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Chagas Disease in Argentina: Reciprocal Construction of Social and Scientific Problems

PABLO KREIMER and JUAN PABLO ZABALA

This article intends to study the possibilities and limitations of scientific knowledge as a factor of social development in peripheral societies. We challenge the idea that the only promotion of scientific knowledge is a legitimate and adequate method to overcome the social problems that many people in Latin America are subjected to. Instead, we propose to investigate the relationships among the social actors involved in the production and circulation of scientific knowledge. We take the case of Chagas disease, a recurring theme in the public agenda since the 1950s, to show how the issue has emerged and has been taken in by public policies related to the production of scientific knowledge. We analyse the different viewpoints and conceptions about the disease, and how they moulded the different institutional initiatives of intervention into the problem. We assume that the practices associated with these mechanisms condition the type of knowledge produced and its possible uses.

Introduction

DIFFERENT SOCIAL ACTORS involved with the promotion, production circulation and diffusion of scientific knowledge see the production of scientific knowledge as a strategy for a legitimate intervention into social

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problems. In fact, public authorities, academic communities, international organisations, civic organisations and even the media have installed the belief that the development of scientific knowledge is a legitimate and efficient method to overcome (in the short or long run) the social problems that many people in Latin America are subjected to. These problems include poor conditions of living, nutrition, environment, transport, education and so on.

This belief has been incorporated by policy makers in industrialised countries and in Latin America. They explicitly use the notion of the *social relevance* of scientific knowledge, and give much importance to the links to social problems. This is clear in the diverse science and technology policies of the region since the transference of the agendas and political instruments by the end of the 1950s with the creation of the National Councils (Kreimer 1997; Oteiza 1992). But the formula 'scientific development leads to social and economic development' is based upon a set of assumptions that are not usually observed in Latin American societies. In fact, the linear conception of the utility of scientific knowledge hides a complex dynamics that determines the production of scientific knowledge as well as the possibility of using that knowledge. This complexity has been partly illustrated by diverse works that show us the winding paths this knowledge could take, and the difficulties in achieving an effective utilisation of scientific knowledge by actors unconnected to academia (Kreimer and Thomas 2005; Vaccarezza and Zabala 2002). This problem is accentuated in Latin American countries due to quantitative and qualitative factors, such as the scarcity of resources, but also the way in which scientific communities have been developed and the shortage of innovative actors in the realm of production, among others.

This article intends, precisely, to study in depth the key dimensions of these processes, and to understand the possibilities and limitations of scientific knowledge as a factor of societal change. We propose to investigate how a determined issue emerges and is taken in by public policies related to the production of scientific knowledge. To illustrate this process, we take the case of Chagas disease, a recurring theme in the public agenda since the 1950s.

Is Chagas Disease a Social Problem?

Public policies are based on a series of abstractions concerning what is actually considered a social problem. Theses abstractions are made up of an 'official' account concerning the principal characteristics of the

problem, the circumstances that lead to it, and the legitimate forms of intervening in it. Thus, a set of unstable circumstances—that in the beginning may be the object of controversy—are objectified into a set of known facts that appear indisputable.

In accordance with Gusfield (1981), it is possible to distinguish two dimensions in these accounts. On the one hand there is a cultural dimension that refers to the significances that the problem acquires on a symbolic level. On the other hand we can differentiate a dimension of social organisation, that is, of the 'pattern of activities through which phenomena become accessible and systematized into data and theory' (ibid.: 32). While the first dimension makes reference to the form in which the problem is thought about, the second shows us the concrete actions through which the actors collect, process and transform certain facts into public policy actions.

Chagas disease is the leading endemic in Latin America (WHO 2000), affecting roughly 18 million people. It is caused by the parasite *Trypanosoma cruzi*, which causes internal lesions of the heart, the digestive system, and/or the nervous system, seriously reducing the lifespan of infected persons. It is considered a disease of poverty (Briceño León 1990: 5), since it is spread through the *vinchuca*, an insect that nests in the walls and roofs of ranches (rural houses made of adobe). At the same time, Chagas disease is considered a neglected disease (WHO 2000). This is a consequence of: (*a*) the sickness does not have externals signs (only occasionally may people present a swollen eye at the time of infection); (*b*) there is a low percentage of infected persons that develop the cardiac disease (only about 20 per cent); (*c*) infected persons usually live with the lesions caused by the parasite for a long period (in general, it can be twenty years or more); (*d*) the lack of information and consciousness in populations where the disease is endemic; (*e*) being infected with the parasite is a cause of job discrimination, which causes infected persons to hide their condition; and (*f*) it is not attractive to international laboratories to invest in the R&D necessary for the production of new treatments.

Our intention in this article is to show that this account is not a mere description of objective facts, but the result of processes in which different social actors choose certain facts, discuss their significance and propose ways of intervention for the problem. To do so, we assume that the emergence of a problem, the definition of intervening in each step, as well as the decision to allocate resources, is the result of the interactions between distinct social actors. These interactions take place within cognitive and institutional frames that mould the actions and interests of the participants.

