaries is discussed. An interdisciplinary characterization of Human Sustainable Development is sketched. Some attempts at the University of the Republic in Uruguay to foster related work that connects sciences and natural sciences are briefly described. This work spans research, teaching, institutional building, and university reform. It has been affected by the difficulties of pursuing interdisciplinary work when the growth of knowledge promotes specialization and academic structures are shaped by disciplinary concerns. Nevertheless, emergent lessons from the experience reported here suggest that trespassing across disciplinary boundaries in Development Studies may contribute significantly to fostering interdisciplinarity.

Keywords: interdisciplinarity, Development Studies, Developmental Universities, Uruguay

Introduction

Seventy years ago, when the Cold War and decolonization were starting, the topic of development rose to the top of political and academic agendas. That was not a coincidence: Alliances and strategies for development in the new independent countries, and in the whole Third World, became a main chapter of the conflict between East and West. Scholars of different origins conducted research on development, but it was mainly seen as an aspect of the discipline of economics, perhaps a new sub-discipline of Development Economics. That view prevailed even when development was defined as a global social transformation that should include structural changes in rural property, finance, regional integration, and the role of the state. Such a global view of development characterized, for example, the contribution of the Economic Commission for Latin America and the Caribbean (ECLAC), led for many decades by Raúl Prebisch and frequently referred to as the “ECLAC structuralism.” If the work in that context included some social scientists who were not economists, their number was limited and natural scientists or engineers were almost completely absent.

In the late 1970s, Albert Hirschman wrote a famous “self-critique” of development, later included in a book significantly entitled *Essays on Trespassing: From Economics to Politics and Beyond* (1981). The book called for taking seriously the intrinsically interdisciplinary nature of Development Studies. Its author is widely recognized as one of the most influential interdisciplinary social scientists of the second half of the 20th century.

Framed by this context, this article will address the following questions:

- (i) Why shortcomings of traditional conceptions of development, stemming from seventy years of history, suggest a deep change in related thinking already underway, particularly in works related to Amartya Sen’s conception of “development as freedom” (1999);
- (ii) Why new ways of thinking about development should combine normative, factual, prospective, and propositional approaches in ways that demand truly interdisciplinary elaboration taking stock of every main branch of knowledge. Such a conception of development and of Development Studies will be sketched; it can connect the enduring insights of Latin American thinking about Science, Technology, Development, and Dependency with the search for inclusive Innovation Systems; and
- (iii) How such a conception has inspired institutional building, teaching, and research policies at the University of the Republic

of Uruguay (UdelaR). These actions are connected to the Research Council of UdelaR, the Unit of Science and Development of the Faculty of Sciences, the Development Network of UdelaR, a quite new Bachelor degree in Development, and the creation of the Espacio Interdisciplinario as part of a reform project oriented by the notion of a Developmental University.

1. From Development Economics to Development Studies

Only a generation after a new and burgeoning subdiscipline of Economics appeared in the aftermath of the Second World War, Development Economics, one of its pioneers reflected on the implications for interdisciplinarity in a famous self-critique of that subdiscipline:

[D]evelopment economics started out as a spearhead of an effort that was to bring all-around emancipation from backwardness. If that effort is to fulfill its promise, the challenge posed by dismal politics must be met rather than avoided or evaded. By now it has become quite clear that this cannot be done by economics alone. It is for this reason that the decline of development economics cannot be fully reversed: our subdiscipline had achieved its considerable luster and excitement through the implicit idea that it could slay the dragon of backwardness virtually by itself or, at least, that its contribution to this task was central. We now know that this is not so; a consoling thought is that we may have gained in maturity what we have lost in excitement. (Hirschman, 1981, p. 23)

The quotation appeared in the first essay in Hirschman's aforementioned book, *Essays in Trespassing*. In the prologue he issued a direct call for an interdisciplinary approach to development problems, asserting that coping with some major challenges of economic and political development requires substantial incursions into other areas.

Soon thereafter Hirschman's concept of an "art of trespassing" became widely recognized and cultivated (Foxley, et al., 1986). By then integrated approaches to development had already been fostered in various institutional settings for several years, for example, in Europe, the Institute for Development Studies in Sussex, UK, and in Latin America, the Center for Development Studies of the Central University of Venezuela. The interdisciplinary spirit of that Center is well known to the authors of this article, a mathematician and an engineer who were both enrolled there in postgraduate programs in Development Studies.

From a broader historical standpoint, by 1970 an important effort to influence policy was underway, aimed at overcoming the narrow view of technology transfer as a road to development. A main influence in that direction stemmed from a document known as the Sussex Manifesto (Singer et al., 1970). Its importance derived from the heterodoxy of its views at that time: Developing countries, even the least developed ones, needed to build their own research capacities; and attention should be given to non-market demand for knowledge, to better link the latter with development goals. Its leader was a development economist, Hans Singer, a close colleague of Prebisch. The team included an economist and industrial policy researcher, Christopher Freeman, and two science and technology policy practitioners with academic backgrounds in geophysics and sociology. Given their diverse backgrounds, relationships between knowledge and development from diverse standpoints were very much in their minds.

