

**Working paper submitted for inclusion in the 2004 “*Culturepoles*” CACS
Conference Proceedings**

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**THE METAPHOR OF ‘LABORATORY-CITY’: EXPERIMENTS IN DEVELOPMENT AND THE
URBANISATION OF THE US-MEXICO BORDER**

Introduction

In his book *Juarez: The Laboratory Of Our Future*, journalist Charles Bowden (1998) uses a series of gruesome photographs taken by newspaper photographers from Ciudad Juarez to paint a devastating picture of this rapidly growing Mexican border city. To collect these photographs, Bowden followed local reporters on the beat through an urbis violently and chaotically organised around the maquiladora economy. His book communicates a deep sense of despair and alarm at what he sees. With all mainstream resources channelled to the city’s export processing industry, poverty is rampant, and massive informal and illicit sectors have emerged. Apocalyptically, the author equates Ciudad Juarez to an experimental prototype of the world’s future condition. The title of his book is based on the sardonic lament of a *Juareño*: “I live in a laboratory” (Bowden 1998: 80).

The metaphor of Ciudad Juarez as a laboratory of development is the topic of this paper. In the following pages, I analyse this metaphor using insights from the literature on the anthropology of scientific laboratories. First, I provide a brief history of the maquiladora economy along the U.S.-Mexico border and its relation to the neoliberal model of development. This account lays the ground for a critical discussion both of space and of process in and outside the scientific laboratory, in the context of their

metaphorical parallels with neoliberalism in Ciudad Juarez. My discussion will comment on some of the subsistence practices of the city's inhabitants, as well as other social dynamics accompanying the implementation and maintenance of the maquiladora economy. As I argue at the end of this paper, the agency of the *Juareños* in responding to the crisis conditions they face can be seen as a force that is pushing the neoliberal experiment to its limits, by intensifying the model's internal contradictions. Based on lessons learned from the analysis of the laboratory metaphor, I conclude with some cautionary notes concerning the theory and practice of "development."

A Brief History of the Maquiladora Border Economy

Chile is often referred to as the country where neoliberal development policies were first implemented, back in the early 1970s. But the onset of neoliberalism had been foreshadowed in Mexico as early as the mid-1960s, with the implementation of a maquiladora economy along the border with the U.S. As I will show later, the maquiladoras largely rely on the type of material conditions that neoliberal policies seek to create in order to enjoy maximum flexibility for capital accumulation.

Before and after World War II, Mexico and the U.S. entered into periodic agreements with each other under the so-called *Bracero* Programme, allowing seasonal low-wage Mexican labour to work in the northern neighbour's agricultural sector. The programme attracted tens of thousands of workers; indeed, by 1960, "braceros made up 26 percent of the seasonal agricultural workers in the United States" (Galarza 1964, cited in Velez-Ibañez 1996). But in the mid-1960s, the U.S. revoked the Bracero Programme in response to a slowing domestic economy, growing anti-immigrant feeling, and increasing labour organising by agricultural workers. Mass expulsions of Mexicans who

lived and worked in the U.S. followed. This immediately created a dramatic rise in unemployment in Mexico. As Biemann (2000:70-71) explains:

The sudden and massive rise in unemployment soon created political frictions. The Mexican government found itself in a vulnerable position, [and agreed] to the plan of a free zone on Mexican territory along the border, a zone where foreign firms could set up assembly plants [...] and [legally] curb the [labour laws,] taxes and customs levied by either government. [...] Thus were born the maquiladoras....

The maquiladoras (or maquilas for short) are factories where foreign manufacturing companies send their components from abroad to be assembled by low cost labour. The processed components are then shipped back abroad for further processing or commercial distribution. Maquilas keep their labour costs low by avoiding unionisation and worker benefit payments, shunning environmental, health and safety regulations, and forcing employees to do piecework for long hours, often without paying them overtime. Employee turnover is high, reaching in some cases annual rates of 100% (Nathan 1999).