When the problem acquires visibility and emerges as a public issue, it is translated into different viewpoints and conceptions. They are reflected in different institutional initiatives as programmes to control the spread of the disease, plans to attend to those who are already sick, creation of institutes, and plans of support to certain lines of investigation. At the same time the practices associated with these mechanisms condition the type of knowledge produced and its possible uses.

At this point it is necessary to make two clarifications. First, to question the objective character of Chagas disease does not mean to deny that certain socio-environmental conditions have a negative impact on the way of life of infected persons. Poverty, the lack of potable water, education, equipped housing, balanced nutrition, access to health centers, exposure to certain germs and viruses, among others, are all factors that can reduce the lifespan of affected people. On the contrary, we wish to show that the way in which these conditions have been selected and translated into institutional mechanisms under the name of 'Chagas disease' is mediated by the conceptions, interests, values and beliefs of each actor that intervenes in that process.

A second clarification refers to the relativism of the idea we are suggesting. In this sense, we consider that the manner in which Chagas disease has been constructed is not hazardous at all, but that each one of the arguments that comprise the official account has come about by a consensus, at a certain moment in history, by a group of participants relevant to the problem in question. In this process, science becomes the main space for the production of arguments, as the statements given are guaranteed by the validity of the scientific method.

Thus, our question about the utility of scientific knowledge for the resolution of social problems lies, for the meantime, on a second plane. We will first challenge the nature of social problems, and analyse the processes by which different participants have adopted and developed each one of the positions present in the objective version of the problem. Particularly, we will focus on the role of scientific knowledge.

In summary, in this article we will argue that:

1. It is not possible to consider a single social situation as intrinsically problematic. On the contrary, it has to be related to the role of social actors that construct it, in situations historically contingent.
2. The production of knowledge is not only a resource located at the resolution of social problems, but it also plays a crucial role in the processes of the construction of the problems.

3. Knowledge is itself the product of social constructions. The interventions and the use of knowledge in other fields of symbolic and material production mould its social role and its cognitive content as well.

Facts under Dispute

The best way to show the relative character of the facts that we are about to treat is to present other possible interpretations. In fact, while the official account of Chagas disease is presented in a linear and smooth way, other social actors question its validity (Law 2004: 13):

1. **The number of infected people**. The first question refers to the magnitude of the disease. According to the National Institute of Parasitology, in Argentina there are around 2.5 million infected people. These figures come from the last obligatory military enrollment in 1995. In the last decade different sources have questioned this number, and assume that it may be higher. The severe economic and social crisis of 2002 and the stop of the systematic fumigations are the main arguments for these positions.
2. **The incidence of Chagas disease and lifespan**. This is a medical/sanitary question: is it really Chagas disease that diminishes the lifespan of infected persons? Infected populations usually have no access to potable water, sewage systems and health care, in addition to having severely deficient nutrition. As statistics show, they have a lower lifespan.[1] But, as Storino (2000) asks, to what extent is the parasite the cause of this difference?
3. **The specificity of the disease**. The third matter has a professional character and is related to the specificity of Chagas disease. In particular, many consulted cardiologists do not perceive the ailments as a specific disease.[2] That is, they recognise that the causes of the cardiac ailments may be related to the infection of the parasite, but the concrete manifestations do not differ form other pathologies and do not have a specific treatment. So people are diagnosed and treated in the same manner whether or not are infected with the parasite.
4. **The personal perception of affected people**. A fourth question comes from the affected people themselves. As one study shows (Sanmartino and Crocco 2000), persons in the endemic regions tend

to 'naturalise' the existence of the disease and minimise the importance of Chagas in their discourse. When asked what diseases exist in the region, the most frequent answers tend to only include a short list, including the measles, chickenpox and flu. And only when the question is specifically pointed at Chagas do they answer: 'Ahh… yes… everyone around here has Chagas.' (Sanmartino and Crocco 2000: 27).

5. **The importance in terms of the public health system**. The last question, pointed at the public health system, refers to the incidence of the disease as a factor in the reduction of the productive capacity of the country. That is, what is the true effect of the disease over the productivity of the national economy? This idea is based on the following points: (*a*) a low percentage of infected persons develop the disease (around 20 per cent); (*b*) the lesions caused by the disease are not always debilitating in terms of work; and (*c*) the lesions are produced, in general, at an older age, when persons also develop other inflictions. These arguments minimise the importance of the disease as a public health issue.

As it has been shown by John Law (2004), even when we admit that social reality is complex winding and multidimensional, with many twists and turns, and numerous events happening at once, our explanations tend to be constructed around a linear narrative, its central theme being unidirectional with the stage and environment relatively stable. These other interpretations of the disease highlight the variety of viewpoints, and deter us from adopting the account in which the social problem of Chagas disease is shown as naturalised.

'Social' and 'Knowledge' Problems: The Construction of a Public Issue

At the present time it is more and more evident the role that scientific knowledge plays in the formulation of the strategies to approach social problems. This is apparent with environmental problems or the controversy over the genetically-modified organism (GMO), where science constantly presents new problems to the public arena that are later resignified, filtered and processed in different ways.

