

JOÃO ARRISCADO NUNES

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CULTURAL DIFFERENCE IN/ALTHOUGH
SCIENTIFIC WORK**

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The transcultural lab: articulating cultural difference in/through scientific work*

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Abstract

Scientific worlds in semiperipheral countries like Portugal are privileged settings for the study of transcultural processes, due to the relative weakness and fluidity of disciplinary and social world boundaries, the high visibility of boundary work and boundary transgression, the dependence on transnational links and experiences for the viability and legitimation of scientific careers and the importance of "travelling cultures" associated with scientific activity as a resource for the local and national professional cultures of scientists. Both human actors - scientists, technicians, graduate students - and non-human actors - research materials, techniques and "inscriptions" - are involved in articulating cultural difference across social worlds, work settings and national societies.

Drawing on approaches and concepts developed by cultural studies, instances of transcultural articulation as accomplished either in and through lab work or in and through its topicalization in actors' talk and accounts are examined in the context of a cancer research laboratory.

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1. Introduction: Invisibilities

The "classical" laboratory ethnographies produced in the 1970's and early 1980's were undoubtedly a central piece in the emergence of the Social Studies of Science as we know them today. They provided a fresh look into the work of "doing science", of the temporal processes of the heterogeneous articulation of human and non-human actors, forms of knowledge, instruments, materials and languages and of the local contingencies involved in these processes. Science emerged from these studies as a construction or practical accomplishment, or, as Pickering has recently put it, as an "emergent intertwining of human and material agency in a dialectic of resistance and accomodation" (1995: 68), rather than as the rendering of a "nature" or "reality" out there¹.

It is useful to keep in mind these accomplishments, if only to draw to the front stage some of the peculiar invisibilities that pervaded this line of work. Some of these invisibilities - with a privileged focus on gender and class and their interrelations - have been highlighted by critics like Donna Haraway (1992b), Sharon Traweek (1988, 1992) or Susan Leigh Star (1991a, b), to name only a few. Their critical assessments directed subsequent studies towards the ways these dimensions were articulated and their relevance made visible in the space and activity of the lab. I shall not get into further discussion of these issues here. My purpose is rather to engage with another form of invisibility which seems to have been missed by most critics, with some conspicuous exceptions - like that of Sharon Traweek (1988, 1992, 1995, 1996), who dealt with it, even if in a partial way, in her study of high-energy physicists in the United States and Japan, or Charlesworth et al.'s study of an Australian case (1989). Most of the "classical" laboratory ethnographies - such as those by Lynch (1985), Knorr-Cetina (1981) or Latour and Woolgar (1986) -

¹For recent critical assessments of laboratory studies see, among others, Lynch, 1993 (especially Chapter 3) and Knorr-Cetina, 1994b. Knorr-Cetina (1992) also provides an interesting discussion of the centrality of the laboratory in the social studies of science and its relation to the notion of experiment.

were located in American sites, and later additions to the literature tended to focus on countries like Britain, France, the Netherlands, Germany or Canada. Although local conditions and their presumed variability across labs was an issue dealt with explicitly in this work, most laboratory ethnographers were silent about possible differences between scientific work in core settings of what I shall call, for heuristic purposes, the world-system of science and the same kind of work in peripheral or semiperipheral settings². In other words, there seemed to be an underlying assumption that once laboratories were established with appropriate infrastructures, staff and equipment or - to use the language of actor-network theory (Latour, 1987) - once the laboratory network had been replicated or transported from, say, the United States or Germany to Brazil, Portugal or Japan, any remaining differences could be assigned either to local variability of a similar nature to that existing among core laboratories, or to different conditions in the relationship of the lab to its "external" environment - such as science policy orientations, funding priorities or more general structural and institutional constraints related to the economy, the educational system, the links of research institutions to the military, to industry or to business, the gender division of labour or exclusionary practices linked to class, race or ethnicity³. The investigation of these dimensions tended to be displaced to other approaches within science studies, as if they were somehow "external" to the daily working of laboratories⁴.

My main argument, here, is that laboratory ethnographers should look more closely at the way local variations across laboratories organized according to the prescriptions of dominant Western science are mediated by differences in the national and local social and cultural environments in which these labs are embedded⁵. Are there differences between doing laboratory work in physics, molecular biology, immunology or neurophysiology at a research institute in California, at a University lab in Brazil or at a research unit in Portugal? And if there are indeed differences, how are they articulated in

²The concept of a world-system of science with core, peripheral and semiperipheral "zones" is obviously borrowed from Immanuel Wallerstein's world-system theory and from its further developments by Boaventura de Sousa Santos and his co-workers (Santos, 1993, 1994). The concept is discussed in more detail in Nunes, 1995b. For a convergent use of this approach in dealing with research on AIDS see Bastos, 1994.

