CHAPTER TWELVE

Technical Assistance in Movement

Nuclear Knowledge Crosses Latin American Borders

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A man walks down the street
It's a street in a strange world
Maybe it's the Third World
Maybe it's his first time around
He doesn't speak the language
He holds no currency
He is a foreign man
He is surrounded by the sound, the sound
Cattle in the marketplace
Scatterings and orphanages
—"You Can Call Me Al," Paul Simon (1986)

Introduction: The Materiality of Travel

The transnational approach is synonymous with the language of movement, circulation, and flows across borders and between nodes in a network. Notwithstanding this focus on movement in this genre of historical analysis, we notice the absence of attention to *travel* itself, as if the movement from one place to another is unproblematic.[1] In this chapter we fill this lacuna. We concentrate on the materiality of movement

and the intricate, different kinds of networks, contacts, and flows that make travel possible. By tracing the itinerary of a mobile radioisotope laboratory as it meandered through several Latin American countries, we highlight the challenges faced not only in crossing borders but in traveling from one town to another within any one country. These challenges were not simply bureaucratic: on the contrary, they were precipitated by an inability to imagine what travel in a "developing" country entailed, by a divergence of cultural norms and expectations between local officials and those in an international organization in Europe, and by the vagaries of nature itself, from earthquakes to floods, and their devastating effects on local infrastructures. People and things don't only move across borders: they travel. Physically crossing space involves planning, money, time, and paperwork, mundane materialities that are ignored at one's peril in a transnational approach.

The postwar period, and in particular the Cold War context, triggered an increasing number of contacts and exchanges between all sorts of agents in the new geopolitical order, particularly the newly created multilateral United Nations agencies. The growth of international markets (once colonial monopolies fell apart) and the availability of air transportation and telecommunications provided the background for scientific and technological exchanges. A sizable proportion of them involved a broad range of technical assistance programs in every area classified as a potential modernizing trigger for a newly conceptualized portion of the world: *underdeveloped* countries.[2] Agriculture, demography, infrastructure, public health, and nuclear technologies are some of the areas where it became expected *to give* and *to receive* development aid. As the large economic and sociological literature on postdevelopment studies has shown, things did not turn out as expected.[3] For historians of science and technology there are still many questions and problems that are unanswered and ignored. How, and by which economic and material means, were people—scientists and technicians—materials, and instruments moved within and across national borders? Who facilitated these movements on the ground? Which natural, political, and mundane administrative obstacles stood against this flow, and how did they affect the appropriation and adaptation of science and technology? What happened when so-called "recipient countries" were not willing to receive the supposed benefits of science and technology? Such questions are not futile or superfluous when science in movement is framed as part of technical assistance programs, an often-forgotten facet of the travel

of knowledge in the second half of the twentieth century. We are fully aware that experts, both local and from neighboring countries, participated in the travel of knowledge and practices connected to radioisotope laboratories, and we will mention some of these actors in the present chapter. However, we will not deal, in depth, with scientific practices and roles involved in the interactions between international, regional, and local training experts and trainees.

By focusing on the International Atomic Energy Agency's (IAEA) Mobile Radioisotope Exhibition (MRE), we aim to address the travel of knowledge in the context of asymmetrical, nonreciprocal exchanges between countries, as embodied by the participation of multilateral agencies in technical assistance programs. To move the radioisotope techniques through Latin America, each of the national atomic commissions, the IAEA planners, and the experts and scientists involved strongly relied on the financial resources set up by the UN development machinery, through the Expanded Program of Technical Assistance (EPTA), and the expertise of its international functionaries in each country, the resident representatives of the Technical Assistance Board (UNTAB).[4] Thus, the *transnational*, in our story, is not an abstract analytic tool. It is the embodiment of the crossing of national borders through different geographic and natural accidents (like the Andes mountains or a flood), power and infrastructure asymmetries, and paper technologies specific to administrative histories. In addressing these issues, the internationalization of science and technology becomes the collective endeavor of local actors and international functionaries to move a rather rigid structure (a truck) containing a set of standardized instruments and materials through the troubled and eventful roads of *Third World* countries. It also refers to the tension between the needs and interests of local and international actors to discipline nature and technology and to the specificities and resistances of the movement within and between each country. Such an approach shows the immense adaptability and stability of the scientific practices that traveled in the context of technical assistance programs. Moreover, the *transnational*, as performed in technical assistance programs, depended on the new administrative technologies of *development planning*.[5]

The two IAEA-MRE trucks (Unit 1 and Unit 2) had been donated in 1958 by the US Atomic Energy Commission for training purposes on the several applications of radioisotopes in the context of the Atoms for Peace campaign and the ensuing creation of the IAEA in 1957.[6] Techni-

cal assistance was classified as a priority for the international agency and seen as a key instrument to shape, standardize, and control the uses of atomic energy around the world. It was also understood as a mechanism to open potential markets for the new atomic technologies and to promote the beneficial side of atomic energy to broader audiences. As such, nuclear technical assistance was modeled after the idea of stages of development, where basic radioisotope techniques (preparation, dilution, measurement) and their "everyday" applications in medicine, industry, and agriculture were seen as the first step up the nuclearization ladder, to be followed by the construction and use of research reactors, and culminating with the acquisition of power reactors.[7] The introductory technoscientific practices of radiochemistry, nevertheless, were meant to demonstrate a nation's modernity, and its possible future. We are not talking here of monumental nation-building technologies, where pride and prestige were at stake. We are talking of the mundane radioisotope techniques (dull, unremarkable, repetitive) to be used in industrial quality testing, in veterinary and dental clinical settings, and in medical therapies in middle-range hospitals. Moreover, the two trucks embodied not only science, technology, and modernization but also the deep symbolism of the "friendly atom."