Nevertheless, the role of science as a 'constructor' of social problems is nothing new, as many studies show us. In particular, we will discuss the texts of Latour (1983) on the transformation of French society resulting from the work of Pasteur, the reflections of Bourdieu (1997; 2001)

on social demands, and Gusfield's (1981) work on the of the construction of the drinking and driving relation as a public problem.

Networks and Actors

Latour proposed the model of *translation* to explain science–society relationships. This approach assumes that 'there is no distinction [between science and society], because there only exists heterogeneous chains of associations that, from one moment to the next, create the necessary points of passage' (Latour 1989: 346). From this viewpoint, he (1983: 141–70) poses that Pasteur, in order to demonstrate the existence of microbes (anthrax in particular), was able to articulate the interests and perspectives of the distinct participants implicated in the illness: farmers, those in charge of the public health system, hygienists and military physicians:

> How has Pasteur succeeded in capturing the interests of other indifferent groups? By the same method he has always used. He transfers himself and his laboratory into the mist of a world untouched by laboratory science. Beer, wine, vinegar, diseases of silk worms, antisepsis and later asepsis, had already been treated through these moves. Once more he does the same with a new problem: anthrax. The anthrax disease was said to be terrible for French cattle. This 'terrible' character was 'proven' by statistics to officials, veterinarians and farmers and their concerns were voiced by the many agricultural societies of the time. This disease was studied by statisticians and veterinarians, but laboratory practice had no bearing on it before Pasteur, Koch and their disciples. (ibid.: 145)

The notion of interest is key in Latour's explanation. For him, 'the interests, as any other thing, can be constructed' (ibid.: 56). And the processes of constructing these interests are set up by the mechanism of translation. It is by way of the mechanism of translation that an actor can use the interests of others to impose his own sense. However, the

> translation that allowed Pasteur to transfer the Anthrax disease to his laboratory in Paris is not literal, word for word. He only carried one element with him, the microorganism, and not the entire farm, the smell, the cows, the willows that surrounded the pond, nor the beautiful farm girl. With the microbe, however, he brought the interests of the agricultural societies. Why? Because by designating the microorganism

> as the live and pertinent cause, he could reformulate the interests of the farmers in a distinct manner: if they want to resolve *their* Anthrax problem, they will first have to pass through *my* laboratory. Latour 1983: 151, emphasis added)

Autonomy and False Social Demand

But the translation of scientific knowledge to a concrete practice of intervention into the problem is somehow more complex than the case of Pasteur. On one hand scientists do not tend to behave like Pasteur, ready to up and move and accommodate their knowledge to the expectations of other participants. Instead, they usually manage among a social space delimited by scientific activity, with its own dynamics and reproduction patterns.

On the other hand, much of the knowledge produced cannot be directly transformed into a concrete practice of intervention. The difficulty to the application of scientific developments does not lie simply in modifying cultural patterns resistant to incorporating new available technologies (such as the application of a new vaccine).

Bourdieu has approached these two problems in different works. The first of these could be found among the analysis of the tension between autonomisation of the scientific field *versus* the attending of social demands. Certainly, autonomy is seen as a precondition for the proper functioning of a scientific field (the internal logic of legitimising knowledge should prevail, above all, over external logic). Even more, Bourdieu (2001: 8) claims that social demands are no more than a euphemism that hides the concrete interests that are too far to attend to the real needs of the social agents that truly require help. In consequence, Bourdieu push scientists '*to affirm your autonomy*, to defend your specific interests, that is, in the case of scientists, the specific scientific conditions, etc., and thereby, *intervene in the name of the universal principals of your existence* and of the conquests of your work' (ibid.: 130, emphasis added).

Let us now see the second problem, the distance between the production of scientific knowledge and its concrete application. In fact, there is an objection to Bourdieu's approach: when he equates 'social demand' with the 'economic benefit of firms', he dramatically neglects the important role of scientific knowledge in society. Actually, scientific knowledge has always had a double legitimacy: (*a*) its capacity to explain the physical, natural and social world; and (*b*) its capacity to transform those worlds in order to satisfy the needs and demands of different social actors. For this reason, the first dimension of the cognitive order cannot be separated

from the social dimension, from the trajectories of the knowledge as a product, from 'what to do with it'. However, knowledge can never be used 'as it is' by any other actor: no one can be cured, fed or produce more with a single scientific paper. Instead, it is a complex process of transformation, of re-signifying knowledge. To simplify, we can call this process the 'industrialisation' of knowledge, where the users that are, precisely, in a position to industrialise the knowledge intervene. In societies that co-emerge with modern science, social actors that industrialise (and growingly produce) knowledge are the firms that, in a capitalist economy, are driven by the maximisation of profit. Beyond the debates about who has the social control of these activities, to deny this role would mean to ignore the real processes of production and social use of knowledge.