Another generation has passed since Hirschman wrote his plea for combining disciplines in Development Studies. A recent collective volume published in 2014 under the title *International Development: Ideas, Experiences, and Prospects* (Currie-Alder et al.) covers a wide set of related topics and perspectives. In its Foreword, Amartya Sen recalls the English philosopher Thomas Hobbes' famous declaration that human lives are "nasty, brutish and short" and that deprivation is caused by "the 'solitary' lives of people." Then, as a characterization of the field, Sen writes:

The subject that we now call "development economics," or more broadly "development studies," is particularly concerned with reversing the solitariness of human efforts to improve their individual lives, through attempts to overcome the nastiness, the brutishness, and the shortness of human lives through human interactions, within the borders of a state, but also across the boundaries. (Sen, 2014, p. x)

Restricted conception of the study of development is still evident in Sen's statement where nevertheless a newer and broader one appears, one that is strongly advocated by the editors of the volume; they go beyond Hirschman's plea by arguing that "thinking on development is pulling together, breaking out of disciplinary silos and drawing on ideas, concepts, and theories across the natural and social sciences" (Currie-Alder et al., 2014, p. 2).

The notion of breaking out of silos is illustrated by the work of John D. Bernal. Besides his scientific contribution as a crystallographer, he elaborated a far-reaching reflection on the role of knowledge in social transformation (Bernal, 1939, 1954). Its importance was recognized when the Society for the Social Studies of Sciences named its award for distinguished contributions

to the field the J.D. Bernal Award. Despite this recognition, however, the broad reach of Bernal's recommendation for trespassing across boundaries between natural and social sciences has proven particularly difficult to implement.

Such trespassing was also strongly advocated by Christopher Freeman, the father of the notion of National Systems of Innovation: "[W]e do not accept the . . . self-centred view that systems analysts and natural scientists have no business to trespass in the exclusive realm of the social sciences." He added: "Neither economists, nor sociologists, nor political scientists have satisfactory theories of social change and it is unlikely that they will develop them unless they overcome their fragmentation into separate jealously guarded kingdoms and learn to cooperate with each other and with natural scientists" (Freeman, 1973, p. 6). As early as 1973, the example Freeman was giving for the necessity of trespassing across boundaries between social and natural sciences was the economics of pollution. In a lecture honoring him Carlota Pérez (2011, p. 2) stressed the importance of interdisciplinarity in his thinking at that early time: "Perhaps the most important lesson Chris Freeman taught us is that economics is incapable of understanding growth without interdisciplinarity."

We may posit that the more doubts and uncertainty we have about a given problem, the more useful interdisciplinary work will be to find a workable solution or a better understanding. Noted physicist Richard Feynman wrote that "All scientific knowledge is uncertain. This experience with doubt and uncertainty is important. I believe that it is of very great value, and one that extends beyond the sciences. I believe that to solve any problem that has never been solved before you have to leave the door of the unknown ajar" (Feynman, 1998, pp. 26-27). Development is surrounded by doubts and uncertainties. Leaving the door ajar means being able to learn from people representing many different intellectual positions. Moreover, trespassing across disciplinary borders is imperative when it comes to the relationship between knowledge and underdevelopment. Questions such as how modern biotechnology can be useful for productive activities in rural villages cannot be answered adequately from the classic and usually ineffective perspective of technology transfer. Scholars concerned with such questions usually work in an interdisciplinary milieu. At the Athena Institute of the Free University of Amsterdam, for instance, individuals with a double academic background, one in science or technology and another in social sciences (usually communication sciences) have developed methodologies for mutual learning among people from different cognitive worlds. The Institute evolved from the Department of Biology and Society, advancing interdisciplinary

expertise through theoretical and hands-on work in development (Bunders & Broerse, 1991).

Even when overtly praised, however, interdisciplinarity has not dominated thinking about development. Richard Nelson, a founding father of evolutionary economics, has offered personal recollections of the narrowing of scope of his own discipline, economics:

My own graduate education in economics . . . was not narrow, or strongly ideologically slanted in favor of market organization and capitalism. I . . . read a lot in the history of economic thought. Economic history was a required subject, and no weak sister to “theory” and econometrics. The issues of income inequalities and poverty were not glossed over either. (Nelson, 2002, p. 110)

The great economists of an earlier generation tended to be broad scholars. In their writings one often sees informed and sophisticated commentary on writings by social scientists and psychologists, and while by 1900 or so economics had become a somewhat specialized subject, the great economists writing then, and through the 1950s, were very open to cross disciplinary discourse. (Nelson, 2002, p. 112)

Why, then, did the narrowing, the move away from the “cross disciplinary,” occur? Nelson has provided one explanation: the trend towards mathematized abstract models. Its early casualties were the more “inter”-directed subjects, such as history of ideas and economic history. Thomas Piketty penned a caustic critique of the trend in his book *Capital in the Twenty-First Century*, including a plea for interdisciplinarity: “The truth is,” he argued, “that economics should never have sought to divorce itself from the other social sciences and can advance only in conjunction with them. The social sciences collectively know too little to waste time on foolish disciplinary squabbles” (2014, p. 32).