For almost two decades after its implementation in 1965, the “Border Industrialisation Programme,” as it was called, attracted a small but steady flow of foreign investment in maquila plants.¹ Then in 1982, with the collapse of the Mexican economy, local wages dropped below those of Southeast Asia, and companies began pouring into the border. The maquila industry received a further boost in 1994 with the peso devaluation and the launching of the North American Free Trade Agreement (NAFTA). By the mid-1990s, employment growth in the sector was reaching annual rates of 15% (Arbelaez 1998).

A significant feature of the Border Industrialisation Programme is that in the first

¹ According to some commentators, the maquiladorisation of the border played a significant role in undermining Mexico’s import substitution industrialisation (ISI) strategy (c.f. Davis 2000: 29).

two decades after its implementation, it failed to create employment for men. The maquilas introduced what became a major global restructuring of labour, differentiating nations of the global North from those of the global South based on the specialisation of production. This is reflected in the global tendency towards geographic separation of labour intensive production in the global South from service delivery industries in the global North, and towards the shift in production from Fordist to post-Fordist manufacturing processes such as *just-in-time*. Significantly, this functional restructuring is resolutely gender-based. The U.S. electronics industry—which began to close its domestic plants to set shop in the border’s free trade zones—did not hire agriculturally skilled men, but young, industrially unskilled women instead. These women were primarily rural migrants from the northern and central states of Mexico, attracted by the possibility of escaping the nation’s depressed small-scale agricultural sector and by the hope of obtaining waged work.

Young women were considered by maquila managers to be more submissive and better suited to perform repetitive tasks that required a certain level of manual dexterity. Women were also expected to accept lower wages than those paid to male workers, under the tacit claim that their work was less valuable. More importantly, given that they had traditionally occupied the sphere of domestic social relations, rural women were inexperienced in labour organising, and were thus preferred over many of their male counterparts. As a result, between 1972 and 1982, up to 90% of the workers hired in the maquilas along the border were women (Arbelaez 1998).² Soon, these women became

² With the expansion of the sector after 1982, and following an increased level of organising capacity by women workers, the percentage of men workers in the maquilas increased; in 1998, men represented about 40% of the industry’s estimated 1 million employees (Arbelaez 1998).

the principal income contributors in their families, while continuing to bear the traditional responsibility for social reproduction, performing domestic tasks such as child minding or food purchase and preparation for all members of the household. The gendered restructuring of production and social reproduction has resulted in major social transformations in the family and the public sphere (c.f. Biemann 2000, Wright 2001).

At the macro level, the neoliberal policies of structural adjustment adopted in Mexico after 1982 have intensified the rural poverty that accompanied failed rural development strategies in post-World War II (c.f. Kelly 2001), creating the conditions for a sharp increase in rural-urban migration. This migration provides a functionally unlimited supply of labour to the Mexican maquila industry, which nowadays ranks above oil and tourism in income generation (Biemann 2000). Attracting women from all over Mexico (thus increasing the size of the local pool of surplus labour), and curtailing their opportunities to organise, are both concerted strategies to keep women's labour—and consequently all labour—cheap, and are thus thoroughly constitutive of the maquila model. Here, development is founded on the mobilisation of rural women's bodies as an accumulation strategy, where women's cheapened labour is the product that the Mexican government sells to foreign investors as a means to capital accumulation. The fact that displaced rural women have become the motors of both the national and the border city's economy indicates that the promotion of the maquila phenomenon is at the centre of an urban-oriented national development model clearly biased against women and against the rural sector.

The Juarez laboratory: metaphor meets material reality

The western epistemic tradition, tied by modernity to the scientific method, tends to regard metaphor with suspicion. As Capel (2001: 14) explains, metaphors do not provide explanation, but rather “establish superficial similarities between phenomena that are not related to each other by internal causal principles” (my translation). However, Capel joins others in recognising the value of the metaphor as “[enabling] one to see similarities in what have previously been regarded as dissimilars” (Soskice & Harré 1995: 290). This “meaning-extending” characteristic makes the metaphor an invaluable tool for producing new knowledge through comparison.