The Nature of the Social Problem

In this article we intend to go beyond the notion of the use of scientific knowledge in a strictly technological sense (for example the development of a new vaccine, a new insecticide or a new drug). Instead, we intend to analyse how scientific knowledge participates in the process of recognising a social problem, conditioning its features, both in its cultural and structural dimensions. In this sense, the works of both Latour and Bourdieu present some limitations. In the case of Latour, he bases his work on a case that had such profound transformations (Pasteur's developments produced notorious modifications in the concrete practices of many participants). This tells us little about other cases (such as Chagas disease) in which these relations are less evident. In Bourdieu's approach, he poses the idea that science and social problems are two separated realms (in permanent tension).

The approach we adopt is closer to that of Gusfield, who analyses the role of scientific knowledge in the process of constructing the relation of 'drinking–driving' as a public problem. This author proposes, from a perspective related to symbolic interactionism, to analyse the arguments, participants and institutions that participate in the stabilisation of a problem in a particular way (as a problem of the driver, and not of public transport).

Gusfield denaturalises and, therefore, de-objectifies any interpretation in which the issue is considered intrinsically problematic. He shows that:

> Alcohol has already been perceived as important in the genesis of such fatalities and accorded and importance as a target in the resolution

> of the problem. That target character is not a given, is not in the nature of the reality as thing in itself, but represents a selective process from among a multiplicity of possible and potential realities which can be seen as affecting auto fatalities and injuries. (1981: 3)

For Gusfield (1981: 28), 'Science, scientific pronouncements, technical programs, and technologies appear as support to authority, or counter-authority, by giving to a program or policy the cast of being validated in nature, grounded in a neutral process by a method that assures both certainty and accuracy'. Clearly, there is no a natural use of relevant scientific and technological knowledge, but *certain social actors* that make a specific and deliberate use of scientific knowledge as a way of intervening in public controversies concerning a problem. It is precisely in this way that the problem becomes 'public'. In other words, it is not about the science, but about the role that scientific rhetoric plays in the construction of public problems.

When analysing how automobile accidents are constructed as a fact, Gusfield notices that the data are not 'simply collected' by individual agents. Instead, this implies the existence of a process of social organisation: 'Someone must engage in monitoring, recording, aggregating, analyzing, and transmitting the separate and individual events into the public reality of "auto accidents and deaths"' (ibid.: 37). And he asks: what facts are collected? Who does it? How are they processed? How are they transmitted? The issues are open to different ways of being seen as a problem, and there are also different modes of conceiving their resolution.

The Construction of Chagas Disease as a Social Problem

Following an analysis analogous of Gusfield's, we investigate how knowledge had been managed by different actors in three different moments. First, we analyse its recognition as a specific disease, although limited to a small group of infected individuals. Second, we consider its eruption into the public scene, and the institutional arrangements (and control practices) that took place. Third, we concentrate on the period of major production of scientific knowledge in relation to the disease since the 1970s, associated with the emergence of molecular biology and the promise of the development of a vaccine.

From Invisibility to Visibility: The Construction of the Disease

The first step towards the construction of Chagas disease as a social/public problem was its identification as a disease, that is to say, as an object of study recognised by the scientific-medical community. Far from what is currently suggested in present accounts about the disease, this operation was surrounded by multiple controversies concerning the symptoms of the disease, the parasite's ability to infect, the valid diagnostic methods used for its recognition, and, as a consequence, its territorial extension.

The announcement of the discovery of a new disease, by Carlos Chagas in Brazil in 1909, had a quick echo in Argentina. Certain members of the National Institute of Bacteriology (belonging to the National Department of Hygiene) considered that Chagas disease could be an important pathology of northern Argentina due to the similar living conditions, the presence of the transmitting insect, and the endemic character of cretinism and goitre (proposed by Chagas as principal symptoms of the disease).

Nevertheless, the first investigations carried out in Argentina had, consequently, the questioning of the importance of the disease and implied, as a result, a strong disinterest on the part of the medical and research communities during the coming decades. Two main arguments led investigators to consider that Chagas disease was not a problem for Argentina: the endemic areas of goitres and trypanosomes were not similar, and the relation between goitres and the parasite could not be established.

As a result of these works, Chagas disease has not been systematically studied in Argentina for more than ten years. Without the epidemiological recognition in the country, the retrocession in the Brazilian medical field, and the reduction to a group of imprecise symptoms belonging to certain mountainous populations in Brazil, the disease could never compete with typhus, tuberculosis, yellow fever or cancer for a place in the issues of interest of scientists and public health officials.

That situation started to change in the 1930s, with the work of Salvador Mazza in the Mission of Studies for Argentinean Regional Pathologies (MEPRA), an institutional space dedicated almost exclusively to the study of Chagas disease. In fact, the investigations carried out by Mazza and its collaborators allowed a 'stabilisation' of the disease as a fatal entity, as much for its epidemiological recognition as for the identification and delimitation of the effects of *Trypanosoma cruzi* in the human organism.