Development Economics started early on an original path in Latin America (Prebisch, 1950); it was based on the work of the Economic Commission for Latin America and the Caribbean (ECLAC). It made a fundamental contribution to heterodox conceptions of development, highlighting the specific dimensions of problems of growth in peripheral countries and thus opening the way to considering political and social aspects of (under) development as well as differences of power in the international context. Yet, the focus was still economics. Knowledge from technology and natural sciences was seldom considered. Neither orthodox conceptions of development nor ECLAC’s heterodox “structuralism” focused in depth on specific scientific and technological dimensions of underdevelopment. Both assumed that industrialization would offer the solution to problems.

Although less known outside the region, creative Latin American thinking about “science-technology-development-dependency” emerged between the 1960s and 1980s, particularly in work fostered by Jorge Sabato on “the problem of interactions.” Answers to a number of pressing questions contributed wider understanding of the role of science and technology in Development Studies:

When, why and how does a society create a demand for science in a given historical situation? What internal and external factors determine the science supply? How do the fluxes of supply and demand move across the different socioeconomic circuits? Who profits from results of scientific and technological research? How do different actors react to external demands? How and why are productive structure and the scientific and technological infrastructure estranged from each other? What role belongs to the state, particularly in developing countries?” (Sabato, 1975, p. 129; our translation)

Like Bernal, some of the founding fathers of Latin American thinking about “science-technology-development-dependency” had backgrounds in sciences as well as engineering. Sabato was a metallurgist; other “trespassing people” were concerned about development problems: Amílcar Herrera (a geo-scientist), Oscar Varsavsky (a mathematician), and Marcel Roche (a physician), were honored by the Latin American Association for the Social Studies of Science (ESOCITE) in the naming of awards given to best works and trajectories in the field after them. Breaking out of disciplinary silos that separate social sciences from technologies and natural sciences proved fruitful for Development Studies.

Moreover, related works in the Latin American tradition (Sabato & Botana, 1968; Sabato, 1975; Sabato & Mackenzie, 1982) anticipated basic notions of the National Systems of Innovation conceptualization elaborated during the 1980s and early 1990s (Freeman, 1987; Lundvall, 1992; Nelson, 1993). Combined with remarkable insights into distinctive traits of innovation in the South, they opened the way for connecting the National Systems of Innovation conceptualization with Development Studies (Arocena & Sutz, 2005).

2. A Paradigmatic Shift Requiring Interdisciplinarity

In the paradigm Hirschman envisioned, the goal of development was “emancipation from backwardness.” It would stem mainly from economic growth that thus became a goal in itself. Following suit, Development

Economics was the intellectual guide along with strategies for climbing the ladder from backwardness to modernity. That pathway was prioritized as reflecting the push of history. Its underlying values, facts, and trends were considered well established. Yet economic growth produces both benefits and undesirable outcomes. The latter fueled well-known notions of Human Development and Sustainable Development that are normative; they document a shift in characterizing development from strategies to values. The new emphasis was apparent in Sen's conception of "development as freedom" (1999), which opened the way to significant change in development theory (Evans & Heller, 2015).

For new and better paradigms to emerge in the field of Development Studies, though, two "methodological" conditions are necessary: (i) trespassing across disciplinary boundaries in and beyond social sciences; and (ii) combining normative, factual, prospective, and propositional approaches. Both conditions are interconnected because trespassing is necessary to studying values, facts, trends, and proposals in an integrated manner. A key insight in Sen's conception of development is that it starts where a paradigmatic shift should, by focusing on values. Since "emancipation from backwardness" is far from sufficient as a normative guide, elaborating ethical concerns and choices must be the starting point. Whether the aim is achieving justice (Rawls, 1999), lessening injustice (Sen, 2009), or meeting another goal, philosophy is at the center of development. The basic normative approach to development must be ethically sound, widely accepted, and plural in its compatibility with more detailed approaches. It should also be a guide for elaborating the research agenda in terms of facts and trends in order to orient proposals. Such requisites seem to be met by Sen's conception of development, defined as the expansion of capabilities and freedoms.

An early critique by one of Sen's well-known supporters framed future possibilities:

Making explicit the contradictions between 'development as freedom' and the increasing concentration of power over the production of culture, information, and, therefore, preferences brings us back to the question of collective capabilities. The most obvious way to establish a counterweight to the unfreedom of the empires of Coca-Cola and MTV is through promotion of a vibrant associational life that enables the less privileged to develop their own distinctive preferences and priorities based on their shared economics positions and life circumstances, and to develop shared strategies for pursuing those preferences." (Evans, 2002, p. 59)

Two lessons stand out in Evans' comment. First, when elaborating the normative approach, it is necessary to consider both individual and collective dimensions of expanding capabilities and freedoms. Second, when thinking about proposals fostering agency, as Sen teaches, it is important to stress shared strategies of the less privileged.