In what follows we describe the real and perceived difficulties of moving the MRE Unit 2 truck through six Latin American countries (Mexico, Argentina, Uruguay, Brazil, Bolivia, and Costa Rica) as a good and localized example of the materiality of travel.[8] We focus our account on the logistics of crossing each of the national borders the International Harvester truck trespassed. In doing so, we pay attention to the actors involved in this movement (frequently made invisible in traditional accounts), and in particular the Viennese driver, Josef Obermayer, and the Argentinian physicist, Arturo E. Cairo, the acting director of Training and Exchange Programs at the IAEA.

The Travel of MRE Unit 2 across Latin America

To move the MRE around recipient countries required a sizable amount of the IAEA's United Nations Expanded Program budget, amounting to an estimated cost of US$16.00 per kilometer and a total cost of approximately US$123,900 from 1960 to 1965, or 0.8% of the total budget for technical assistance at the IAEA. To implement it, the agency relied on

its bureaucracies in the Vienna headquarters and on local personnel, including two Viennese drivers, as well as trained technicians who enjoyed the agency's trust and had been given the responsibility and duty to report regularly on the trip. Starting in 1958 the IAEA also relied on the UN EPTA fund and UNTAB resident representatives in each country.[9] This mass of human and financial resources constituted a complex network that set the heterogeneous conditions for the movement of scientists, engineers, instruments, and materials.

For MRE Unit 2, crossing the borders between the United States and Mexico, Mexico and Argentina, Argentina and Uruguay, Uruguay and Brazil, and Brazil and Bolivia, to its storage depot in Costa Rica involved a number of highly specific challenges, not to mention the cancellation of the trip to Chile after the disastrous 1960 Valdivia earthquake.[10] Moreover, the itinerary itself kept changing, despite dozens of last-minute fixes and administrative arrangements and interventions. The itineraries "on paper" never seemed to consider actual times on the ground, and events and delays at one stop caused a domino effect later down the road.

The MRE trucks measured 10.5 meters long, 3.4 meters high, and 2.4 meters wide and weighed approximately thirteen tons. They had been assembled and equipped at Oak Ridge National Laboratory in Tennessee. They included a small chemistry laboratory and radiation counting room, with basic instrumentation including Geiger-Müller counters, centrifuges, and glassware. As such, they embodied the knowledge and practices of standardized radioisotope techniques, such as methods for radiation counting, dilution, and biological and medical tracing. As Nicolas Dew says, "there is no science without metrology."[11] Standardized practices are required in order to have common ground for scientific practice, but standardization relies on movement. After lengthy deliberations, the IAEA decided that a couple of drivers from the IAEA's staff needed to be commissioned for such a crucial task.

It proved to be a huge challenge to move an International Harvester truck on the Latin American roads and railroads and even onto ships and into ports.[12] A chauffeur with the type of qualifications required warrants at least a G-4 salary. The driver must have unusual driving skill to handle such a large vehicle since it is comparable to a large bus, be qualified to act as a mechanic, and have a keen sense of responsibility for the vehicle itself, including its cleanliness and day-to-day maintenance and operation. The person would also have to be willing to travel with the vehicle and be responsible for it twenty-four hours a day.[13]

Oak Ridge, Tennessee, to Nuevo Laredo, Mexico

The beginning of the trip, originally planned for December 23, 1959, was delayed a fortnight, to early January the next year. The delay was caused by the Christmas holiday season, a telling sign of the unrealistic planning elaborated by out-of-touch officials. William Pope, an electronics technician at the Oak Ridge Institute for Nuclear Science, had been hired by the IAEA for the Mexican part of the itinerary. Josef Obermayer, a bilingual (German and English) professional driver, was picked by the IAEA to take the truck through Latin America by road. He departed with Unit 2 from Oak Ridge in Tennessee to cover the almost two thousand kilometers to the Mexican border city of Nuevo Laredo. On January 5, the MRE crossed the US-Mexico border.

A young Mexican Chinese physicist, Eugenio Ley Koo, was waiting for Obermayer and Pope; his role was to act as a translator and also as the professor in charge of the radioisotope training courses. Between January and April that year, the Mexican stops included midsized cities at the center of the country—Monterrey, San Luis Potosí, Guanajuato, Guadalajara, Puebla, Mexico City, and Veracruz—where the peaceful uses of atomic energy were promoted. Arguing for the need to increase governmental funds for the development of nuclear science and technologies, a group of Mexican scientists and promoters (including Nabor Carrillo, rector of the National University of Mexico) took advantage of the IAEA exhibition and laid out a program of conferences and related shows in Mexico City that highlighted nuclear energy as a modernizing technology.

If crossing the US-Mexico border was easy (later in the trip Obermayer would recall the steak and beer he had enjoyed in Monterrey), the next part of the journey soon became a challenge. No direct shipment route existed between the Gulf of Mexico ports and Argentina (Buenos Aires). The Pan-American Highway did not go that far (and it still does not). Thus, Unit 2 of the MRE had to be taken back to New Orleans in the United States. In a letter sent from Mr. Cairo in Vienna to Mr. Adriano Garcia, he stated, "They [the Flota Argentina de Navegación de Ultramar] have suggested shipping from New Orleans, but it is also possible that they will have one of their ships deviate from its regular route to collect the mobile laboratory in Veracruz."[14]

Tampico, Mexico, to New Orleans, Louisiana, to Buenos Aires, Argentina

The truck was eventually scheduled to leave the port of Tampico for Buenos Aires on April 18. The unit was loaded on the *Lancero*, owned by the Flota Argentina de Navegación de Ultramar. The cruise took almost three weeks, passing north to New Orleans and then south to Argentina. Although the precise date is not clear, by May 10 the MRE was in Buenos Aires.

