Beneath a Modern Sky: Space Technology and Its Place on the Ground

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In delineating a trajectory of human history, anthropology and other social sciences have tended to describe traditional life in particular geographic terms while leaving modern experience universal in scope. Studies of science and technology, while helping to locate and describe centers of modern practice, have less frequently explored their edges. Using a case study of the location of the primary French/European space launch site in French Guiana, this article examines technologies associated with the development of space beyond the atmosphere by evaluating the impact of rockets and satellites on the construction of human space on the ground. Exploring the social significance of a modern sky and its transformation of one tropical margin into a technical center, the question of where things are becomes one of how they are defined. The modern appears less a placeless universal center and more a moving boundary, one dividing humans, nature, and technology into less stable domains.

Modernity, we are often led to believe, has no place. More accurately, it might be claimed that modern technology creates spaces that are not immediately defined by their location, together with the possibility of living fully within them without knowing where one is. Amid uniform landscapes conjured from steel and concrete, carefully climatized and fed with waves of images floating freely overhead, coordinates of time and space become simultaneously universal and ephemeral. In the last century, railroads and rifles appeared to travel the earth with impunity, and such contemporary cousins as television and missiles acknowledge even fewer boundaries. An enduring general assumption—however belied in practice—lingers when discussing moderns and their things; once sufficiently advanced and properly

AUTHOR'S NOTE: In addition to the editor and three reviewers of this journal, the author thanks Alice Bullard, Richard and Sally Price, Paul Rabinow, Marc Redfield, Lucien Taylor, and Silvia Tomaskova for readings and perceptive comments on drafts of this article. The University of California, Berkeley; the Camargo Foundation; and the National Science Foundation (Award no. 9400155) generously supported the research.

Science, Technology, & Human Values, Vol. 21 No. 3, Summer 1996 251-274

ordered, they will function in the same manner no matter where they are. Is this not, after all, the magic of the modern, its most alluring or terrifying promise?

Consider the following postcard. A blue machine sits in a vaguely defined room, surrounded by green panels and the glow of fluorescent light. The focus rests on the control panel at its center, a glowing bank of buttons, and as one's eye travels away from it the field of vision grows blurred and uncertain, sensing a roomful of motion. Nothing in the image itself conveys a sense of specific context; only the legend on the reverse side securely locates it as an interior shot of the space center in Kourou, French Guiana. Unlike neighboring scenes along the rack of souvenirs—shots of exotic animals, people, and tourist landmarks—the card intentionally portrays something apart from conventional locality: some dynamic artificial space, free from ties to the world. In this sense, it is a veritable snapshot of modernity, of a where that could be anywhere. And yet, significantly, the card does mark a particular site on the globe and a set of human activities embedded in it. Indeed, the appeal of the image to its potential purchasers is based partly on this fact, for the room that could be in Houston, Texas, or in suburban Paris actually lies in northeastern South America, on the edge of a vast rain forest. What should not be modern sometimes is; what is modern sometimes rests on what is not. Within the frame of one transgressing postcard, the order of modernity is at once established and undermined: a technical center, there on the margin.

I encountered the image in question on a hot and slow afternoon in the summer of 1990, during my initial visit to French Guiana. Few people were out in the streets of Cayenne, few doors open following the noon siesta, and, newly arrived on a flight from Paris, slightly jet-lagged and uncertain of my surroundings, I felt strikingly out of place. Coming upon a stationery store near the center of town, I stepped inside to escape the sun. Instantly, the surroundings became familiar: the constant climate of air-conditioning, the ordered racks of items displayed for sale, the (comparatively dim) wash of fluorescent light. Momentarily revived by this modern environment, I remembered a purpose and examined the postcard rack for a likely means of communication. Here the unhurried expanse of experience outside lay neatly and attractively packaged in well-chosen shots: carefully framed landscapes, tropical animals, old buildings, and traditional peoples. In this assembly of postcards, the world of French Guiana became manageable and consumable, simultaneously equal and present, ordered, separated, and—so to speak—clearly worth seeing. Then I noticed a rack with rockets and other machines, attractions of a different order, focused more on the future and less on the past. Amid them I found the postcard described, so remarkably placeless and

empty of people and yet so appropriately available to represent and authenticate this immediate experience of my travels.