The production of scientific knowledge in the MEPRA can be organised into distinct central themes, which mark the successive levels of approximation to the theme by Mazza himself. Theses levels are related to the dynamics of infectious diseases, and can be divided into: verification of the parasite in the region and existence of transmitters, existence of natural reservoirs of the parasite, verification of infected humans, identification of acute cases, identification of chronic cases, description of the characteristics of each stage of the disease, and finally trial tests of treatments.

Mazza and his colleagues carried out a series of studies that demonstrated the first two points by finding many animals naturally infected with the parasite, for example a dog (Mazza 1926), distinct classes of armadillos and a weasel (Mazza 1930). The distribution of triatomines and its infection with *T. cruzi* had also been assessed (Niño 1928).

Nevertheless, the identification of infected people, a crucial point for the determination of the existence of the disease, was not so simple. On the one hand, using the diagnostic methods, it was difficult to find traces of the parasite in the blood of infected persons. It was possible to observe the parasite in the blood only in the cases where the infection was recent (acute cases). At the same time, in a few instances these persons presented a series of temporary symptoms (fever and swelling of the face) that favoured its recognition. On the other hand the assumed symptoms then attributed to Chagas disease (goitre and cretinism) were not recognised in those successfully identified as infected.

Mazza developed a strategy of research oriented towards the identification of these acute cases, derived from the patients' clinical diagnosis. These findings were established in 'a symptomatic chart, which once known, is *difficult to confuse with the other processes*'. But many of these symptoms (fever, weakness and tachycardia, and sometimes an ocular oedema) were not exclusive of Chagas disease, but common to other endemic diseases such as malaria. Anyway, Mazza presented this chart by saying, '*With the exception of signs of the goiter*, all of the other characteristic symptoms of the acute cases of trypanosomiasis, well described from the start, by the discoverer of this ailment, Carlos Chagas' (Mazza and Ruchelli 1934: 3, emphasis added). These results were later confirmed by the microscopic observation of the parasite after '*repetitive investigations of trypanosomes in the blood*'.

Mazza carried out three simultaneous operations through his investigations that had a central importance in the configuration of the social problem:

1. First, he appeals to a rhetoric in which the existence of the disease appears 'naturalised', and its lack of identification is summed up by a lack of competence.
2. At the same time, he reconfigures the clinical characteristics of the disease, from goitre and cretinism to a group of symptoms of less gravity. This operation is central for two reasons: on the one hand he looks to refute the argument of the impossibility of observing 'pure forms' of the disease, since the investigations were done in a region where goitres and malaria were not found. On the other hand it is an intent to settle a central aspect of the controversy (the association with the goitre) as if it were a minor aspect of the issue.
3. Third, Mazza presents the way to identify the parasite as a current procedure. However, this procedure was also the result of a series of investigations that included the repletion of tests on numerous occasions, the utilisation of distinct alternative diagnostic methods available, as well as training '*to know what you are looking for*' (Mazza 1939: 134, emphasis added).

Thereby, the way in which Mazza dedicated himself to the disease is extremely distinct to other investigators in Argentina. The institutional frame is important at this point: these other investigators belonged to the National Health Department, whose institutional mission was the identification of evident health problems in the population. They limited themselves to findings related to the occurrence of known and established diseases. On the other hand Mazza took the disease as the main line of investigation in his scientific career, and dedicated himself to accumulating evidence of the consequences of the infection of parasite (aspects that did not present conclusive evidence).

From Arithmetic to Geometric Growth:
From a Private to a Public Problem

At the beginning of the 1940s the disease had already been identified by the scientific-medical community. But it was not until the end of the1940s

and middle of the 1950s that Chagas disease was recognised as a social problem of national relevance. Once again our argument is that to understand the form that these processes took on, it is necessary to pay attention to the circumstances surrounding them. We have to observe what kind of scientific knowledge—and the conceptions of the disease—were at the base of the process. At the same time, we propose to analyse the *rhetorical use* of scientific knowledge in the public arena, and to observe how the arguments about the disease were transformed into public policy.

In the realm of scientific knowledge, two operations had been crucial since they modified how the disease was thought about and, at the same time, the type of actions that were deployed. The first operation was to transform the disease into a chronic ailment, whose principal identifying sign was cardiac affectations (and no longer goitres or cretinism). The second was the statistic estimation of the affected population, what geometrically elevated the number of *presumed sick*. Within scientific community the principal source of argumentation of both transformations came from works done by Cecilio Romaña from the Institute of Regional Medicine in the University of Tucumán (IMR).

At the IMR Romaña worked to produce the necessary evidence to make known the public health concerns. The first published work in the *Annals of the IMR* (Romaña and Cossio 1944) made clear the change in strategy with respect to the investigations of the MEPRA. In an article on chronic cardiac forms of Chagas disease, Romaña presents the clinical histories of thirty-five patients with a symptomatic chart of miocarditis and a positive reaction to laboratory tests for infection of *Trypanosoma cruzi*, using the reaction of complement fixation.