A technical problem that would come up again and again throughout the trip was the lack of a constant voltage and electric power. This fact had an impact on the itinerary itself, which was restricted to (mostly) electrified areas, and also on the instruments' performance. A telegram sent by Obermayer to his boss Cairo on June 15, 1960, reads: "Please send urgent approval to buy transformer stabilisator [*sic*] power supply big problem apr. cost 200 ds expl letter on the way. Josef Obermayer." In fact, Obermayer was confronting a problem that arises whenever one assumes that technology developed in the Western world will work "anywhere." As Joseph O'Connell has said of the US Navy, it "has found that it cannot set up an overseas base simply by sending ships, airplanes, bullets and soldiers. None of these can move freely into a new setting unless the Navy first sends the volt, the ohm, the metre, and other standards ahead to prepare the way." The IAEA, like the Department of Defense, found that scientific equipment "cannot move into new settings for long unless the setting has been prepared by rendering certain variables similar with respect to where the equipment was produced, and stable with respect to time."[15] Stable power supplies were needed for the MRE to manufacture reproducible, "universal" scientific results.

Another revealing fact about the asymmetric conditions between development planners and actors on the ground was related to Obermayer's salary and per diem (stipend) during the Argentinian journey. The recipient country had the obligation to pay half of his salary, which had been set according to the UN pay scale. However, as those in charge of the radioisotope courses in Buenos Aires claimed, there was a major disparity between Obermayer's salary, not to mention his per diem, and those of local scientists:

> Concerning the *per diem* topic . . . those received by Obermayer [1,000 Argentinian pesos per day] are of the same amount as those assigned to you,

> and to engineer Buchler, to whom I ask you to send my greetings. I want to remind you that our people do not receive the compensatory and comfortable back up of a salary in US dollars, not even one like Obermayer's, but between 6- and 8,000 [Argentinian] pesos per month. As a consequence, they don't feel their professional pride hurt, but rather their wallet.[16]

To avoid unpleasant quarrels, the IAEA decided to move the driver's salary to the UNTAB account and, more important, change his assignment to a "technical expert" post.[17]

In Argentina, the MRE traveled from Buenos Aires to Mendoza and then to Cordoba city. During this journey, the IAEA continued to push for the MRE to visit as many countries as possible, in order to optimize costs and travels. Thus, despite not being an IAEA member state, Chilean officials (Chile had no national atomic commission as yet) negotiated a MRE visit after their neighbor's. No sooner had the visit been approved than the dramatic Valdivia earthquake of May 1960 disrupted the Andean pass between Argentina to Chile:

> the road from Argentina to Chile through the Andes at the point called "Las Cuevas" cannot be utilized as it is not suitable for the vehicle. The other road connecting Argentina and Chile, at the south, is a good road but it is not possible to travel from south Chile to Santiago due to the last earthquake.[18]

Taking the truck by sea was economically unfeasible, given the other urgent priorities that the Chilean government now had. The MRE never made it to Chile: getting it there was an insurmountable hurdle.

Buenos Aires, Argentina, to Montevideo, Uruguay, to São Paulo, Brazil

Back in Buenos Aires, in November 1960, the truck was stored until its next stop in Uruguay. A new surprise was in store. At the end of this month, Dr. Hernán Durán, the UNTAB resident representative in Uruguay, wrote to Dr. Cairo declining the use of the MRE, arguing that the government was no longer interested. This change in itinerary was angrily received at the IAEA headquarters, with Cairo answering Durán's letter in an excited mood:

> I am very surprised to hear that Uruguay was no longer interested in the use of the mobile laboratory. This decision would create a most unfortunate situ-

> ation for the Agency . . . [since] all other activities have been planned in consideration of this request. Moreover, as the Technical Assistance Board has already allocated a certain amount of money for the laboratory's visit to Uruguay, it would be most unwise not to utilize the sum for this purpose.[19]

It was not until March 1961 that the University of Montevideo again showed an interest in receiving the MRE. Things had to be accelerated since, in the meantime, Brazil had committed to receive the truck on June 1. Obermayer, who at this point was back in Vienna, had to fly back to Buenos Aires, where the truck had been stored. More problems awaited him when he got there. The highway connecting Buenos Aires with Montevideo was out of order because of the season's heavy rains and the floods that had swollen the upper Paraná River. The Argentinean UNTAB representative explained the consequences:

> With the present state of the road the trip-some 200 km.- will take at least 10 to 12 days and during all this time an officer of the Argentine and Uruguayan customs have to be aboard the truck to certify that no piece has been taken out while in transit. The fees for these inspectors, plus their per diems and travel costs go heavily into money.[20]

This new obstacle was avoided, and the truck finally crossed on a boat, arriving in Uruguay, as expressed in Obermayer's letter to Cairo:

> Well, I finally made it from B. Aires to here, and not by Road but by Boat. . . . so I had to wait for a Boat since the Ferry boat to Colonia could not take a truck of this size. Anyway I get over here on the 22.4. and yesterday got the truck out of custom, which was quite a problem.[21]

For the next few weeks, from May to June 5, radioisotope courses were taught in Montevideo by Argentinean experts who had traveled to offer "technical assistance" to their more unprepared neighbors. Things ran smoothly until the MRE had to be transported to the next Latin American country. The question of how to move Unit 2 from Montevideo to Brazil posed a difficult dilemma: by sea or by road? The latter option was dropped because of the almost two thousand kilometers that Obermayer would have to drive and the high costs it entailed. After a very careful inquiry, a sea route seemed the more suitable option:

> It is possible to go by road to Rio from here, but according [to] the automobil [*sic*] club, the road is pretty bad in parts. Transport by railroad also is possible, but it seems it may take quite some time. Now the safest bet would be your guess, to go by Boat to Santos and from there by Road to Rio.[22]

As these plans were evolving, Marcello Damy Souza Santos, chairman of the National Nuclear Energy Commission (Brazil), sent a telegram to Cairo in Vienna. Souza Santos sought to cancel the MRE visit to his country, arguing that they had already established their own program on nuclear energy.[23] Once again, Cairo made a strong case to dissuade the Brazilians, who finally agreed to have the MRE for six months. On August 1, Obermayer and the MRE were on board the *Cap Palma* (fig. 12.1), which took them to the port of Santos Rio, where they arrived on August 10.