³For an useful collection of contributions focusing on these themes, see Harding, 1993.

⁴ Callon and Latour's actor network approach (Latour, 1987), Shapin and Schaffer's (1985) historical study of the emergence of "experimental life" and of the modern science laboratory in 17th-Century England and Shapin's more recent study of civility and science (1994) offer important insights for a different approach to these issues, although they don't deal explicitly with the topic I am concerned with in this paper.

⁵Santos (1989) uses the concept of "regulatory conversion" to refer to the processes of mediation between the lab and its "environment". See also Nunes, 1996b.

and through lab work? Are they perceived as relevant by the researchers and technicians themselves? And if that is the case, how are they turned into relevant elements in the "refiguration" of the world which goes on in the lab?

2. Multisite lab work, articulation and scientific frontier cultures

Traweek's study of high-energy physicists, Haraway's comparison of the constitutive role of cultural difference in national versions of primatology (1992a), Hess's survey of academic cultures (1995) or the recent work of Cristiana Bastos on AIDS research in the United States and Brazil (Bastos, 1994) suggest possible ways of carrying out this type of work. They rest upon one version or another of comparative historical research (Haraway) or of multisite ethnography (Traweek, Bastos). At the very least, they require that historical or ethnographic information on different settings be available. I would like to suggest a different path, which should be thought of as complementary, rather than alternative, to the ones just mentioned. It has the considerable advantage of being compatible with a single-site ethnography, and it seems to be particularly suited to research on settings displaying the features of what I shall refer to, in the following sections, as *scientific frontier cultures*. In some research labs, scientists and technicians themselves articulate differences between settings either by resorting to a repertoire of stories and representations of "how things are done abroad" or by invoking a particular kind of scientific travelling experience, which I shall describe - drawing an analogy with multisite ethnography - as *multisite laboratory work*. This kind of experience is unevenly distributed among scientists, but it is a constitutive feature of the way scientists in countries like Portugal "insert" themselves into transnational science worlds, and it is accessible to the ethnographer through "shop talk" and accounts of scientific work. These articulate cultural difference in ways relevant to local activity in the lab.

At this point, it may be useful to clarify my use of *articulation* throughout this paper. In science studies, this concept has been used mostly by authors in the pragmatic-interactionist tradition to refer either to the alignment of actions by participants in a given situation (Strauss, 1993: 40-41), or, more specifically, to the alignment of tasks between different levels of work organization - such as the experimental setting, the laboratory and the science world (Fujimura, 1987: 258). I shall extend its meaning and use it here in the double sense in which it is used in cultural studies. According to Stuart Hall,

articulation describes, on the one hand, "the form of the connection that *can* make a unity of two different elements, under certain conditions... a linkage which is not necessary, determined, absolute and essential for all time"; on the other hand, to articulate means "to utter, to speak forth, to be articulate. It carries that sense of language-ing, of expressing, etc." (Hall, in Grossberg, 1996: 141; emphasis in original)⁶. Whereas the first meaning may be understood as a generalization of the way the term is used by Strauss and Fujimura, the latter definition - which is very close to Homi Bhabha's notion of cultural enunciation (Bhabha, 1994) -, points towards how social actors generate interpretations of their actions and experiences through talk and expression in specific situations and how these are constitutively linked to their actions. Both lab talk and accounts of work experience are instances of articulation in this sense.

This approach suggests the need for a redefinition of what it means to speak of "culture" in laboratory settings. We are no longer speaking solely of the way technical and vernacular languages are brought together in the lab, of how tasks and lines of work are aligned, of how different objects and inscriptions are subject to transformations that turn them into publishable and shareable scientific knowledge, of the rhetorics and pragmatics of scientific writing, or of the emergence of "epistemic cultures" associated with specific disciplines or research domains. A broader and more explicit convergence with current concerns of cultural studies is at stake, here. I shall explore, albeit briefly, two of these concerns: the dynamics of globalization and the enunciation of cultural difference. The case of Portugal provides an interesting entry point for a first approach to these issues.