Integrating sustainability in particular into Sen's framework can be a starting point for interdisciplinary work in the normative approach to development. Combining previous remarks it can be said that Sustainable Human Development is (i) an expansion of people's freedoms and capabilities, both individual and collective, (ii) in order that they may lead lives they value and have reasons to value (iii) in ways that preserve such possibilities for future generations, (iv) assuming expansion of freedoms and capabilities are both the defining aim of development and its main tool, which (v) implies considering people as agents, not patients. This normative definition leads to focusing the factual approach on the issue of power, an issue somehow neglected in conceptualizations of Innovation Systems, though it has been recognized in development work. Currie-Alder, et al. have acknowledged their volume did not address power explicitly, but it was present "in everything to do with development" (2014, p. 12).

The normative characterization of development stresses expanded capabilities and freedoms for attaining goals related to leading valuable lives. "Power is the ability to pursue and attain goals through mastery of one's environment" (Mann, 1986, p. 6). Such environment is both natural and social. In fact, "The pursuit of almost all our motivational drives, our needs and goals, involves human beings in external relations with nature and other human beings. Human goals require both intervention in nature—a material life in the widest sense—and social cooperation" (Mann, 1986, p. 5). This point of view suggests that power stems particularly from:

(1) productive forces and technology more generally (including destructive forces) that enable using material resources in ways that have become increasingly diversified, especially since technological power was strengthened by its combination with science;

(2) social relations that, by coordinating activities of many people, foster organizational power; in that sense the main "sources of social power" are ideological, economic, military, and political relations (Mann, 1986, 1993, 2012, 2013); and

(3) interactions between social relations and technology that include, but are not restricted to, the interactions between productive forces and productive relations highlighted in Marx's theory of history.

The elaboration of such a “Marx-Mann conceptual scheme” for studying (some main aspects) of social power began in Arocena and Sutz (2014, 2015). It is most briefly mentioned here only in order to stress that the study of power relations should be at the core of factual approaches to development and that, by its very nature, such study should be interdisciplinary.

Factual approaches should be complemented by prospective approaches, for both cognitive and policy reasons. Generally speaking, knowledge about some processes should include some ideas concerning its possible futures. At the same time, policies will have effects, whether intended or unintended, not so much in the present as in the future. A prospective approach to the possibilities of Human Sustainable Development should closely examine the increasing role of advanced knowledge in power relations and in living conditions. The interactions of this process with some other main trends will shape the future in no small measure. Examples of such trends are the following:

- (1) accelerated expansion and diversification of production and consumption, as well as rising aspirations in consuming;
- (2) increasing environmental degradation threatening climatic catastrophe;
- (3) improvements in some living standards, including life expectancy, health, and education; and
- (4) inequalities, widening in most countries, fostering poverty and lowering the possibilities of leading valuable lives.

The magnitude of these trends and their connections are well known; all four of them are knowledge-based. They are directly or indirectly fostered and molded by prevailing modes of knowledge production and use, though that is less evident in the fourth trend. The weight of social power relations in expanding inequality is also widely acknowledged (OXFAM, 2016). Furthermore, the dynamics of technological change are a source of inequality (Brynjolfsson & McAfee, 2014). And the interactions of capitalist relations with scientific and technological knowledge concentrate power and pose the risk of “de-democratization” (Tilly, 2005).

Analyzing the possible interactions among such trends demands trespassing across boundaries between natural and social sciences. Trespassing is also necessary when it comes to discussing the propositional approach. An interdisciplinary research agenda for Human Sustainable Development integrates normative, factual, and prospective approaches. Democratizing knowledge becomes a key strategy of the propositional approach, expanding awareness of collective problems of human beings, with priority for the most deprived sectors. Seeing people as agents further implies the process

should involve them, akin to the connotation of transdisciplinarity as co-production of knowledge with stakeholders in society (Hirsch Hadorn et al., 2008; Ostrom, 1996).

Environmental degradation and rising inequality must be met with a “portfolio” of strategies. As a defining goal for policy, fostering frugal innovation for social inclusion means working at multiple levels, not only in technological generation but also in politics and ideology, in order to diminish consumerism and reorient the production of goods and services. Frugal innovation (Bound & Thornton, 2012) means doing more and better with fewer resources. The best science should be involved and innovation policies be seen as part of social policies. Aiming at social inclusion implies that multiple actors must participate. Connecting advanced knowledge with “popular” actors, though, remains a challenge to avoid further knowledge-based inequality.

3. Building Institutional Spaces for Interdisciplinary Work

Interdisciplinary academic work has an important role to play in the conceptualization of development sketched in the previous sections. Toward that end, we have been working for the last thirty years in a sub-field of Development Studies called “Development, Science, and Technology.” It is a space for collaboration between natural and social sciences. Our efforts have been two-fold. We elaborated the underlying ideas in a recent contribution to new conceptions of development (Arocena & Sutz, 2014). At the same time, we have been building institutional spaces for fostering interdisciplinary work related to development in teaching, research, academic policies, and university transformation. We present here this history.