The Brazilian journey started off badly. On arriving at Santos Rio, Obermayer learned that the port had been paralyzed by a dockworkers' strike, and it took four days before the truck was offloaded. Then he had the Brazilian customs paperwork to navigate, Obermayer complain-

FIGURE 12.1. Loading MRE Unit 2 on the *Cap Palma* at Montevideo, Uruguay, 1960. *Source*: IAEA Archives, Vienna.

ing that now "something new, the Custom office wants a price on all the items of the inventory list."[24] The weather was a problem too, "[s]ince the temperature, in some of the places here is quite a lot (Santos 40º), here in R. Preto about the same, I like to thank you for the ventilador [*sic*], which helps a lot."[25] Moreover, at this point in the journey, it was not even clear *how and by whom* the MRE was to be used while in Brazil. To add to the confusion, Souza Santos was out of the country, and so "Mr. Vidal," a public relations officer from the National Nuclear Energy Commission, with no familiarity with radioisotopes whatsoever, and Obermayer were left alone to arrange the release of the truck from the customs officers.

Political problems complicated matters further. At the beginning of 1961, Jânio da Silva Quadros had been elected president of Brazil, only to resign a few months later, on August 21. The country was immersed in political turmoil, which delayed any decisions related to the MRE. More specifically, Obermayer's per diem was halted due to the closing of the banks. On August 23, the truck was finally given the green light to leave the *alfândega* ("customs" in Portuguese).

During the first weeks of October, the truck was on the road to São Paulo, even though the purpose of the exhibition was still not clear to anyone. Rather than teaching courses on radioisotopes, Unit 2 was used as propaganda for the Brazilian National Nuclear Energy Commission, to demonstrate the peaceful uses of atomic energy, and for specific research on thyroid diseases that had been explicitly requested, since the uses of radioactive iodine in diagnostics were well established. It was clear that, for Brazilian experts, the MRE had nothing new to offer. Improvisation, however, continued to rule the day. While Unit 2 was in Goiana, the rainy season arrived. Obermayer described the situation to Cairo:

> Dr. Lobo wanted to go and I told him, with the Unit now its impossible since the rain season started and the roads are very bad. So he get us an ambulance and we loaded some equipment as Scintillation Spectrometer, Zentrifugue [*sic*] and so on, in there and where [*sic*] travelling with it, via Rio, Sao Paulo, Ribeirao Preto, Araxa, Uberaba, Uberlandia, Araguari back here! Tomorrow I take the Unit to Inhumas where we stay a few days, and then we go by ambulance again to Goias Velho and a few small places around there. So you see we are cruising around a lot here.[26]

From Brazil's Alfândega *to Santa Cruz, Bolivia*

Notwithstanding his multiple adventures, nothing had prepared Obermayer on the ground, and Cairo in Vienna, for the trip from Brazil to Bolivia. After an extension of the visit in Brazil, from January to the end of March 1962, Unit 2 had been stored in Rio de Janeiro for more than a year. Meanwhile, before sending new invitations to more countries, the IAEA had asked for extra EPTA funds to cover the unexpected expenses of the truck's transportation. From Cairo's office in Vienna new invitations, offering cheaper conditions, were sent to more Latin American countries. The mobile exhibition seemed more affordable this time, and the initial response was good. However, by January 1963, the IAEA was informed that no more EPTA funds were to be provided for the mobile laboratories because of competing priorities between UN agencies. Bolivia, however, did not reconsider, and local officials agreed to pay for the transportation, half the per diem for the experts and for Obermayer, but not the experts' salaries: "As you can understand, these conditions make the IAEA's proposal practically unacceptable for countries with reduced economic media as ours."[27]

Finally, to get the MRE moving, the IAEA agreed to pay the total sum of the experts' salaries, who would travel from Argentina to teach radioisotope techniques. Different itineraries were proposed to move the MRE from Rio de Janeiro to Bolivia. All customs paperwork was to be done by the Bolivians. Radioisotope courses were scheduled for four different cities in the country: Santa Cruz, Cochabamba, Oruro, and La Paz. In an enthusiastic letter, Obermayer described the planned trip to the Vienna headquarters:

> Then I saw a Mr. TORRES the AGENTE COMERCIAL of the COMMISSÃO MISTA FERROVIARIA BRAZILEIRO-BOLIVIANA, who told me some good news! First it is possible to ship the truck via train, either from Sao Paulo or Bauru (shorter distance) via Corumbá (border) to Santa Cruz. The payment must be made at Sao Paulo up to the border and it can be arranged to pay the Bolivians share at Bolivia (Santa Cruz). The train go from Sao Paulo dayly [*sic*] to Corumbá and from there every Friday to La Paz. Wednesday next week I will get by phone the prices from Sao Paulo. The trip takes about 1 week and since it is a freight train, I believe it is advisable to fly to La Paz after loading at Bauru, to arrange for papers and payments at the other end, ok?[28]

Nice plans! But they clashed with events on the ground. One month later, Obermayer was still in Rio de Janeiro, trying to obtain the necessary documents from the *alfândega*.