Portugal is a semiperipheral country within the world economy and state system, with a weak investment in scientific and technological research and weakly defined boundaries between scientific disciplines and specialties. Work in general - including scientific work - is often characterized by common sense as being dominated by low productivity, resistance to innovation, inefficiency and lack of organization. These features, in turn, have often been invoked as instances of a national character whose qualities - gentleness, lack of violence, tolerance towards strangers - would be matched by subservience, laziness, nostalgia for the past or lack of initiative. Many of the features of science worlds in Portugal are explained by scientists themselves by resorting to these popular notions of what makes Portugal and the Portuguese different

⁶See also Slack, 1996; Haraway, 1992; Bhabha, 1994.

from their European neighbours and, of course, from Americans, Asians, Africans or Latin Americans. Recently, a Portuguese sociologist has tried to identify the sociological and historical roots of these representations, using the notion of a frontier culture (Santos, 1994). In a way, it can be argued that all cultures are frontier cultures, as far as they invariably appear as temporally emerging, more or less stable configurations of symbols, artifacts, forms of knowledge, narratives and practices drawn from heterogeneous repertoires (Nunes, 1995a, Bhabha, 1994). Here, however, frontier culture is used in the specific sense proposed by Santos, as a way of dealing with the particular links between heterogeneity and openness which have historically underpinned the *acentricity* of culture in Portugal. The notion of acentricity is a means of describing the non-existence of a core of national cultural configurations capable of sustaining in a more or less stable and historically continuous way an external differentiation from other national cultures and of providing a common ground for the convergence of a set of differentiated and assertive local and regional cultures. This cultural acentricity nourished a plethora of discourses on the "true" character of Portuguese identity. These include some accounts of the presumably central role of Portugal and of the Portuguese in the emergence of modern science and of the modern experience of nature, in connection with overseas expansion and exploration in the 15th- and 16th- Centuries⁷, a process presumably interrupted - according to some accounts which found their most elaborate expression in the late 19th Century - by the hostility to modern science which thrived under the joint influence of absolutism and post-Tridentine catholicism. On the other hand, the Portuguese were often described, particularly by Northern European travellers, as the "savages" or "primitives" of Europe, a depiction they shared with other Southern Europeans and with the Irish. It will come as no surprise, then, to find a permanent tension between the images of Prospero and Caliban in the discourses of Portuguese identity (Santos, 1994), a tension extended to the historical relationship of Portuguese society to modern science and modern rationality, with the former being represented, alternatively, as one of the sources of the latter or as radically alien to it and thus dependent, for its very constitution, on the influence of foreign culture and of the intellectuals in exile influenced by it, the so-called "estrangeirados".

⁷See Madureira, 1993, for a penetrating criticism of this view, which is largely based on a conflation of "experience" and "experiment", both translated as "experiência". For a general discussion of the acentricity of Portuguese culture and of the discourses on Portuguese identity, see Santos, 1994.

The accuracy of these representations is not at issue, here. But they provide some interesting clues to the origins of common sense discourses on the "underdeveloped" and dependent features of science and of science worlds in Portugal.

Scientific worlds in Portugal do display a number of historically rooted specificities, which may be brought together under the concept of a scientific frontier culture. Among these are their internal heterogeneity (at the disciplinary as well as at the national level), expressed, among other features, in the blurred or fluctuating boundaries between disciplines and research domains - generating a diversity of configurations ranging from settled, well-bounded disciplines like physics to "fluid spaces" like the domain of cancer research (Mol and Law, 1994) -, the heterogeneity of career paths of scientists, the unequal involvement of research groups and institutions with transnational science worlds or the almost exclusive reliance on European Community programs for the funding of scientific research over the last ten years, with no significant investment in R&D by the Portuguese state⁸. Another relevant feature is the considerable overlap between science worlds and academic worlds: over 80% of the researchers in all scientific areas work in the public sector, and most of these are to be found at universities or research institutions associated with universities, where they usually teach or work as graduate students (Jesuíno, 1995). Linked to these characteristics are the high visibility of boundary work and boundary transgression in scientific activity, the central role of scientists with "atypical", transdisciplinary careers, most of them with an experience of training abroad, and the high dependence of scientific reputation - both national and international - on transnational networks. Transnational relations, however, do not follow a common path. Different research areas, disciplines, specialties, institutions or research teams tend to display specific openings towards foreign institutions and research groups, configuring a diversity of maps of scientific networks⁹.

Although "travelling cultures" (Clifford, 1992) are typical of the activity of that quintessential cosmopolitan subject, the modern scientist/scholar, they emerge in a variety of forms, involving not only the movement of people but

⁸The situation seems to be changing towards a greater involvement of the state in all areas of scientific research, including the social sciences.