In 1992, the Academic Unit of the Research Council of the University of the Republic of Uruguay (UdelaR) was created. Since then the second author of this article has served as Academic Coordinator of the Unit. Its aims were double and interconnected: first, to cooperate in managing research policies and programs; and second, to conduct academic work in the broad field of Science, Technology, and Society (STS). Discussion then and since has centered on the question of whether research management requires academically trained personnel. If the answer is yes, another question follows. Should the tasks include research and teaching? If so, should research and teaching activities concentrate on advancing disciplinary agendas, such as sociology of science or economics of technology? Or should they build better understanding of problems related to knowledge production and use from an integrated perspective?

The later strategy has prevailed, but pursuing it has not been easy. It entails risks to individual careers based in the academic sphere on mono-disciplinary criteria of performance (McNeill et al., 2001, p. 13). It also poses a challenge in terms of self-identification when disciplines constitute more a background than an identity:

Discipline as identity versus discipline as background. (1) My discipline/training is my allegiance (Jesuit versus Dominican), my noun-expressed identity (“I am an economist”), caste-mark, for life; versus (2) my discipline/training is one of many relevant adjectives or adjectival clauses about me (“I trained in economics 25 years ago”). Hypothesis: stance (2) is better. (Gasper, 2000, quoted in McNeill et al., 2001, p. 14)

We have not been alone in finding it difficult to build a scholarly identity as a member of the field of STS (Jasanoff, 2010). Many young researchers “migrated” back to their disciplinary identities—psychology, anthropology, biology, engineering, political sciences, sociology, and economics. With time, however, a sense of STS identity developed, built upon individuals’ backgrounds and profiting by addressing problems of knowledge and development from multidisciplinary angles. Today the Academic Unit of the Research Council of UdelaR is a recognized group working in matters of Science, Technology, and Society in Uruguay. Connecting planning and evaluating academic activities with researching and teaching has proven fruitful.

Opportunities for working in development, science, and technology have also grown over time. In 1994 the Faculty of Sciences of the UdelaR created a Unit of Science and Development. The first author of this article is the Coordinator of that Unit, which offers courses in which undergraduate science students can study some of the connections with social issues. The first course offered by that Unit was “Science and Development,” and other courses have focused on “University, Science, and Society,” “The Evolution of Scientific Ideas,” “Bioethics and Research Ethics,” “Scientific and Technological Policies,” and “Science and Community Activities.” All members of the Unit are at the doctoral level in the social sciences and at the graduate or postgraduate level in natural sciences.

The Academic Unit of the Research Council and the Unit of Science and Development also cooperate with the Network of Development Studies of the UdelaR. This Network was created with the goal of fostering interdisciplinary work and includes several researchers of both natural and social sciences. At present the majority of personnel (except those belonging to those two Units) are development economists and economic historians. That Network

of Development Studies fostered organization of a Development Bachelor Degree at the Faculty of Social Sciences of UdelaR. Both this degree and the Masters Program in Economic History of UdelaR have courses related to Science, Technology, Innovation, and Development taught by members of the Academic Unit of the Research Council and the Unit of Science and Development. Undergraduate students of the Development Bachelor Degree promoted the organization of a specialized teaching module dealing with issues of science and technology that was launched in 2016; a short course on interdisciplinarity was included to give the students tools to better deal with development problems. The idea of the latter was to help students to build an integrative perspective on development problems by acknowledging the importance of interdisciplinary work.

In addition, the authors of this paper have been working since the beginning of the last decade on the notion of a Developmental University at both theoretical and policy levels as an alternative for a democratizing transformation of higher education that better connects it with Sustainable Human Development (Arocena, et al., 2015; Arocena & Sutz, 2016). This notion inspired a global project for a new reform of the UdelaR (Arocena, 2014, 2016), including expanding and diversifying policies oriented to strengthening research and innovation as well as their connections with social inclusion, technological upgrading of national productive capabilities, and cooperation with small and medium firms (Alzugaray et al., 2012; Bianco & Sutz, 2014).

Creation of the Espacio Interdisciplinario of the UdelaR was a primary effort of reform, influenced by the notion of a Developmental University. It supports interdisciplinary networks, careers involving different areas of knowledge, and a closer integration of the university functions of teaching, research, and extension (elsewhere called “service” or “cooperation” with external actors). Organizing teams to cope with challenges that cannot be handled solely in disciplinary contexts is a major aim. Toward that end Centers for Climatic Change, Childhood and Poverty, and Coastal Management have been created in this institutional environment. Interdisciplinary work obviously occurred before Espacio Interdisciplinario was created. Subsequent initiatives, though, have studied prior experiences, learning about obstacles and designing and implementing strategies to overcome them. Toward that end, in a similar vein to that of the Research Council, an Academic Unit was established to study interdisciplinary research at UdelaR (Martínez et al., 2015) and more generally (Vienni et al., 2015). As a result of these efforts, the Espacio Interdisciplinario has gained wide legitimacy at UdelaR in interdisciplinary activities. It has become a place

where scholars of different disciplines work together while multiplying dialogues between university and society.