> Dear Mr. Cairo!
>
> I would like to give you a short report about what happened up till now. As I wrote you last time, it is possible to ship the truck by train, and as a matter of fact about the only way at the moment, because the Rio Parana is heavy flooded and roads are closed. I have been after Mr. Vidal dayly for the necessary transit papers, but since this week there is a change in government, everything is slowed down more than usual. Also I got in touch again par telephone with the Comissão in Sao Paulo at the 19.6 and they promised to call back the exact price of shipping via UN-Office Rio, but nothing happened. After urging the UN-office to try again, we couldn't get connections with Sao Paulo, so that means wait until Monday.[29]

Days later, when Obermayer drove the truck from its storage place in Rio to Bauru, the rear axle broke and his departure was delayed once again.[30] Now quite pessimistic, the hapless driver complained about what he called "Brazilian time." This was the most challenging part of the trip, and much was to happen before he eventually arrived at Santa Cruz (fig. 12.2).

Once again Obermayer faced the problem of how to upload the truck on a train, and improvisation was the only way to get ahead:

> Well, at Bauru the railroad people did not like to take the transport at all on account of the hight [*sic*] of the truck. Just after a few hours of on going back and forth we decided to fit blocks under the frame so the truck could not sway while transported. Then we found the loading ramp to [*sic*] small and only for small cars. So around we went again and finally found a place at the Sorrocabana [*sic*] station. Then they sent a very old railcar with cracked boards where I refused to load on. So more arguments and this by 36ºC. Then in order not to get stuck with the rear end of the truck, it needed a lot of boards to left the truck up, and those boards seems to be more precious as gold here. By this time I was so disgusted with all this fiddling around, I was about ready to go home! Finally in the afternoon we got the truck loaded, with a lot of scraping, yelling and confusion all around. Some characters in front yelled "vamos"

FIGURE 12.2. MRE Unit 2 on the train from Rubiacea to Corumbá, Brazil, 1963. *Source*: IAEA Archives, Vienna.

some in the rear the opposite, and after the truck was on the flatcar there where [*sic*] about 2 zentimeters? at each side missing![31]

The worst was yet to come. Obermayer flew from Rio to Corumbá, where the train was supposed to arrive on July 20, 1963. More than a week later there was still no news whatsoever of the train and its precious cargo. Our driver traveled to the train station at Bauru, where he was told the train would arrive shortly. Desperate to find the train and the truck, he traveled back to Corumbá, where the station chief made his best efforts to locate the train along the line. Then, on July 24 they received a telegram from Rubiacea, a little station a few hours from Bauru, informing them that the train had been involved in an accident. After a heated argument as to why the Corumbá station had not been told about this before, Obermayer traveled to Aracatuba in a frenzy, not without trying to locate the UNTAB resident representative at Rio, Mr. Peter. Telephone lines, however, were out of service.

Two days later, Obermayer arrived in Rubiacea, where he was able to estimate the damage to Unit 2. The direction axle was bent, in addition to there being some exterior damage. Obermayer was now stuck in

Corumbá for almost two weeks, in a place that he considered "the worst place I ever saw, with those millions moskitos you can hardly sleep . . . the telephone line is now broken down again, nobody knows for how long."[32]

Finally, the truck was released and arrived in Santa Cruz, a town on the Bolivian border, early in August. As Obermayer was trying to figure out the best way to drive the truck through Bolivia, a new surprise awaited him. When he traveled from Cochabamba in Brazil to La Paz (while still in the process of making arrangements to pay for repairs to the truck), he realized that the road to the Bolivian capital was too steep and too narrow for the truck. The length did not help either. The twisty road made it impossible for Unit 2 to reach La Paz. Unwilling to abandon the mission, in mid-August some instruments were sent to the city by bus, and a few courses were taught.

The UNTAB representantive in Bolivia, Ms. Margaret Joan Anstee, bitterly complained to IAEA official Cairo that "quite a number of the difficulties could have been avoided if our office had been brought into the picture at an earlier stage."[33] In reply, though he apologized for all the inconvenience, Cairo also argued that "they were practically helpless [in the IAEA] since most of the time we did not even know where we could reach . . . Mr. Obermayer."[34] In the event, the rest of the courses were given at the Faculty of Agronomy in Cochabamba and at the Faculty of Veterinary Science in Santa Cruz, ending on October 25.

Rio de Janeiro, Brazil, to Punta Arenas, Costa Rica

For the next two years, the MRE was stored in Rio de Janeiro, where it had returned at the end of 1963. Eventually, the IAEA donated the truck as a radioisotope laboratory to Costa Rica, as part of the UN special fund Project for the Eradication of the Mediterranean Fruit Fly in Central America. This last move was not an easy one either. The only available route from Brazil to Costa Rica was by sea. The itinerary via New Orleans was too costly. The MRE finally embarked in Rio de Janeiro on a ship specially made available by the Argentinian merchant fleet. The MRE traveled to Punta Arenas on the Pacific coast of Costa Rica, arriving on August 11, and it was unloaded in Santa Cruz port before reaching its final destination at San José.

Reflections on Technical Assistance and the Movement of Science and Technology

The portability of knowledge is a prerequisite for the standardization of science, or metrology. However, this "universalizing," or standardization, of scientific and technical practices is resisted and made visible by the multiple contingencies that constantly reconfigure knowledge itineraries. The history of MRE Unit 2's travel through six Latin American countries, though rough, most certainly was not an exception. It illustrates the many difficulties of reproducing and moving knowledge outside its curated and hygienic original locations. As Paul Simon's song states in our epigraph: "It's a street in a strange world."