⁹For a detailed survey of scientists in Portugal, see Jesuíno, 1995. Other discussions of science worlds and science policy in Portugal may be found in Gonçalves, 1995, and in contributions to Gonçalves, 1993, 1996. For an useful - if rather unbalanced - overview of the recent developments in disciplinary fields and research domains in Portuguese science, see Gago, 1992.

also that of materials, inscriptions and information using available communication and information technologies, of which the facilities provided by Internet are perhaps the most conspicuous. Forms of scientific travelling range from undergraduate or graduate training and post-doctoral fellowships to teaching, attendance of seminars or conferences, short visits for creating or sustaining networks and cooperation schemes, and to *multisite lab work*. The latter includes periods ranging from a few weeks to one or more years, during which research scientists or graduate students live and work, continuously or intermittently, at a site in another country, as part of an overall working program involving their "home" lab. Experiences of this sort are constitutive not only of early training of graduate students, but in some cases they become a more or less regular feature of scientists' work at later stages in their careers. To be sure, according to Stoleroff and Patrício (1995: 30), only about 5% of the scientists interviewed for a survey of the scientific community in Portugal had spent three weeks or longer abroad working on research projects over the year prior to the survey. The relative rarity of this practice, however, should not conceal the fact that these are scientists working at research institutions involved in transnational cooperation and enjoying a visibility which endows them with a considerable influence and reputation within their disciplines and research domains¹⁰.

The experience of multisite lab work allows some dimensions of scientific activity and its organization to become visible in a way which is hardly found where the experience of work is centered on one site. The cases of gender, ethnicity and national culture are particularly interesting. Some scientists have become aware of the differences in the gender composition of laboratory staff while working in other countries. In the case of the lab I have observed, most of the researchers (including senior members of staff) are women, as well as most of the technical staff, which is not true of Scandinavian, Dutch and British laboratories where they have worked. This "feminization" of some research settings in the life and biomedical sciences is sometimes explained by invoking the relatively low status of research in general, and particularly among biologists and physicians, who tend to look up to better paid and more prestigious careers in business or clinical practice, respectively. As work schedules and careers are usually organized according

¹⁰The centrality of multisite lab work in the definition of the "quality" of the researchers and of their training is highly visible in what is known as the "Super-Doctors" program, a widely publicized graduate training program in Medicine and Biology sponsored by several institutions and including periods of work at prestigious foreign research centres like the Institut Pasteur, in Paris.

to a male-centered notion of personal availability, women - especially married women and women with children - are easily excluded or disregarded in job applications or promotions. Although these pressures are not unknown in research careers, there would be more room for managing them and making them compatible with the "traditional" roles of wife and mother. Regardless of how convincing this explanation may be - and other sources of information on women in science cast some doubts on it, at least as far as its scope is concerned -, it does point towards an awareness of gender as a relevant dimension in the organization of science worlds and research settings which rests upon the experience of multisite lab work¹¹.

Multisite lab work also contributes to a greater recognition of the relevance of dimensions like race or ethnicity to the division of work and hierarchy in research laboratories. Commenting on the low status of lab assistants in the United States, a senior researcher who holds a visiting professorship at an American university noticed that a high proportion of them were Asians and made an explicit link between ethnicity and the division of labour at the lab. These issues are usually ignored by those who do not have the experience of working in a multiethnic society, but their topicalization by scientists who have had that experience is often - as in this case - one way of enhancing the visibility of some categories of actors performing lab work who are often "deleted" from discussions and accounts of scientific work (Star, 1991a, b)¹².

3. Tales from the lab

I shall explore some of these issues drawing on material from work in progress at a cancer research unit. The Centre for Research in Biopathology and Oncobiology/Institute for Pathology and Molecular Immunology of the University of Oporto (CIBO/IPATIMUP) is an autonomous research institute associated with the University of Oporto¹³. Although the trend towards the "molecularization" of cancer research has made itself felt in Portugal as elsewhere, it has by no means achieved the dominance documented by

¹¹For a detailed discussion of gender-related issues in the Portuguese scientific community, see Amâncio and Ávila, 1995.

¹²Ethnic diversity is sometimes found in Portuguese labs among students and trainees involved in cooperation programs with African countries like Mozambique or Cape Verde.

¹³For details on the setting and on the research, see Nunes, 1996a, b, c.