This essay examines a portion of the history of technology behind that image with an eye to where things fall on and off maps. The case at hand is particularly germane because it involves the realization of natural space beyond the confines of the globe: the literal "outer space" of the Space Age and consequent redefinitions of the human sphere below. Thus this discussion revolves around twin meanings of the term "space," one thought in physical terms and the other in human terms. This unavoidable word play serves to underline the historicity of the abstract expanse of the universe, recalling that before the launching of the first artificial satellite there was no active outer space to redefine the more immediate active one below—in a sense, no modern sky above a modern ground. I would advance the claim that technologies associated with the exploration and commercialization of outer space have significantly transformed experiences of "social space" on a global scale, exemplified by the redefinition of the equator relative to rockets and satellite orbits. The example of Kourou and the Guiana Space Center both illustrates this point and describes its anthropological significance, serving as a reminder that human technologies unfold between horizons of human history and geography and also amid narratives of human temporal location embedded in expressions such as "Stone Age" and "Space Age," for technologies, in addition to acting on the world, play significant roles—literal *and* symbolic—in efforts to differentiate between groups of humans inhabiting it, both past and present.

What follows, then, is written between theory and empirical observation, moving back and forth from general themes to a particular instance and invoking more than one modern narrative tradition. Even as its subject is alternately abstract and exact, so too will be the language, for I would make my point as I have found it: between general statements, personal experience, reflection, and the words of others.[1] If there is a special promise in the social study of science and technology, I believe it lies in the incongruities of the objects under scrutiny, their mixture of irrepressible artificiality and naturalizing certainty. Unsettling definitions of realms social and natural, scientific practices, and technological artifacts open a back door to anthropology, returning us to an order of humans through an order of things. By its very existence, the space center in French Guiana negotiates the boundary of worlds, providing means of transportation across them. In examining the context of this technical center with respect to issues of place and space, then, the goal is to dislodge discussions of modern technology, reorienting global and local realities, machines, and human lives.

Place and Space, Modernity, and Anthropology

I begin with a quick further delineation of what is intended by the terms "place" and "space" and what this article calls the "placeless space" of modernity. Recently, much has been written about the promising return to theoretical significance of concepts of social space, in part inspired by Foucault's reminder that space is a concept central to modern power and that the creation of modern space anchored in modern places allows the practice of modern life (Foucault 1980; Livingstone 1992; Pred and Watts 1992). Here I follow strains of Anglo-American geography and French theory, as briefly embodied in Yi-Fu Tuan and Michel de Certeau, and their deceptively simple separation of categories of space and place. Tuan reminds us that human experience involves movements and pauses, the former corresponding to our sense of space and the latter to our sense of place. "What begins as undifferentiated space," he writes, "becomes place as we get to know it better and endow it with value" (Tuan 1977, 6). In de Certeau, this observation translates into a clear distinction between place, as a description of position, and space, as a description of practice, establishing a grid on which to map a geography of science and technology. Together, space and place describe the extent of life; the particular is realized through action, in vectors of motion across bounded locations. We know a street or a mountain by walking it, taking its measure through time (Certeau 1984, 117). Thus space and place, while defined in opposition to each other, can only be understood in their relationship as stable binary categories, linked through experience.

Yet one central ambition of a modernist ethos could be described as the erasure of location in nature. The experience of natural place is to be replaced by that of built space, given conditions with a controlled environment. Streets can be standardized, ordered by type and function, and evenly paved. To maximize speed, an ideal highway would have no hills or curves and, as a result, would offer a uniform experience. With its uniform buildings, the modernist city can be located anywhere, positioned by charts of reason rather than history or by a national vision rather than a river or coast (Holston 1989). Thus what began as a clear distinction between human experience of mobile spaces and fixed places grows more complicated when considering distinctively modern settings. What develops in such situations can be described, then, as a sense of "placeless space," a state of experiencing mobility without geographical locality.

Anthropology is a discipline long concerned with space and place. Its preferred source of knowledge is the "field" (a destination requiring physical or psychological movement on the part of the researcher), and its preferred object of study is a geographically bounded group (in the case of ethnography, often localized to the level of a village). Along certain strands of the

ethnographic tradition in cultural anthropology, the rhetorical function of this focus on the local scale and setting has often been to challenge overly categorical statements of human nature. To write an anthropology explicitly acknowledging modernity (Rabinow 1989; Faubion 1988), and especially one that recognizes modern technology (Escobar 1994), one would want to review the general narrative of placeless space and test its analytic fabric against experience in the world, for it is precisely along this divide between local and universal where domains of "traditional" and "modern" find definition as well as their respective narrations: ethnography and theory. Contrast the careful, occasionally numbing detail at the root of an ethnographic monograph describing a traditional society and its particular milieu (say, Evans-Pritchard 1940) with the wide sweep of a theoretical discussion of modern existence (say, Heidegger 1977). In the one, we find exact coordinates of a locatable people (*The Nuer*); in the other, we find an effortless abstraction of universal concept (*The Question Concerning Technology*). Exceptions exist, of course, in both directions; ethnography makes certain appeals to human universals and theory to located examples. But between the two, the force of gravity is neatly reversed: modernity floats upward while tradition roots in the ground.[2]