From a geographical perspective, acceptance of the heuristic value of the metaphor of Ciudad Juarez as a laboratory makes it possible to subject its components—the lab and the city—to a spatial type of analysis. I will first turn my attention to the physical layout of the scientific laboratory. A scientific laboratory can be described as a contained space where experiments can be conducted and models can be showcased. A population of experimental objects is provided for this purpose, and the necessary conditions for experimentation are created and controlled. Starting from this basic description, I will argue that Ciudad Juarez exemplifies the territorialization of social experimentation, whereby a place with a specific political geography becomes a metaphorical laboratory, one in which the role of experimental objects is imposed on human populations.

The space of the lab

Bruno Latour and Steve Woolgar were among the first theorists to write on the anthropology of the scientific laboratory. In *Laboratory Life: The Construction of Scientific Facts* (Latour & Woolgar 1986), they provide a description of a lab’s physical layout, according to the spatial dispersion of materials, apparatus, and people. The lab is

divided into two sections, based on the productive functions of the research process: in one section of the lab are the scientists writing the lab's product (i.e., scientific articles), and in the other are their assistants working on apparatus. In Ciudad Juarez, as in the case of the scientific lab, productive functionality coincides with overall spatial organisation. The city is divided between the industrial zones where the maquilas are situated and the surrounding squatter communities and squalid private developments—both known as *colonias*—where the workers live. Upper and middle class barrios occupy small pockets in the midst of the colonias.

While in the scientific laboratory each of the productive functions occupies a distinct area, its location can be spread around the totality of the lab's space and not delimited by one single dividing line. This is also the case in Ciudad Juarez. But the city's layout differs from that of the scientific laboratory in the efficiency of its spatial functional organisation. Whereas a laboratory is designed (and at times re-arranged) according to a functional *order*, the layout of Ciudad Juarez is the result of recent vertiginous population growth³ combined with a lack of state planning (Quijada & Chavez 1996). Ciudad Juarez is the fourth largest city in Mexico, yet most of its colonias lack basic infrastructure—including paved roads, sewage systems, garbage collection, running water, and electricity. As Bowden (1998: 41) reports, “School is often taught in makeshift outdoor environments where students must endure extreme weather conditions.” Land squatters build their homes out of wooden pallets and cardboard discarded by the maquilas, as only a few people are able to afford a more solid brick structure. Electricity is often stolen by colonia residents using unsafe techniques and

³ Ciudad Juarez is believed to grow by approximately 50,000 people a year (Thompson 2001).

materials—a common cause of fires that can ravage entire colonias in a matter of minutes; indeed, the lack of paved roads not only makes transportation to the maquilas difficult for workers, but it also prevents fire departments in Juarez or El Paso from attending to fires on time.

While so-called squatter communities can be found in every major metropolis in Latin America, their massive eruption in Ciudad Juarez can be traced directly to the maquila model of development, which is based on attracting foreign capital through low wages and providing zero taxation on corporate income. As a result of this fiscal treatment, the government is unable to raise the revenue that would be required to build the necessary infrastructure in the colonias.

Innovation and the politics of collaboration

The laboratory studies literature is concerned not only with the functions of space in laboratories, but also with their technical and social role in the production of scientific knowledge. For Knorr-Cetina (1999), one of the key roles of the laboratory is the transmission of innovation. In other words, the laboratory is the setting out of which communication flows to the external world with regards to what makes a particular model or experiment work. This information allows the replication of the model in different locales, where it will likely be subjected to further experimentation. This has certainly been the case in the Juarez laboratory. The corporate success of the maquiladora model in the Mexican border city of Ciudad Juarez, measured in terms of the growing number of large plants (an average of two new ones per month in 2000), has provided neighbouring governments in Central America with the incentive to adopt a similar model. Structural adjustment policies in these nations have been accompanied by free trade zone laws,

which have resulted in exponential growth of the maquila sector in the region. By 1998, a total of 682 maquilas (not counting the thousands of small 'submaquila' workshops scattered throughout the rural areas), employing 240,310 people (a majority of whom are women), were in operation in El Salvador, Guatemala, Honduras and Nicaragua (Bensted 1999). The message transmitted by the Juarez laboratory is clear: today, the global accumulation process increasingly favours low levels of investment in social infrastructure as well as high flexibility for transnational corporations.