Fujimura for the United States¹⁴. Immunological, epidemiological, cytometric, environmental and molecular biological approaches are routinely drawn upon by the researchers - around 40 - who work in this particular lab. About half of these are permanent researchers, and the other half are graduate students. The remaining staff includes 9 technicians. The disciplinary background of most of the senior researchers is medicine or biology, whereas most of the graduate students have degrees in biology or biochemistry. The laboratory and its members are involved in international cooperation through joint research and training programs, particularly with countries like Denmark, Norway, Sweden, the Netherlands, Britain, Spain, the United States and several Latin American countries, namely Brazil. The institute also offers a training program to pathologists from Portuguese-speaking African countries. The presence of foreign postdoctoral fellows, visiting researchers, graduate students or trainees is a conspicuous feature of the routine workings of the lab. Although I do not claim this particular setting to be "typical" of biomedical research units in Portugal, it is certainly exemplary as a particularly clear instance of how transnational, national and local conditions are articulated in laboratory work in a semiperipheral location, performing an intermediary role at the intersection of cultural experiences as diverse as those from Northern and Southern Europe, the United States, Latin America and Africa.

Over the last two years, I spent many hours hanging around the lab, observing routine work, listening to shop talk, chatting with the researchers, students and technicians and interviewing them, attending meetings and running seminars on the social studies of science and on my research for the members of the lab. Most of my perceptions and interpretations seemed to be on line with what classical exemplars of lab ethnographies had already told us. But some things struck me as being rather unexpected. Recent discussions of laboratory ethnographies have insisted on the need for a close look at the way dimensions like gender, ethnicity or state politics are made relevant or irrelevant within the context of the lab, and particularly to the way actors themselves articulate these relevances. Some of these dimensions seem to operate at a scale different from that of the lab. An issue may be represented at different scales, and each scale involves - to borrow the language of cartography - different ways of projecting and symbolizing these issues (Santos, 1995). As Joan Fujimura has reminded us, the work of science is, to a

¹⁴Fujimura, 1992, 1995. For a broader discussion of the relationship between disciplinary orientations and the politics of cancer research, prevention and treatment in the United States, see Proctor, 1995.

large extent, a work of articulation of social worlds, but also of articulation of scales (Fujimura, 1987, 1992, 1995). Within the particular scale of the lab and of the units where experimental work is performed, some of these dimensions seem to be irrelevant or, at best, they seem to work behind the actors' backs, without ever being enunciated by them in a way directly relevant to the epistemic cultures and work practices involved. At some moments, however, they acquire an unexpected visibility, allowing the lab ethnographer to probe into their articulation and meaning. Some of these situations are presented and discussed in the following sections.

The South, the North, and the South of the North

F. is a Brazilian researcher, whom I met for the first time while he was on a two-year post-doctoral fellowship at the lab. He is a pathologist specialized in breast cancer. After a period of work at one of the largest medical schools of Brazil as an assistant professor, where he got his PhD, F. decided to come to Portugal on a research fellowship, and he stayed for two years. Unlike most of his colleagues, who tend to choose either the United States or England to do graduate or postdoctoral work, F. chose Portugal largely because he was seduced by the "hands on" style of work and teaching of the director of CIBO/IPATIMUP, during one of his visits to São Paulo. Having returned to Brazil at the end of 1995, F. is now back to Oporto as a senior researcher.

F. has the experience of working in countries as diverse as Brazil, Sweden and Portugal. As a scientist, he has travelled and dwelled across a space which includes the South (Brazil), the North (Sweden) and the South of the North (Portugal). His choice of Portugal as the place around which his life as a researcher revolves rests upon a particular way of articulating this diverse experience and of configuring a scientific frontier culture based on a specific travelling experience. It is impossible to understand his approach to science and research without taking into account the way he articulates this experience. This, in turn, provides an interesting comparative point of view in trying to understand the way Portuguese researchers articulate their own experiences of a scientific frontier culture.

At the lab, F. is approvingly described by his colleagues, students and technicians as an extremely competent researcher, who is capable of performing all the operations needed to produce "good" science, from