Conclusions

The history of the concept and the field of Development Studies demonstrates that understanding complexities of the relationship between nature and society requires interdisciplinary work. Gone are the days when one discipline could aspire to build a “theory of everything.” That is more so if the aim is not only to understand but also to act. As the philosopher Karl Popper wrote more than fifty years ago, “*We are not students of some subject matter but students of problems. And problems may cut right across the boundaries of any subject matter or discipline*” (1962, p. 67).

Popper’s statement is highly applicable for development research, education, and policy-making. Yet, the sheer amount of knowledge available and necessary requires increasing specialization, knowing more about a narrower subject. Combining disciplinary and interdisciplinary work will continue to be a challenge, increasingly difficult but increasingly required. No general and permanent solutions can be expected, but there are better and worse ways of responding. Interdisciplinary scholars have long been aware of these difficulties (Klein, 1986). Researchers working in the Global South, though, often face especially difficult problems for interdisciplinary work in the midst of weak academic systems that amplify pressure to build legitimacy through universalist criteria of quality and traditional career trajectories (Bianco, Gras, & Sutz, 2016). The evolution from Development Economics to Development Studies underscores the need to trespass across disciplinary boundaries and to combine contributions from the natural and social sciences.

This article has sketched a conceptualization of development and the academic practice of Development Studies that goes beyond disciplinary boundaries. It stems from work over a quarter of a century at the University of the Republic in Uruguay. In the long run the aim has been to contribute to interdisciplinary research and teaching about development. But actual purposes were much more limited, and so are the results reported above. The limitations followed both from general causes and personnel situations. The latter include the fact that the authors are not interdisciplinary scholars but only scholars of development. They work in an institution where Development Studies hardly exist. Moreover, as also happens in many other universities around the world, organizational structure, reward systems, academic identities, and “common sense” in general are

shaped by disciplinary considerations. In such context, the overall strategy behind the specific actions previously described has aimed not to establish interdisciplinarity itself but only to encourage “trespassing.” Of course, the conceptualization of development presented in this article trespasses across disciplinary boundaries, and consequently its elaboration will need interdisciplinary work. The activities of the Academic Unit of the Research Council and of the Unit of Science and Development offer opportunities to scholars and students of different disciplines to listen to each other and cooperate systematically. The Espacio Interdisciplinario is an institutional space for experimenting with different types of interdisciplinary work. A notion of a Developmental University distinct from a university comprised of academic silos has been the fundamental inspiration for our work.

Trespassing can be considered as a first step on the route to full-fledged interdisciplinarity. In pursuing trespassing we have encountered big obstacles and achieved small (but very worthwhile) successes. This experience is not isolated. It is part of a larger roster of examples in different parts of the world that, as a whole, affirm that strong interdisciplinarity is crucial to the field of Development Studies. It is difficult to achieve but not impossible.

Biographical Notes: RODRIGO AROCENA holds Ph.D. degrees in Mathematics and in Development Studies, both awarded by the Central University of Venezuela. He is Full Professor of Science and Development, Faculty of Sciences, University of the Republic, Uruguay (since 1994). Former positions in the same University include being its Rector (2006-2014) and Full Professor of Mathematics in the Faculty of Sciences (1986-1996). He organized the Unit of Science and Development in the Faculty of Sciences as an interdisciplinary space for fostering academic collaboration between natural sciences and social sciences. With the same aim he teaches the course “Scientific Knowledge, Social Power, and Human Development” in the Faculty of Social Sciences. With Bo Goransson and Judith Sutz he published “Knowledge Policies in Developing Countries: Inclusive Development and the ‘Developmental University,’” *Technology in Society*, 41 (2015), 10-20. The paper prompted an invitation to write a book to be published by Palgrave.

JUDITH SUTZ is an Electrical Engineer with a Masters on Development Planning (Central University of Venezuela), and holds a Ph.D. in Socio-Economics of Development (University of Paris-Sorbonne). She is Full Professor and Academic Coordinator of the University Research Council, University of the Republic, Uruguay, where she also teaches Research, Innovation, and Development in the Faculty of Social Sciences. She leads an interdisciplinary research group on Science, Technology, and Society, and participated in the institutional building of Espacio Interdisciplinario, an innovative undertaking aimed at promoting interdisciplinary work. She belongs to the Scientific Board of a global network of scholars working from a plurality of standpoints on innovation systems and development, GLOBELICS. With Rodrigo Arocena and Bo Goransson she published “Knowledge Policies in Developing

Countries: Inclusive Development and the ‘Developmental University,’” *Technology in Society*, 41 (2015), 10-20. The paper prompted an invitation to write a book to be published by Palgrave.