The travel of knowledge and scientific practices related to radioisotope manipulations faced "obstacles" and resistances of very different kinds. Some of them had to do with practical considerations, like the size of the truck relative to the narrow roads of Latin America. International Harvester trucks had been designed for US highways and flat landscapes, where gas stations and other infrastructure were readily available. The high, tortuous, and twisty roads in the mountains between Brazil and Bolivia did not lend themselves to passage by such a gigantic truck. Its huge volume and heavy weight also posed an enormous challenge when it was loaded and unloaded from the different ships and trains used to cross national borders. No direct flights or shipping routes existed between the main urban centers and ports. For the IAEA and UN functionaries, and for Obermayer, this situation amounted to a "lumpy" obstacle course, quite at variance with the smooth itinerary they had originally planned for. This was so only because technical assistance planners had imagined an abstract landscape, where mobility was unimpeded in an imagined flat and Westernized space.[35] Latin American infrastructure was not a good fit for traveling the *American way* in those years; indeed, economic and market exchanges were locally limited, and commodities and people barely traveled, except in the very localized areas of US economic influence.[36]

A different type of resistance to the movement of knowledge lay in the lack of interconnectivity that resulted from different bureaucratic traditions (national and otherwise) embedded in customs requirements and from divergent administrative criteria, for instance, concerning the per diem payments for Obermayer and other personnel. This was, indeed, al-

ready made clear by the Uruguayans when they told Arturo Cairo of the Brazilians' inclination for excessive paperwork. There was also a disconnect between national and international agencies (typically as seen in the lack of communication and participation of the UNTAB resident representatives in each country). At a more everyday level, what the Latin American actors perceived as harmless "delays" were translated into incomprehensible obstacles, and even backwardness, by the agency's bureaucracy.[37] Even more, administrative paperwork was entangled with telephone, postal, and telegraphic communications hampered by troubled operations, which came to a standstill because of natural or political events. Time also seemed to run at a different pace: Vienna time as expressed in Obermayer's and Cairo's letters was out of sync with the rhythm and contingencies of everyday life and the countless pauses imposed by festivities, workers' strikes, and natural disasters like floods and earthquakes. For all that, Obermayer adapted and managed to overcome most material impediments. It is quite possible that the main reason the MRE kept moving was Obermayer's tenacity and inventiveness.

Still a third type of contingency, evolving from the previous two, lies in the high costs, for "recipient countries," of the transportation and maintenance of Unit 2. Technical assistance programs were meant to be cheap for donors but turned out to be very expensive for recipients, and higher than planned for by the IAEA.[38] In 1966 in the Final Report of the MRE, the agency recognized that it had to bear some of the expenses that some countries had not been able to pay. Moreover, the high cost of transporting the MRE and its precious cargo, and of paying the driver and expert personnel, competed with more pressing priorities for the Latin American countries. This was very obvious in countries like Haiti, which refused the MRE from the start, but also in Chile, which did not manage to receive it after the earthquake that shattered the country. The friendly atom seemed to be an attractive offer on paper—but not attractive enough to those who were supposed to buy/receive it. In the end, half the recipients were countries like Mexico, Argentina, and Brazil that already had nuclear science communities and facilities.

Still, the MRE exhibited interesting positive points for the countries and agents in the Latin American region. Both in Mexico and in Brazil, the exhibition's itinerary served to promote increased funding for local nuclear science and to exalt the values of modernity promoted by scientific elites. Moreover, as David Webster claims, in the polarized context of the Cold War, the UN's specialized agencies were "a relatively accept-

able source of technical assistance for many governments."[39] This was certainly the case for Mexico, a country with a perceived aggressive and powerful neighbor but whose governments were equally concerned with their own nationalistic and revolutionary domestic ideologies.[40]

Concerning Latin American science, the MRE itinerary also renders visible regional asymmetries. Argentinean experts were supposed to teach the Uruguayans and Bolivians the basics of radioisotope techniques, and they did so despite all kinds of setbacks. Mexico City scientists were supposed to take their skills to the inner midsized cities. Networks, contacts, and flows are easier when linguistic and cultural barriers are lowered. In pursuing the dream of modernization, local elites were decisive in carrying out the necessary stages, both in their own countries and in those of their neighbors.

Concluding Remarks

What was left behind after the MRE truck passed was not a scientific degree or even a technical certificate on radiochemistry. The truck and the people associated with the MRE left distributed expertise, different quanta of changed local practices, and a set of conditions (a basic "atomic metrology") in which the technologies and practices of the peaceful applications of atomic energy might possibly reproduce and expand in the future. But before science, or even metrology, could possibly be established, the truck had to arrive. This, as we have shown, was by no means an easy task.

To address the actual *movement* of scientific and technological practices in an asymmetric world, we have emphasized what we call the "materialities of travel," in contrast to the model of "circulation" advanced by James Secord's article "Knowledge in Transit."[41] In previous articles, we have criticized both the metaphor of circulation—for suggesting a circular, revolving directionality and an image of downright naturalized "flow"—and Secord's conceptualization of this process as mainly concerning the practices of *communication*.[42] Though in his original article Secord mentioned the importance of "an understanding of the practices of communication, movement and translation," he soon narrowed his inquiry to the first, with crucial and conservative consequences for his whole approach.[43]

By focusing instead on travel (*movement*), and on the planned and altered itineraries that characterize most travelers' experiences, our nar-

rative seeks to reveal the outright limits of the "circulation" of knowledge and—tangentially—to address the *translation* of transnational into local interests. Communication practices certainly are an important aspect of scientific exchanges, but in our case they are embedded in the larger question of the materialities of travel: when the telephone or the telegraph lines are out of order or when a local functionary fails to address a pressing request from the field. Nature, infrastructure, national interests, and pressing economic priorities were key when science and technology traveled as part of technical assistance and development programs during the Cold War. In Secord's account, by contrast, communication practices are salient, and even play a crucial role, because his attention is focused on exchanges playing out in a more or less symmetrical field of power during the Scientific and Industrial Revolutions.