The 'chronic cardiac form' included in this work is a somewhat imprecise group of clinical manifestations, some of which included the enlargement of the heart, heart palpitations, and partial or total auricular obstructions. Nevertheless, these symptoms were not repeated in all the patients, and diagnosis as 'chronic Chagas disease' could only be 'presumed, [while] the etiological diagnosis corresponded to the laboratories' (ibid.: 17).

At the same time the diagnostic technique utilised by Romaña in order to 'verify' the presumption that they were dealing with chronic Chagas disease was complement fixation, whose accuracy has been questioned for its high degree of false positives (criticisms that had already been formulated by Mazza himself). However, Romaña paid scant attention to the criticisms and made little of the false results because of the 'necessity' to diagnose the disease. In another investigation on the issue it is said

that the obtained results indicate that this method 'permits one to apply as a routine in the regions where the frequency of Chagas Disease *makes it necessary* to come up with a diagnosis' (Romaña and Gil 1946: 298, emphasis added).

Romaña's strategy was clearly defined by the demonstration of the epidemiological importance of the disease associated with the existence of chronic patients, even if he had to apply research methods a bit more heterodox. This wishes were crystallised by a change in the strategies of investigation by the end of 1945, when he carried out the first inquiry in rural schoolchildren who did not have apparent signs of the disease. The objective was to draw up an index of infection in individuals in zones with a high prevalence of infectious vectors.

This produced a fundamental change: from the study of sick people to the indiscriminate study of the population. Romaña expressed this change in explicit form at the beginning of his text, published in 1946 (Romaña et al. 1946: 324), where he points out that 'Investigations on Chagas Disease have been largely directed by the findings of clinical cases of affected people. The expansion of trypanosomosis studied by human groups with precedence of targeted symptoms has almost never been done. '

The inquiries were carried out in different stages from December 1944 to October 1945 in the north of Argentina. Around 600 children had been considered, with a rate of infection around 20 per cent. Even if the population under study was severely reduced in number (a similar study done in Chile considered 14,000 individuals), Romaña presumed that these results constituted a demonstration of Chagas' epidemiological distribution. Based on this assumption, the figure of those inflicted with the disease passed from 1,400 cases to 700,000 (Romaña 1953). To do so, he made a substantial methodological jump in the way of calculating the amount of infected people: Instead of calculating the number affected as the result of the sum of identified infected persons (acute or chronic), Romaña proposed to extrapolate the rate of infection to the rest of the population living in similar conditions (calculated in 3.5 million people).

In social terms the recognition of the importance of Chagas disease entailed an institutional development for the fight against the problem. Institutions to combat the disease were created as a consequence of the results of Romaña. We should not think that the changes in the social organisation of the disease are a direct consequence of the 'advances' of scientific research. In fact, none of the findings were still *stabilised* at the moment of being incorporated in the discourse and in the actions of public policy.

What actually happened was an *appropriation of the scientific rhetoric* on the part of political actors. One significant element was the health policies carried out under the Peronist regime. They had a strong emphasis on hygiene, the fight against the infectious agents, and bringing about access to health care in marginalised sectors of the population. In this context, Peron's minister of health, Ramón Carrillo, who further elevated the disease to the status of a 'national problem', quickly adopted Romaña's rhetoric concerning Chagas disease.

But it is not only politics. A third transformation in the conception of the disease was crucial in the configuration of these policies. It was related to a scientific-technological advancement that had occurred during these years: the application of a new insecticide. Thus, if since the middle of the 1940s the only possible solution that had been considered for the disease was to produce changes in rural housing,[3] a new insecticide would modify everything. When the efficiency of gammexane in eliminating the *vinchuca*s of the '*ranchos*' (rural houses made of adobe and straw) was demonstrated (in Argentina, by Romaña himself), fumigation was installed as the principal means of intervention into the problem. And the programmes set forth by the minister of health were principally oriented to draw up a plan for the massive housing fumigations.

Production of a Vaccine against Chagas Disease, or the Construction of Fictions from Laboratories

A fundamental cognitive displacement began in the 1970s, principally in the heart of the tradition of biochemistry, at the then Campomar Foundation (today the Leloir Institute): a shift of focus from infected people to the parasite, *T. cruzi.* This movement was accompanied by several institutional initiatives. The National Programme of Research on Endemic Diseases by the Secretary of Science and Technology (SECyT) in 1974 and the Special Programme of Investigation and Training of Tropical Diseases (TDR) of the World Health Organisation in 1975 were the most important ones. These institutions meant fundamental support for the consolidation of academic investigations on Chagas disease.

Thus, all aspects related to the physiology of the parasite and the hosts have been deeply investigated. The objective was two-fold: to find a target to attack the parasite for the production of an efficient trypanocidal drug; and the study of antibodies that would respond to the parasite, with the objective of producing a vaccine. This ultimate route was particularly important in that it seemed to offer a radical solution to the social problem.

If one could obtain a vaccine against Chagas disease, the other aspects of public policies (such as systematic fumigation of the r*ancho*s) could occupy a secondary place.