References

- Alzugaray, S., Mederos, L., & Sutz, J. (2012). Building bridges. Social inclusion problems as research and innovation issues. *Review of Policy Research*, 29 (6), 776-796.
- Arocena, R. (2014). *Trabajando por una segunda reforma universitaria: La universidad para el desarrollo. Memoria del Rectorado 2006-2014*. Montevideo: Universidad de la República.
- Arocena, R. (2016, forthcoming). Fostering the developmental role of the university in Uruguay. In C. Brundenius, B. Göransson, & J. M. Carvalho de Mello (Eds.), *Universities, inclusive development and social innovation: An international perspective*. New York, NY: Springer.
- Arocena, R., Göransson, B., & Sutz, J. (2015). Knowledge policies in developing countries: Inclusive development and the “Developmental University.” *Technology in Society*, 41, 10-20.
- Arocena, R. & Sutz, J. (2005). Evolutionary learning in underdevelopment. *International Journal of Technology and Globalization*, 1 (2), 209-224.
- Arocena, R. & Sutz, J. (2014). Innovation and democratisation of knowledge as a contribution to inclusive development. In G. Dutrenit & J. Sutz (Eds.), *National innovation systems, social inclusion and development. The Latin American experience* (pp. 15-33). Cheltenham UK: Edward Elgar.
- Arocena, R. & Sutz, J. (2015). Sobre mudança estrutural e políticas de conhecimento democrático. In J. E. Cassiolato, M. G. Podcameni, & M. C. Soares (Eds.), *Sustentabilidade socioambiental em um contexto de crise* (pp. 83-103) Rio de Janeiro: E-papers. English version: On structural change and democratic knowledge policies. Retrieved from http://www.redesist.ie.ufrj.br/ga2012/textos/Judith/Lecture%2013_FoArocena&Sutz.pdf
- Arocena, R. & Sutz, J. (2016, forthcoming). Inclusive knowledge policies when ladders for development are gone: Some considerations on the potential role of universities. In C. Brundenius, B. Göransson, & J. M. Carvalho de Mello (Eds.), *Universities, inclusive development and social innovation: An international perspective*. New York, NY: Springer.
- Bernal, J. D. (1954). *Science in history*. London: C.A. Watts and Co.
- Bernal, J. D. (1939). *The social function of science*. London: Faber Finds.
- Bianco, M., & Sutz, J. (Eds.). (2014). *Veinte años de políticas de investigación en la Universidad de la República: Aciertos, dudas y aprendizajes*. Montevideo: CSIC-Ediciones Trilce.
- Bianco, M., Gras, N. & Sutz, J. (2016). Academic evaluation: Universal instrument? Tool for development? *Minerva* doi:10.1007/s11024-016-9306-9. Article not assessed on an issue.
- Bound, K., & Thornton, I. (2012). *Our frugal future: Lessons from India's innovation system*. Retrieved from: https://www.nesta.org.uk/sites/default/files/our_

frugal_future.pdf

- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age*. New York, NY: Norton and Co.
- Bunders, J., & Broerse, J. (Eds.). (1991). *Appropriate biotechnology in small-scale agriculture: How to reorient research and development*. Wallingford, UK : C.A.B. International.
- Currie-Alder, B., Kanbur, R., Malone, D. & Medhora, R. (Eds.). (2014). *International development. Ideas, experience, and prospects*. New York, NY: Oxford University Press.
- Currie-Alder, B., Kanbur, R., Malone, D. & Medhora, R. (2014). The state of development thought. In B. Currie-Alder, R. Kanbur, D. Malone, & R. Medhora (Eds.), *International development. Ideas, experience, and prospects* (pp. 1-20). New York, NY: Oxford University Press.
- Evans, P. (2002). Collective capabilities, culture, and Amartya Sen's *Development as Freedom*. *Studies in Comparative International Development*, 37 (2), 54-60.
- Evans, P. & Heller, P. (2015). Human development, state transformation and the politics of the developmental state. In S. Leibfried, E. Huber, M. Lange, J. D. Levy, F. Nullmeier, & J. D. Stephens (Eds.), *The Oxford handbook of transformations of the state* (pp. 691-713). Oxford: Oxford University Press.
- Feynman, R. (1998). *The meaning of it all. Thoughts of a citizen-scientist*. Cambridge USA: Addison-Wesley.
- Foxley, A., McPherson, M., & O'Donnell, G. (Eds.). (1986). *Development, democracy, and the art of trespassing. Essays in honor of Albert Hirschman*. Indiana: University of Notre Dame Press.
- Freeman, C. (1973). Malthus with a computer. *Futures*, 5 (1), 4-12.
- Freeman, C. (1987). *Technology policy and economic performance: Lessons from Japan*. London: Pinter.
- Hirsch Hadorn, G., Hoffmann-Riem, H., Biber-Klemm, S., Grossenbacher-Mansuy, W., Joye, D., Pohl, C., Wiesmann, U., & Zemp, U. E. (Eds.). (2008). *Handbook of transdisciplinary research*. New York, NY: Springer.
- Hirschman, A. (1981). *Essays in trespassing. Economics to politics and beyond*. Cambridge, USA: Cambridge University Press.
- Jasanoff, S. (2010). A field of its own: The emergence of science and technology studies. In R. Frodeman, J.T. Klein, & C. Mitcham (Eds.), *The Oxford handbook of interdisciplinarity* (pp.191-205). Oxford: Oxford University Press.
- Klein, J.T. (1986). The broad scope of interdisciplinarity. In D.E. Chubin, L.A. Porter, F.A. Rossini & T. Connolly (Eds.), *Interdisciplinary analysis and research: Theory and practice of problem-focused research and development* (pp.409-424). Maryland, USA: Lomond Pub.
- Lundvall, B. A. (Ed.). (1992). *National systems of innovation - Toward a theory of innovation and interactive learning*. London: Pinter Publishers.
- Mann, M. (1986). *The sources of social power, vol. I. A history of power from the beginning to AD 1760*. Cambridge, USA: Cambridge University Press.
- Mann, M. (1993). *The sources of social power, vol.II. The rise of classes and nation-states, 1760-1914*. Cambridge, USA: Cambridge University Press.
- Mann, M. (2012). *The sources of social power, vol. III. Global empires and revolution, 1890-1945*. Cambridge, USA: Cambridge University Press.