Transnationalism not only interrogates the national frame but also subverts disciplinary boundaries. Indeed, we were often in danger of leaving aside the history of science and technology (a risk that, to be honest, is present in Secord's analysis). Our main actors include a driver and several international functionaries; they are the ones who kept the science of radioisotope applications traveling along minor roads and on ships and railroads. Still, 1,500 students and technicians took the courses offered by the MRE and its personnel on the Latin American trip, more than 130 in Mexico alone. We do not know how many of them actually used and applied the new knowledge in their everyday practices; but certainly, the MRE contributed to a basic "atomic metrology." We hope to have contributed to addressing the main question behind Secord's preoccupations, a question rightfully raised in a classic paper by Adi Ophir and Steven Shapin, "The Place of Knowledge":

> How is it, if knowledge is indeed local, that certain forms of it appear global in the domain of application? Is the global—or even the widely distributed—character of, for example, much scientific and mathematical knowledge an illusion? . . . Perhaps the days in which ideas floated free in the air are truly nearing an end. Perhaps, indeed, what we believed to be a heavenly place for knowledge we will come to see as the result of lateral movements between mundane places.[44]

As may be clear by now, our argument supports not only the relevance of mundane scientific practices and technologies but also "lateral movements between mundane places."

Acknowledgments

We thank John Krige for organizing the workshop "Writing the Transnational History of Science and Technology," held at the Georgia Institute of Technology, Atlanta (November 2–3, 2016), as well as all the participants for their generous comments on a previous version of this chapter. We also thank the generosity of Martha Riess and Leopold Kammerhofer at the IAEA Archive in Vienna. This research was made possible by UNAM-PAPIIT research grant number IN401017.

Notes

1. Examples include John Krige's account of the transnational development of ultracentrifuges and even Zuoyue Wang's treatment of Chinese students in the United States, as well as our recent book on radioisotopes in Mexico. See John Krige, "Hybrid Knowledge: The Transnational Co-production of the Gas Centrifuge for Uranium Enrichment in the 1960s," *British Journal for the History of Science* 45, no. 3 (2012): 337–357; Zuoyue Wang, "Transnational Science during the Cold War: The Case of Chinese/American Scientists," *Isis* 101, no. 2 (2010): 367–377; Gisela Mateos and Edna Suárez-Díaz, *Radioisótopos itinerantes en América Latina: Una historia de ciencia por tierra y por mar* (Mexico: CEIICH-Facultad de Ciencias, UNAM, 2015).

2. "Underdevelopment began . . . on 20 January 1949 [the day President Harry Truman took office]. On that day, 2 billion people became underdeveloped. In a real sense, from that time on, they ceased being what they were, in all their diversity, and were transmogrified into an inverted mirror of others' reality: a mirror that belittles them and sends them off to the end of the queue, a mirror that defines their identity, which is really that of a heterogeneous and diverse majority, simply in the terms of a homogenizing and narrow minority. . . . Since then, development has connoted at least one thing: to escape from the undignified condition called underdevelopment." Gustavo Esteva, "Desarrollo," in *The Development Dictionary: A Guide to Knowledge as Power*, ed. W. Sachs (London: Zed Books, 2010), 1–23, at 2.

3. Arturo Escobar, *Encountering Development: The Making and Unmaking of the Third World* (Princeton, NJ: Princeton University Press, 1994); Esteva, "Desarrollo"; Nick Cullather, "Development? It's History," *Diplomatic History* 44, no. 2 (2000): 641–653.

4. UNTAB was the 1960s successor of the UN Technical Assistance Administration, created in tandem with the United Nations. According to Webster, de-

spite the common localization of its origins in Truman's inauguration address, development programs and UN technical assistance programs were "boosted, but not created, by Truman's 'point four.' Implementation was multilateral from the start." David Webster, "Development Advisors in a Time of Cold War and Decolonization: The United Nations Technical Assistance Administration, 1950–59," *Journal of Global History* 6, no. 2 (2011): 249–272, at 252.

5. See the papers included in *Journal of Global History* 6, no. 2 (2011).

6. We should point out that these gifts had to be accepted by the IAEA, as the United States was the main contributor to its finances. Moreover, the MRE acted as a political instrument to produce obligations for the recipient countries. There is a growing literature on the different meanings and goals of the Atoms for Peace initiative, which was announced by President Eisenhower on December 8, 1953. See John Krige, "Atoms for Peace: Scientific Internationalism and Scientific Intelligence," *Osiris* 21 (2006): 161–181; Martin J. Medhurst, "Atoms for Peace and Nuclear Hegemony: The Rhetorical Structure of a Cold War Campaign," *Armed Forces and Society* 24 (1997): 571–593; Kenneth Osgood, *Total Cold War: Eisenhower's Secret Propaganda Battle at Home and Abroad* (Lawrence: University Press of Kansas, 2006).

7. On radioisotopes as instruments of US foreign policy, see Angela Creager, "Tracing the Politics of Changing Postwar Research Practices: The Export of 'American' Radioisotopes to European Biologists," *Studies in the History and Philosophy of Biology and Biomedical Sciences* 33 (2002): 367–388; Angela Creager, "Radioisotopes as Political Instruments, 1946–1953," *Dynamis* 29 (2009): 219–240; John Krige, "The Politics of Phosphorus-32: A Cold War Fable Based on Fact," *Historical Studies in the Physical and Biological Sciences* 36, no. 1 (2005): 71–91; Gisela Mateos and Edna Suárez-Díaz, "Clouds, Airplanes, Trucks and People: Carrying Radioisotopes to and across Mexico," *Dynamis* 35, no. 2 (2015): 279–305.

8. The itinerary followed by Unit 1 in Europe, Asia, and Africa will be addressed in a forthcoming article where we describe the MRE as one of the IAEA's first attempts to implement nuclear technical assistance in the context of the UN development program.