The development of basic knowledge about the parasite, necessary for both political and cognitive objectives, had a fundamental impulse with the emergence of a new disciplinary field: molecular biology. This discipline had had its brief life around the end of the 1950s, and began an age of complete institutionalisation since the middle of the 1970s (Kreimer 2006; Kreimer and Lugones 2003).

As a result of the displacement that had taken place since the 1980s, investigations in molecular biology were repositioned to Chagas disease in two different senses. On the one hand was a legitimate strategy to find the 'hidden' aspects of *T. cruzi*, which operated as the foundation of a long-term policy based on scientific knowledge of excellence in the fight against the disease. On the other hand it repositioned Chagas—and particularly the parasite—as a central focus within biomedical research in Argentina.

As a consequence, since those years we observe a significant production of scientific studies related to different aspects of Chagas disease (Kreimer and Zabala 2006: 40 see Table 1):

TABLE 1
Publications of Argentine Scientists, 1995–2005

Database	*Number of papers*
Science Citation Index (SCI)	830
Medline	650
Biological Abstracts	170
Total	1,650

Source: Authors' estimation based on indicated data.

If we assume the linear model of innovation, we may say that the policies of the promotion of scientific knowledge have obtained important results. A great number of 'relevant' scientific knowledge has been produced (the subjects are oriented to a social problem), with an international standard of quality (regarding the journals where they have been published).

The thematic organisation of the knowledge produced during these years are very revealing, as we see in Table 2. We differentiate the main objectives of cognitive reference: the infected people, the parasite, the vector and the epidemiological aspects.

TABLE 2
Distribution of Indexed Publications in the SCI by Argentine Scientists from 1995 to 2005, Following Thematic Orientation

Object of study	*Number of papers*	*Percentage*
Parasite	415	50
Infected	191	23
Transmitters	183	22
Epidemiology	33	4
Others	8	1
Total	830	100

Source: Authors' estimation.

One half of the publications refer to the parasite (*T. cruzi*), which is explained by the strong concentration of research in molecular biology and biochemistry. It is significant that many of these scientists claim to be working on the development of new drugs (in particular, identifying 'targets' to attack the parasite). Nevertheless, that development should be carried out by other social actors as pharmaceutical laboratories that do not claim interest in the issue. Therefore, the utility claimed by these scientists is reduced to a rhetorical construction, since the shortage of links between those groups and the producers of drugs impedes the effective use of scientific knowledge locally produced.

A similar thing occurs with research oriented to the study of infected people. Once again, we have found that these investigations are not translated into attention for sick people, but rather the basic study of the disease prevails. Clinical investigation, which could imply greater attention to patients and a better incorporation into clinical practice in general, accounts for a small proportion, and is carried out in poorer institutional conditions (regarding both financial as well as professional recognition).

Finally, we can point out that the same is true with research related to the vector. In a large part the objective of these studies is to know the different biological mechanisms of triatomines, but the results (with a few exceptions) are not related to epidemiological aspects that could be taken advantage of by those who intend to control the extension of these insects.

Beyond the variety of issues from which the investigations of Chagas disease is spread out, qualitative analysis shows us a common element: the strong predominance of *basic* or *academic* research in all fields of knowledge. Thus, the principal products of these investigations are scientific papers, usually published in international journals, and its principal

(almost exclusive) sphere of circulation and diffusion is the scientific field. This knowledge acquires an endogamic character, in the sense that its comprehension requires a high specialisation in the subject that only scientists themselves possess.

As a consequence of the cognitive displacement produced since the 1980s, the *T. cruzi* is now seen as an important *biological model* due to the possibility of obtaining complete sequences, DNA and observe original processes not present in other biological species (Agüero 2003). The construction of this model operates as a mechanism to legitimate those groups in its process of integration into international networks. Indeed, most research groups maintain good relations with the international community, specially with American and European labs; a large number of scientists effectively take part in international networks and projects supported by international agencies such as the NIH, OMS, Howard Hughes and the European Union.

So, the promise made by scientists of a vaccine perpetuated in the public area as a 'fiction' that stimulated the quest for financial support to continue their investigations. Since the beginning of the 1990s diverse groups benefited from the public financing resulting from a problem defined as something whose resolution would only appear in a 'matter of time'. Other groups worked in the construction, also rhetorical, of 'targets' to attack the parasite and, therefore, the basis for new drugs.

Today, there are only a few groups—of the many that had existed—investigating the development of a vaccine. Political authorities have been gradually abandoning this strategy to the problem; priority is now being given to two other available solutions—the systemisation of the vector's control (like the experiences of certain states in Brazil), and basic research into targets to attack the parasite.

Conclusions

This article argues that the recognition of the disease, which today is self-evident, was the result of the actions of different actors over a long period. That is to say, it was not facts that obliged a group of actors to accept it and undertake actions in this respect. Instead, it was the agreement between the actors that converted them into facts. And this data, objective and immobile, is in reality changeable, its meanings flexible, and its acceptance negotiated among several actors. This can be seen in

the profound redefinition of the significance of Chagas disease in the cognitive sphere, from Carlos Chagas to molecular biology.