handling the samples of biological material to the processing of the different inscriptions, the manipulation of diverse pieces of equipment and even the editing procedures for publication. His previous experience in Brazil was that of an environment where relations among people seemed, on the surface, to be informal, but with a strict hierarchy based on class differences defining the distribution of tasks and implying that the senior researchers usually had little or no involvement with actual laboratory work. In Sweden, he found a very different environment, thoroughly equipped and based on an elaborate division of labour, where specialized staff took care of the "peripheral" or "postintellectual" tasks of performing calculations, generating tables, drawing graphs or editing texts and photographs for publication, making it possible for the researcher to concentrate on the "noble", intellectual tasks of thinking through inscriptions and materials and writing down the papers and reports. Technicians knew how a text to be submitted to a particular journal was to be edited, so that research scientists did not have to deal with the technical details. In Portugal, again, F. met with a peculiar working environment. Both equipment and people are easily accessible, hierarchies are rather loose, and although there is a division of labour which is most visible among technicians, the researchers themselves do a lot of the "dirty" laboratory work and graduate students are trained in a variety of techniques in molecular biology, immunocytochemistry or cytometry. What F. appreciates most is the possibility of doing the work himself, of having free access to all pieces of equipment and materials, so that he can perform every step of the work himself. This would be seen, from a Swedish perspective, as a rather inefficient way of using staff and resources. But, from a Brazilian point of view, this flexibility and lack of a rigid organization of work provides a space of scientific freedom which is far more attractive for F. than the more rigid and predictable lab culture of Sweden. It allowed him to develop his skills in immunocytochemistry, cytometry and molecular genetics on a largely self-taught basis. This environment also had a positive influence on his productivity, as measured by the number of publications in international journals: over the two years F. spent as a postdoc in Portugal, he was able to get 15 pieces published and to establish himself as a recognized specialist in the field of breast pathology, acting now as a referee for some of the high ranking journals in his area.

For Portuguese researchers, experiences of working abroad are usually less varied, and they tend to be concentrated in Western Europe. This has important consequences for the way they articulate their experiences and their accounts of scientific work in Portugal and in core European countries. For

some, the example of Sweden, Denmark, Norway, Britain or Holland is invoked as a way of explaining or justifying the failures, limitations or constraints upon their work. Specific articulations are often made with political-economic or science policy issues; but it is quite common to hear researchers, technicians or students refer to some cultural stereotypes about Portugal and its presumed difference from Northern European countries as a way of explaining particular instances of failure. Success, on the other hand, is usually not associated with local or cultural specificities. This is something that science studies scholars have been familiar with: you invoke "external" arguments to explain failure, but success is due to some immanent logic and process of scientific work itself or with the ability to replicate locally "good laboratory practice". If it works, you just "edit out", as usual, the local details of your work from your report or paper. If it doesn't, local conditions become relevant as clues to what went wrong.

The experience of working in Northern European settings often reinforces national cultural stereotypes, although some interesting exceptions may show up. These often depend on the seniority and experience of the researchers. A recent episode is particularly interesting in this regard. Graduate students working on a project were required to extract and process RNA from biological samples. RNA is much more sensitive to manipulation than DNA, and failure to process it adequately is not uncommon. A crucial moment in the processing of RNA requires going through a procedure known as the "northern blot". This consists, briefly, in transferring a gel containing the biological material out of which RNA is extracted to a stable matrix - in this case a nylon membrane, which will allow further manipulation of the material. Successive failures in performing the northern blot were attributed to inadequacies in the local conditions of the lab, and a decision was made to try and perform the procedure at a major research centre in London. It was assumed that working at a core lab would sweep away all the troubles that had caused failure. After a month of trials, however, students were unable to successfully perform the northern blot at the London lab. This time, cultural explanations drawing on national stereotypes were not invoked, and the reasons for failure had to be looked for elsewhere, either in problems with the biological materials or in the skills and performance of the researchers. Senior scientists found this episode educational, in so far as it helped to dissociate failure from a "necessary" link to the local conditions of a semiperipheral lab, showing that even in core labs unpredictability and failure are constitutive of scientific work, and that doing science is a contingent process. Multisite lab

work thus provides not only a way of recognizing the differences on which the scientific hierarchy within the world-system of science rests, but also the continuities binding different sites together.

Translating across scales and sites

Within Europe, Portugal has the highest incidence of stomach cancer, with levels comparable to those found in Colombia or Northeastern Brazil. In spite of this local and national relevance, stomach cancer is not a priority in international cancer research programs. Researchers who decide to make a career studying stomach cancer have a hard time trying to publish in international journals or finding the appropriate forum at which to present their findings. Japanese scholars control international publication in this area, but they tend to ignore work done in other countries, so even within this small niche for publication Portuguese scientists seem to be caught in the double bind of choosing a locally relevant research subject but sacrificing an international career, or betting on an international career by yielding to the definitions of priority areas by core countries. This dilemma is shared by researchers elsewhere, like in Brazil, where some regions display the highest known incidence of some cancers of the genital area. However, these are regions generally defined as poor and marginal, and it soon becomes clear to any observer that although cancer is seen as the great killer of the *fin-de-siècle* and as the disease of civilization *par excellence*, the same inequalities that pervade all areas of social life conspire to make some types of cancer more relevant, more visible and more threatening than others. In countries like Brazil, these are the kinds of cancer that affect the urban middle - and upper classes of Rio de Janeiro and São Paulo, whose lifestyle and health conditions are not very different from those of similar groups and classes in the United States. Breast cancer is usually associated with developed and urbanized societies, whereas stomach cancer is a "peripheral" type of cancer, with a high prevalence in so-called less-developed (Portugal, Latin America) or geographically and culturally eccentric (Japan) societies.