The scientific laboratory's concern with the transmission of innovation (via, for example, the publishing networks that divulge knowledge produced in various types of scientific labs) led Knorr Cetina (1999) to also investigate the politics of the laboratory. As she explains, "...certain types of tasks become of special concern to heads of laboratories, who tend to spend much of their time representing and promoting their lab" (ibid.: 38). Promoting Ciudad Juarez to investors involves advertising the city's cheap labour and its proximity to the U.S. A trade advertisement for a Juarez maquila subcontractor reads: "If you're trying to cut your production costs, Mexico beats the Far East by 10,000 miles" (Biemann 2000: 78). After all,

experiments need laboratories just as much as laboratories need good (technically and financially powerful) collaborations and experiments.... it is clear that experiments, which are at the same time "collaborations" ... also represent a tremendous political force.... *Collaborations and experiments do not have to be "loyal" to laboratories....*" (Knorr Cetina 1999: 43, emphasis added.)

Given that companies can hire subcontractors to operate as their manufacturing subsidiaries, it is relatively simple for them to move their production to any city or country that provides lower costs. The global maquila industry has thus been popularly referred to as a 'race to the bottom,' in which cities and nations compete for

“collaborations” with foreign companies and subcontractors, to obtain their patronage in exchange for the opportunity to exploit their citizens at the most competitive cost. It is out of this strategy of flexible accumulation that the limits of the neoliberal maquila model of development emerge.

The experiment... and its limits

The analysis of the Juarez laboratory leads by association to the related metaphor of experimentation. An experiment is a process that can be described as the testing of hypotheses via the “staging of real-world phenomena” or the processing of “partial versions”—or even representations—of these phenomena (Knorr Cetina 1999: 33). The metaphorical Juarez experiment is conducted by Mexican government officials and transnational maquila executives, who are continuously testing new strategies to maintain or improve the material conditions for capital accumulation, in an environment suited to this purpose. These strategies include the blending of production and distribution activities through ‘just-in-time’ techniques, but also labour disciplining tactics such as the use of employee databases that facilitate the blacklisting of workers with a history of asserting their rights. In any case, both sets of actors (i.e. state officials and corporate executives) can be metaphorically associated with the researchers of a laboratory, testing theories related to phenomena of interest to science. The neoliberal experiment, like a scientific experiment conducted by scientists on live animals, embodies the violence of vivisection—in this case applied to human beings, the experimental objects of the ruling class (Visvanathan 1992).

In the laboratory, an object subjected to experimentation might suffer a transformation at a much different pace than it would in an uncontrolled environment.

Thus, it can be said that in a controlled setting, ‘real time’ is substituted by laboratory time (i.e. the time it takes to obtain some measurable result). The question of laboratory time can help explain why the metaphor of experimentation resounds with the model of neoliberal development. Neoliberalism, as an applied theory that posits the necessity of SAPs and free trade policy, is ideologically infused with pretensions of universality; as such, it does not take into consideration the history (and geography) of individual places, meaning that it abstracts reality from the materiality of time (and space). While economists in the IMF and the World Bank may take a minimum of particularities into consideration when designing SAP packages for a specific nation, the fundamental homogeneity of the model persists in their putatively made-to-measure designs. Scholars of laboratory studies have observed that scientific experiments “are not only ‘technically’ manufactured in laboratories, but also inextricably *symbolically* and *politically construed*” (Knorr Cetina 1995: 143). This observation seems to travel well to the metaphorical neoliberal experiment, with its heavy ideological baggage.

The widespread application of the neoliberal model against the grain of historico-cultural and politico-economic specificities of place is an indication of the ideologically driven homogeneity of the model, which constitutes one of its structural limitations—just as the controlled environment of the laboratory constitutes an internal limitation of the experimental method. A lack of reflexivity is manifest in the designing and defending of neoliberalism. Proponents of this framework downplay the fact that the material conditions that allow the neoliberal experiment to exist are fabrications; they are effects of a particular ideology of order, with obvious parallels to the conditions of a scientific experiment in a laboratory set-up. In the Juarez experiment, these fabricated conditions

include: the effects of economic and social policies which have induced migration; political instability deriving from crisis situations (such as the ending of the Bracero Programme or the currency devaluations of the 1980s and 1990s); and a strategy of locating the “laboratory” in geographic proximity to the vast U.S. markets. The fact that a specific environment must be given particular shape prior to putting in place a neoliberal strategy of maquiladora industrialisation points again to the model’s limitations. As the recent history of Juarez shows, the stabilisation of uneven material conditions presents enormous challenges, and thus, the neoliberal model must continuously invent ways to adapt to changing and often unanticipated conditions that threaten the actual possibility of its existence.