9. See Gisela Mateos and Edna Suárez-Díaz, "Atoms for Peace in Latin America," *Latin American History: Oxford Research Encyclopedias*, 2016, doi:10.1093/acrefore/9780199366439.013.317.

10. The Valdivia earthquake shattered Chile on May 22, 1960, and continues to be classified as the most powerful earthquake ever recorded.

11. Nicholas Dew, "*Vers la Ligne*: Circulating Knowledge around the French Atlantic," in *Science and Empire in the Atlantic World*, ed. James Delbourgo and Nicholas Dew (New York: Taylor and Francis, 2008), 53–72, at 56.

12. The decision-making behind the selection of two International Harvester trucks to host the MRE is not addressed in the files available to us at the IAEA

Archive. The company had several subsidiaries in Latin American countries and Asia, probably providing an argument for the availability of spare parts and mechanical services while there. But what seems to be most important is that Oak Ridge National Laboratory had organized the previous US Atoms for Peace Mobile Campaign starting in 1956, and for that, they equipped Harvester trucks too.

13. A. E. Cairo to L. Steining (chief administrator for IAEA Technical Assistance Programs), Jan. 11, 1960. The source for all letters cited in this chapter is folder SC/216-LAT-1, IAEA Archive, Vienna.

14. Cairo to Adriano García (UNTAB resident representative in Mexico), Feb. 18, 1960.

15. Joseph O'Connell, "The Creation of Universality by the Circulation of Particulars," *Social Studies of Science* 23, no. 1 (1993): 129–193, at 163.

16. Celso Papadopulos (in charge of the radioisotope courses) to Cairo, Oct. 12, 1960.

17. Bruno Leuschner (UNTAB resident representative in Argentina) to L. Steining, May 13, 1960.

18. A. M. Haymes (administrative assistance, UNTAB, Argentina) to Cairo, Oct. 18, 1960.

19. Cairo to Hernán Durán, Dec. 7, 1960.

20. Bruno Leuschner to Steiner, Apr. 17, 1961.

21. Josef Obermayer (in Montevideo) to Cairo, Apr. 30, 1961.

22. Obermayer (in Montevideo) to Cairo, June 28, 1961.

23. Telegram from Souza Santos to Cairo, May 12, 1961. On the energetic Brazilian atomic program, see Carlo Patti, "The Origins of the Brazilian Nuclear Programme, 1951–1955," *Cold War History* 15, no. 3 (2015): 353–373.

24. Obermayer (in Rio de Janeiro) to Cairo, Aug. 17, 1961.

25. Obermayer (in Riberão Preto) to Cairo, June 11, 1961.

26. Obermayer (in Goiana) to Cairo, Feb. 17, 1962.

27. Professor Ismael Escobar to Cairo, Nov. 17, 1962.

28. Obermayer to Cairo, June 13, 1963.

29. Obermayer (in Rio de Janeiro) to Cairo, June 21, 1963.

30. There is no information regarding the consequences of storage while in Latin America, though the truck ended up spending almost two years at warehouses.

31. Obermayer (in Corumbá) to Cairo, July 22, 1963.

32. Obermayer (in Corumbá) to Cairo, Aug. 2, 1963.

33. M. J. Anstee to Cairo, Sept. 6, 1963.

34. Cairo to Anstee, Oct. 2, 1963.

35. On landscapes and geographical accidents, also see Itty Abraham, "Landscape and Postcolonial Science," *Contributions to Indian Sociology* 34, no. 2 (2000): 163–187; Itty Abraham, "The Contradictory Spaces of Postcolonial Techno-Science," *Economic and Political Weekly* 41, no. 3 (2006): 210–217; Nick

Cullather, "Damming Afghanistan: Modernization in a Buffer State," *Journal of American History* 89, no. 2 (2002): 512–537; Penny Harvey and Hanna Knox, *Roads: An Anthropology of Infrastructure and Expertise* (Ithaca, NY: Cornell University Press, 2015).

36. Harvey and Knox, *Roads*; Mateos and Suárez-Díaz, *Radioisótopos itinerantes*.

37. This is so despite Cairo being an Argentinian who participated in different missions in Latin America and Asia to evaluate the state of nuclear development and the needs of "recipient countries."

38. Gisela Mateos and Edna Suárez-Díaz, "Expectativas (des)encontradas: La asistencia técnica nuclear en América Latina," in *Aproximaciones a lo local y lo global: América Latina en la historia de la ciencia contemporánea*, ed. Gisela Mateos and Edna Suárez-Díaz (Mexico City: Centro de Estudios Filosóficos, Políticos y Sociales Vicente Lombardo Toledano, 2016), 215–241.

39. Webster, "Development Advisors," 249.

40. Renata Keller, *Mexico's Cold War: Cuba, the United States and the Legacy of the Mexican Revolution* (Cambridge: Cambridge University Press, 2015); Gisela Mateos and Edna Suárez-Díaz, "We Are Not a Rich Country to Waste Our Resources on Expensive Toys: The Mexican Version of Atoms for Peace," in "Nation, Knowledge, and Imagined Futures: Science, Technology and Nation Building Post-1945," ed. John Krige and Jessica Wang, special issue, *History and Technology* 31, no. 3 (2015): 243–258.

41. James A. Secord, "Knowledge in Transit," *Isis* 95, no. 4 (2004): 654–672.

42. Mateos and Suárez-Díaz, "Expectativas (des)encontradas"; Mateos and Suárez-Díaz, *Radioisótopos itinerantes*.

43. Secord, "Knowledge in Transit," 656.

44. Adi Ophir and Steven Shapin, "The Place of Knowledge: A Methodological Survey," *Science in Context* 4, no. 1 (1991): 3–22, at 16.