As a consequence of these trends, research projects in the area of cancer research are often specified according to the priorities and outlooks of science worlds in the core. Following Santos (1994), we may call this the specific version of science as the *imagination of the core*: in order to be included among "developed" societies, a country increases the visibility of

those features generally associated with "development", and correspondingly decreases the visibility of those associated with "underdevelopment". This may be achieved through the adoption of social accounting procedures directly imported from core countries, which often "create" social and health problems by amplifying the visibility of those categories of disease or crime which are more common in the core, and reducing the visibility of the problems assumed to be irrelevant or unknown in core countries. Researchers at CIBO/IPATIMUP have tried to deal with the double bind generated by this situation, which forces them both to do locally relevant research *and* to participate in transnational science by working on the priorities defined as global because they emerge from dominating countries in the scientific world-system. This concern is explicitly articulated when research proposals are drafted, as well as at the different stages of the development of projects. Recently, a team of researchers drafted a proposal, which ended up being funded by a Portuguese agency and by a Danish institution, whose aim was to identify the genes expressed in stomach mucines that could be associated with protection against gastric carcinoma. The strategy followed by the proponents to make this an acceptable research project from the point of view of core scientific worlds was based on their considerable experience of working at research sites in core settings and of being part of international scientific networks. It consisted of performing a translation of the project into a contribution to the targeted mapping of genes expressed in different zones of the human organism and presumably linked to specific diseases. Since this has been an accepted line of work in the efforts to map and sequence the human genome, it was possible for the Portuguese researchers to turn their local interests into a contribution to the wider areas of molecular biology of cancer and to the human genome project. The different outlooks, interests and priorities of core and semiperipheral science worlds - where the former tend to impose themselves as universally relevant - were thus articulated locally by researchers with an adequate experience of multisite lab work.

The very concept of *translation*, in this case, should be extended to encompass not only the "linguistic" ("relating versions in one language to versions in another one") and the "geometric" meanings ("moving from one place to another") defined by Latour (1987: 117), but also the work of articulating scales and of playing with the unequal visibility of research themes and priorities defined at different scales. This means that a particular transnational or global disciplinary culture constrains what is to be defined as an interesting or relevant research problem leading to opportunities for

international publishing. Locally, however, persisting research traditions, awareness of problems of local or national importance or financial constraints narrowing the range of usable biological materials to those that can be obtained locally - like samples taken during surgery, which depend on the types and frequency of specific pathologies, and these may not be the ones identified as interesting or relevant on a global basis... - lead researchers to translate global problems into locally do-able work (Fujimura, 1987; Nunes, 1996c), thus articulating differences in scientific cultures which play themselves out at different scales when seen from the local perspective of a setting like a Portuguese lab. The operation of translation is thus a way of enunciating cultural difference (Bhabha, 1994), of enacting and performing emerging relations among local scientific worlds whose capacity to "grow" to a global scale is unequal, while increasing the opportunity for developing specific agendas. This may be achieved through the emergence of "boundary" research subjects, retaining both its local relevance and its significance as a contribution to global agendas. Research on stomach cancer and the way it is articulated locally with the field of the molecular biology of cancer provides an interesting instance of this process.

The technical and the vernacular

Being familiar with published lab ethnographies, it came as no surprise to me to find out that the "shop talk" of researchers and technicians involved a mix of technical and vernacular language, and that most of what was said during lab work was definitely on the side of the latter, even if used in specific situations associated with "technical" procedures. I was struck, however, by the fact that shop talk involved a "mix" of English as a source of "technical" and specialized terms or expressions, either used literally or as transliterations, and Portuguese vernacular. We find here a significant difference with work at sites where either you have to use a foreign language - which you often master only in its technical and vehicular versions - or both you and the "natives" have to use a language foreign to both in order to understand one another so as to get the work done. This seems to be the case of those research settings in Scandinavia or in the Netherlands with a heavy presence of foreign scientists and graduate students. Researchers who find themselves in these situations often go through the schizoid experience of sharing a cosmopolitan scientific and technical culture which finds its expression in scientific English and in the common familiarity with standardized instruments,