Perhaps for this reason, the experiment is heavily dependent on various forms of state involvement, or ‘bail outs,’ despite neoliberal rhetoric against the assumption of such a role by the state. As part of the Juarez experiment, the Mexican government has built and continues to build infrastructure necessary to attract and retain maquilas, including superhighways, high-speed freight trains, and advanced telecommunications systems. In addition, it has adopted and continues to implement SAPs, which include policies such as the elimination of social programmes and state subsidies meant to benefit the middle class and the poor. The Mexican government also provides or facilitates the repressive apparatus to contain trade unionism and social revolt. These forms of state intervention are in tension with its political and economic aspirations for stability, particularly under conditions of extreme social polarisation such as those found in Ciudad Juarez.

Approximately one half of Ciudad Juarez' estimated two million inhabitants are of working age, yet only about 230,000 of them were working in the city's 400 or so maquilas in 1998 (Nathan 1999). For those who do find work in the maquilas, wages are often below the city's cost of living. The example of Oscar Chavez, from the border city of Ciudad Acuña, is both illustrative and emblematic:

... his weekly Alcoa take-home pay was \$60. He said he spent about \$11 for bottled drinking water. About \$5 went to rent ... \$20 for electricity and \$10 for buses and taxis.... There was little left for food or clothing. His wife, who worked in another Acuña plant ... earned about the same as her husband. She was spending about \$40 a week on their groceries, Mr. Chavez said. (Dillon 2001)

The fact that along the border “real wages bear little of no relationship to workers’ productivity or cost of living” (Davis 2000: 36) points to what could be called, borrowing de Janvry’s (1981) term, a ‘functional dualism’ between the capitalist maquila economy and the informal subsistence economy. The accumulation strategy of the global maquila industry is based on finding the lowest wage environment, which is typically situated in places where employers can operate while paying wages that fall below what workers spend on their social reproduction. In other words, the maquila industry can only exist because of its low production costs, and these are only possible due to the fact that workers subsist through means other than their maquila wages. Maquila workers and their families must often participate, like the unemployed, in a variety of subsistence activities. These activities effectively provide the equivalent of a subsidy to the maquila industry, by allowing it to continue to profit from a low wage workforce.

The subsistence strategies of maquila workers include squatting on unused land, where workers do not need to pay rent (yet they must live with the constant risk of losing their homes in a flood, a fire, or bulldozed by the police), as well as engaging in informal

sector work, which includes ambulatory food sales, street performances, or sex work (Bandy 2000).⁴ For many, attempting to illegally migrate to the United States is the only economic option, at significant risk for their lives. Crossing into the U.S. has become a potentially deadly choice due to the militarisation of the border, which has pushed migrants into increasingly dangerous routes through the desert (c.f. inter alia Andreas 1999).

The militarisation of the border is one of many state policies undermining the subsistence strategies of Juarez's residents. While the much-maligned trade of 'coyote,' or people smuggler, is now dominated by full time smugglers or hardened criminals, it is significant to note that this had not always been the case. For many experienced border-crossers, helping other people to enter the U.S. illegally in exchange for a what used to be a small fee was, until the 1980s, a way of supplementing an insufficient income while providing what was considered by clients to be a valuable service. Nowadays, under tighter border conditions, "the demand for coyotes' services, even at increased prices, shows no sign of abating" (Spener 1999), but increased jailed penalties for people smuggling in the U.S have become a deterrent for many of the casual, small fee coyotes. This has left many would-be border-crossers in the hands of bandits and the most unscrupulous coyotes.