- Mann, M. (2013). *The sources of social power; vol. IV. Globalizations, 1945-2011*. Cambridge, USA: Cambridge University Press.
- Martínez, C., Vienni, B., Cruz, P., & Repetto, L. (2015). Saberes extendidos. Una mirada a la integralidad y la interdisciplina desde el Espacio Interdisciplinario de la Universidad de la República. *INTERdisciplina*, 3 (5), 223-240.
- McNeill, D., García-Godos, J., & Gjerdåker, A. (2001). Interdisciplinary research on development and the environment. Centre for Development and the Environment (SUM) University of Oslo. Retrieved from: <https://www.duo.uio.no/bitstream/handle/10852/32646/irderep10.pdf?sequence=1>
- Nelson, R.R. (Ed.). (1993). *National innovation systems. A comparative analysis*. New York, NY: Oxford University Press.
- Nelson, R.R. (2002). Thoughts stimulated by reading Geoffrey Hodgson's Economics and Utopia. *Review of Social Economy*, 60 (1), 109-113.
- Ostrom, E. (1996). Crossing the great divide: Coproduction, synergy, and development. *World Development*, 24 (6), 1073-1087.
- OXFAM (2016). An economy for the 1%. How privilege and power in the economy drive extreme inequality and how this can be stopped. Oxford: Oxfam GB, Oxfam House Oxford.
- Pérez, C. (2011). Session in memory of Chris Freeman. 9th Triple Helix Conference, Stanford. Retrieved from 7/30/2016: <http://es.slideshare.net/fredwilson/carlotaperez-talk-at>.
- Pikkety, T. (2014). *Capital in the twenty-first century*. Cambridge, USA: Harvard University Press.
- Popper, K. (1962). *Conjectures and refutations: The growth of scientific knowledge*. New York, NY: Basic Books.
- Prebisch, R. (1950). *The economic development of Latin America and its principal problems*. New York, NY: United Nations.
- Rawls, J. (1999). *A theory of justice*. Cambridge, USA: Revised Edition, Harvard University Press.
- Sabato, J. & Botana, N. (1968). La ciencia y la tecnología en el desarrollo futuro de América Latina. *Revista de la Integración*, 1 (3), Buenos Aires 1968, 15-36.
- Sabato, J. & Mackenzie, M. (1982). *La producción de tecnología. Autónoma o transnacional*. México: Ed. Nueva Imagen.
- Sabato, J. (Ed.). (1975). *El pensamiento latinoamericano en la problemática ciencia - tecnología - desarrollo - dependencia*. Buenos Aires: Editorial PAIDOS.
- Sen, Amartya (1999). *Development as freedom*. Oxford: Oxford University Press.
- Sen, Amartya (2009). *The idea of justice*. Cambridge, USA: Belknap Harvard.
- Sen, A. (2014). Foreword. In B. Currie-Alder, R. Kanbur, D. Malone, & R. Medhora (Eds.), *International development. Ideas, experience, and prospects* (pp. x-xi). New York, NY: Oxford University Press.
- Singer, H., Cooper, C., Desai, R. C., Freeman, C., Gish, O., Hill, S., & Oldham, G. (1970). Draft introductory statement for the world plan of action for the application of science and technology to development. Annex II in *Science and technology for development: Proposals for the second development decade*. New York, NY: United Nations, Document ST/ECA/133.
- Tilly, C. (2005). *Identities, boundaries, and social ties*. Boulder, Colorado: Paradigm Publishers.

Vienni, B., Cruz, P., Repetto, L., Von Sanden, C., Lorigo, A., & Fernández, V. (2015). *Encuentros sobre interdisciplina*. Montevideo: Trilce.