materials and procedures, while, at the same time, being reminded of their condition as foreigners through their inability to articulate the translocal commonalities with the particularities emerging from the local embeddedness of work sites. If lab work is permeated and made possible by a competent use of the vernacular - and this means to be able to make sense of situated uses of fragmentary statements, interjections or even slang -, we should expect the specific networks in formally similar laboratories located in different places to be different, as well as their work practices. Technical knowledge of a language like English does not provide for an all-around competence for lab work involving talk, just as it is impossible to reduce lab work to the formal and specialized operations detailed in instructions and research protocols. No "perfect" language for science is available (Chartier and Corsi, 1996), and networks cannot be transported elsewhere "just like that". The "foreignness" of scientific English reminds scientists both of what they share as participants in transnational and translocal science worlds, but it also underlines the unequal distribution of the ability to speak for science as a "universal" form of culture. The inescapable use of the vernacular is a reminder of the cultural differences that permeate the worlds of science and of the need for a broader engagement with the operations of translation in scientific worlds, more sensitive to the asymmetric relations between vernacular languages and their constitutive role in laboratory work¹⁵.

4. Conclusion

In spite of postmodern criticisms of the universalism and foundationalism of modern science, the latter has retained its characteristics as one of the most powerful means of cultural globalization in the contemporary world, and as a major arena where the contradictory dynamics of globalization and localization and of deterritorialization and reterritorialization are played out. It will come as no surprise, then, that approaches developed within the transdisciplinary field of cultural studies increasingly pervade the way we deal with science. This globalized activity *par excellence* is, at the same time, a field of enunciation and articulation of cultural difference. Without losing sight of structural sources of differences in

¹⁵Sharon Traweek has drawn attention to the issues related to the use of English and Japanese among high-energy physicists in Japan, and the accounts of her fieldwork in Tsukuba Science City are permeated by an unusual sensitivity to the role of vernacular language in the everyday life of a scientific setting. Cf. Traweek, 1998, 1992, 1995, 1996.

scientific practice - associated with levels of economic development or political and state organization -, we should pay more attention to a concern with the "refiguring" in scientific work of features linked to the topics dealt with by cultural studies, such as gender, nationality, ethnicity and cultural difference.

The research laboratory is, in some instances, a privileged entry point into the way these dimensions are articulated in and through the daily work of scientists and through their accounts of that work. It is not only the material site where the (social and natural) world is refigured in order to produce those objects and practices recognizable as science, or the master metaphor for the sites or settings where activity conducive to the production of science is carried out, ranging from the "risk society" as a whole to "nature" beyond the walls of research institutions (Beck, 1992, Irwin, 1995) to the body itself - particularly the female body - as in the case of reproductive technologies and biomedicine, or even to war, as Thomas Pynchon suggests (Pynchon, 1973). The laboratory is also a central chronotope of science studies, that is, "a fictional setting where historically specific relations of power become visible and certain stories can 'take place' (Clifford, 1988: 236, n. 9). According to Mikhail Bakhtin, who coined the term, "[i]n the literary artistic chronotope, spatial and temporal indicators are fused into one carefully thought-out, concrete whole. Time, as it were, thickens, takes on flesh, becomes artistically visible; likewise space becomes changed and responsive to the movements of time, plot and history" (quoted in Clifford, 1988: 236, n.9). The laboratories constructed by laboratory ethnographers are chronotopes, just like the settings constructed by the accounts of scientists and technicians. They are fictional¹⁶ constructs emerging from the contingent intersection of daily laboratory practice with the selective invocation of experiences of multisite lab work and of scientific travelling cultures. The approach outlined here points towards one way of supplementing Michael Lynch's call for the study of the "topical contextures" of scientific practice (Lynch, 1995) and for an "epistopics" - turning epistemological concepts into topics for empirical research - (Lynch, 1993), by extending our inquiries into the territory of "ethnotopics", of the way heterogeneous cultural repertoires are drawn upon in scientific work in order to enunciate those cultural differences that appear as meaningful to scientific actors and as relevant to their work experiences in heterogeneous and unequal science worlds.

¹⁶According to Knorr-Cetina (1994a: 7), "[f]ictionality arises from the *transformations* of forms of symbolic organization in modern institutions and the cultural attributions of reality, literality or normality which apply to these forms" (emphasis in original).

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