The criminalisation of survival activities such as land squatting and border crossing is accompanied by an increase in actual violent crime, including the involvement of a growing number of Juarez' residents in *narcotrafico* (drug trafficking). It has been

⁴ This list focuses on individual and family strategies of subsistence, but there is also a vibrant array of social organisations in Ciudad Juarez. To my knowledge, however, they have not received concentrated attention in the literature. For an analysis of Tijuana's community organisations, see Bandy (2000).

reported that at one time in the mid-1990s, the Juarez cartel—a network of small and big scale dealers, smugglers, hired guns, financial experts and corrupt officials and police officers—had revenues estimated at \$200 million a week (Bowden 1998: 64). The magnitude of drug dollar circulation is difficult to estimate, but its multipliers are widely believed to be the economic lifeline of Ciudad Juarez. At the same time, narco-executions occur almost every day. In addition, dozens of murders, gang killings, and disappearances, specifically of women, are reported every year (at least 150 women were killed in 1995, most of them adolescent maquila workers), making Ciudad Juarez the most violent city in Mexico. Herein lies one more contradiction of neoliberal policies. While the model relies on the state's monopoly of violence to maintain the conditions for capital accumulation, the poverty that emerges out of these same conditions leads increasing numbers of people to challenge the state through the adoption of violent strategies of subsistence and wealth acquisition. The explosive growth of violent crime undermines the state's ability to maintain conditions favourable to capital accumulation in the formal sector.

Conclusion

The Juarez metaphor of the laboratory must be considered beyond its more literal denotations. Because of its geography, its fast evolving cultural practices, and its political economy, Ciudad Juarez can be seen as a laboratory in at least two major respects. First, it can be seen as a laboratory of technocratic and industrial experimentation in neoliberal development; and second, as a sociological laboratory in which it is possible to observe, at a high degree of magnification, both the increasingly harrowing social conditions that accompany the neoliberal model of development, as well as the continuous attempts by

the model's practitioners to minimise vulnerability to such conditions. Ciudad Juarez embodies a key contradiction in the neoliberal model of development, arising out of two of the model's competing needs. I've argued that on the one hand, the neoliberal strategy of development—which is based on creating conditions favourable to accumulation—requires a 'functional dualism' based on the co-existence of capital-intensive and informal economies; yet, on the other hand, the model also needs to limit informal sector subsistence practices in order to contain labour spatially and retain its pool of low wage surplus labour. In this way, the ingenuity and resilience of the city's residents in their struggle to survive can be said to act as a precipitating element in pushing the neoliberal experiment to its limits, by multiplying the model's internal contradictions.⁵

Unfortunately, it is difficult to imagine how an informal economy devoid of solidarity and collective organisation objectives could become the basis of a more just society.

The metaphor of Juarez as a laboratory helps us to understand how neoliberalism as a model of development can reproduce itself through the "transmission of innovation", despite its violence and its well-documented social and economic failures.⁶ But more importantly, this metaphor can also be helpful in identifying pitfalls that socially minded theorists must avoid in their investigation of more equitable and sustainable possibilities for economic and social life. I have discussed how neoliberalism as theory and policy is ahistorical, unreflexive and undemocratic. In contrast, social theory (and policy) must not only be empirically grounded, but also historically-sensitive and reflexive, meaning that it

⁵ Not discussed here are the equally significant ecological limits of the maquiladorisation of the U.S.-Mexico border. Again, the literature pertaining to Ciudad Juarez is scarce. For an analysis of these in the case of Tijuana, c.f. *inter alia* Saldaña (1999).

⁶ On the social and economic failures of the neoliberal model in Latin America, c.f. *inter alia* Veltmeyer (1997), and Gwynne & Kay (2000).

must take into account the subjectivity of its producers and the ideological basis of its production.

The challenge, then, is to find ways of incorporating bottom-up participatory mechanisms that involve all members of society in the formulation of social theory and policy, so as to avoid the violence of undemocratic experimentation (i.e. vivisection) on populations. At the same time, the scale of theory and policy formulation must be expanded to include the 'political development' of the wealthiest nations. If the health of the most powerful national economies in the world depends on the existence of places like Ciudad Juarez, it is clear that a co-requisite for change in the global South is fundamental change in the global North.

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