We intended to show how the displacement of the conception of the problem was operated regarding the possible alternatives of intervention: from a problem of precarious living conditions, to a problem of fumigation, and then a problem of basic research. In this way, we can see that what is understood as a 'social problem' is redefined in each moment in history. And according to the accepted definitions, a set of actions oriented to intervene in this problem is defined. These decisions configure in each case a set of actors and institutions that explain how the problem has been translated in the sphere of social organisation.

Within these processes, the relation between decisions on public policies and the production of scientific knowledge that was always complex. Particularly, we have seen that it is not enough that certain knowledge that was accepted as valid in the academic field be simply introduced into a public policy field, as Bourdieu would say. Scientific knowledge functions as a particular form of rhetoric, and serves to legitimise the processes of policy making even where cases where it was not completely accepted in the scientific field.

We also want to show the importance of constructing 'fiction'. We have shown some examples: Romaña's statistics and the rise of the public problem; and the molecular biologists and the investigation of 'excellence' as a strategy to fight against the disease. And so the knowledge of the genetics of the parasite was presented as the cognitive deciding factor for an effective solution to the problem: a vaccine or a new drug.

This has diverse implicit assumptions. First, the process of knowledge production offers a satisfactory promise for the development of a strategy of intervention, with independence of other social, cultural, symbolic and institutional dimensions. Second, the development of 'applied' investigations omits, or deliberately ignores, the processes of knowledge *industrialisation* needed to get out of the laboratory and arrive at the *rancho*s.

Thirdly, an important theoretical aspect of our study, there is an operation of *purification* (Gusfield 1981; Knorr-Cetina 2005 [1981]) of the parasites. They are taken as objects of knowledge detached from all social sets: from the *rancho*s, from the *vinchuca*s and from the infected people. They are *purified* into gene sequences in libraries of protein splicing or in socio-technical devices for the construction of analogies with other biological mechanisms.

Thus, the official history of the disease establishes milestones that respond to the modes of intervention of different actors in each specific

period. These milestones articulate a set of cultural mechanisms that, far from being neutral, construct and dispel the topics and modalities, and even configure the existence itself of a topic in the public sphere. The scientists are not mere receptors of the actions of other participants, but key actors of the development of these mechanisms. They are active producers of meaning and, furthermore, produce the discourses that will later be articulated in more complex social relations because of the rhetorical use made by other actors of their discourse. As a consequence, a purification of the second order is generated that can be resumed in the sequence shown in Box 1.

Box 1
Sequence of Second-order Purification

I. Physicians postulate the existence of the disease. ⇒ II. Physicians and scientists produce a public discourse concerning the dimensions of Chagas disease as a social problem. ⇒ III. The authorities re-signify the meaning of this discourse, making the problem that was once private, public. IV. Institutions generate mechanisms of intervention. ⇒ V. First the biochemists, then the molecular biologists install the discourse concerning the need of knowing the physiology and genetics of the parasite. ⇒ VI. Scientific and technological institutions begin to establish the relation between molecular investigation and the possibility of developing vaccines and drugs. ⇒ VII. The parasites are 'purified' in the laboratory, free from all contextual contamination. ⇒ VIII. Investigators negotiate with the most prestigious international networks of knowledge production, and there is an offer of an 'interesting biological model' in exchange for resources and visibility. ⇒ IX. The authorities and the media announce in the public arena the importance of the findings of local scientists related to the study of Chagas.

The successive processes of purification operate like a curtain that hides the level of social organisation (practical and concrete actions). Thus, in the public sphere problems emerge as already naturalised. Doing so, they tend to stabilise following the relative position they have, the relations and links they establish, etc. Nevertheless, no knowledge can be reappropriated by other participants unless through several processes of social mediation. So the utility of scientific knowledge—its application to resolve a social problem—cannot be analytically separated from the

social organisation needed to carry out the interventions proposed by the scientific field. The fumigation process requires agents that produce not only its technical content, but also ways to periodically administer it, resources to produce it en mass, etc. A new drug, on its part, also depends on a socio-cognitive network, composed of scientists that state the possible molecular targets, and also of pharmaceutical laboratories that isolate a molecule, public organisms that regulate the clinical tests, resources aimed to establish the technical and financial viability of a new product, physicians that coordinate their administration, and so on.

The problems shown in this way lose, without a doubt, the romanticism of the purified discourses, the heroism of those who search for magic potions, the self-denial of the public persons able to undertake—and take charge of—social problems, the preaching of health professionals who worry for their patients, the dedication of corporations that look to satisfy social needs. But on the other hand they allow us to dismantle the 'fictions' that generate 'modern' panoramas of magnificent knowledge whose utility is, in the best cases, abstract.

NOTES

1. From 79 years for a woman in Buenos Aires, to 67 years in Chaco (INDEC 2001).
2. The interviews were done by the authors in Buenos Aires, 2005.
3. According to the considerations of the National Congress of Medicine, 1946. This affirmation was sustained by Romaña (1947) himself.

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