By explicitly concentrating on knowledge and tools, key symbolic and material aspects that constitute modern life, the social study of science and technology offers a natural gateway into the spatial distribution of modernity. Indeed, recently there has been considerable interest in issues of social space within its parameters (Ophir and Shapin 1991; Lynch 1991) as well as increased cross-fertilization with strains of anthropology (Hess and Layne 1992; Pfaffenberger 1992). Borrowing a trick or two from the traditional pursuits of tradition, the new ethnographers of the world of modern knowledge (e.g., Latour and Woolgar 1986; Traweek 1988) have described laboratories and experiments as the key locations within it (Knorr-Cetina 1992; Pickering 1992). Yet social studies of science, exuberantly focused on the fruitful site of the laboratory, have spent less time outside its extended bounds in the fields beyond. When ethnographic procedures have been introduced into the social study of science, the study of a restricted domain—the research center or laboratory—becomes a project framed against philosophical debates about knowledge claims. In such a setting, the discussion, although appealing to social context, frequently retains a universal rather than a local flavor. The social spaces in question lie at the heart of modernist science and technology, close to the great arteries of the industrially developed world. Local place recedes behind a typology of urbanized spaces while the lived interactions of professional practice overshadow those of cultural practice. Such is the vision of the laboratory.

Yet laboratories themselves can be located within hierarchies of prestige and influences—an imperial map of knowledge—and their inhabitants recognize variants of cultural style amid professional practice (Traweek 1992; Zabusky 1995). Recent studies of technology (e.g., Bijker, Hughes, and Pinch 1987; Galison and Hevly 1992; Williams 1993; Winner 1986) succeed in reinstalling the material in culture, carefully positioning tools within systems and society and large-scale scientific research. Recent histories of science (e.g., Cittadino 1990; Palladino and Worboys 1993; Osborne 1994; Pyenson 1993) recall the imperial scope of the scientific enterprise and its colonial extensions, acknowledging the material and symbolic effects of specific technologies (Adas 1989; Headrick 1988). Indeed, recent work in urban planning reminds us that physical complexes can be—and increasingly are—designed throughout the world with the express hope of fostering modern technological growth, as economic engines and symbols (Castells and Hall 1994). Thus, for all their neutralizing elements, laboratories and machines are not simply neutral. And science and technology outside the core, probes and instruments outside laboratory walls, and machines outside of urban environments operate amid a welter of climates and encounters, observing and influencing, acting and malfunctioning. In following such phenomena, one encounters a world of natural and social places amid the technical space of science, remnants of an older space of knowledge—the field—a space that can in turn reveal human terrains hidden behind the tools of the laboratory; for while modern sensibilities may stress pure categories, modern technologies rarely keep still, and bearing down their specific intersections often leads one far afield, across conceptual and disciplinary boundaries and between ideas and actions (Haraway 1989; Latour 1987).

Thus we return to classic motions of anthropology: gyrations between situated and general, traditional and modern, natural and cultural. The challenge, however, is to take the modern as seriously as that which it has been positioned against, to respect the present as well as the past (Rabinow 1992), to become, in Latour's (1993) terms, symmetrical, to cease insisting on the pure gravity of categories. In this way, we can turn to asking the central question at the edge of modern place: what then, is outer space, and how did it come to be?

Nature Reordered: Space Technology and the Globe

> Exerting himself to look out into space, man did not descry something entirely different and alien; rather, what was held out to him was a cosmic mirror of his own world, of its history and its potential. (Blumenberg 1987, 676)

In the middle of the twentieth century, outer space was still a concept defined in a single direction; one looked up through the sky, not down from beyond it. The earth had but a single satellite, the moon, and the man on it was a figure of poetry, not technological triumph. Beyond the atmosphere lay a realm for astronomic observation and literary speculation, not exploration or commercial development. But when nineteenth-century Western imperial expansion began to unravel, ink drying on the last white areas of its terrestrial maps, a new and final frontier was defined, one above the emerging political boundaries of First, Second and Third Worlds (McDougall 1985). Frequently described in language of colonial conquest (the inexorable "progress of mankind" now continuing beyond the confines of a single planet), this frontier reflects both a logical extension of modernist ambition and its limits. Outer space describes that which lies beyond place, stretching between things away from the familiar globe. To imagine this beyond as a frontier is to invite its exploration yet is also simultaneously to reposition the surface already known. The earth becomes a whole and suddenly intimate place, one that can fulfill the promise of Copernicus by traveling across another sky (Blumenberg 1987). Moreover, thanks to the compelling present tense of photography, it can be seen from a distance and recognized as a globe, that potent symbol in reconceived relations to the environment (Ingold 1993).

Yet this reorientation of Earth is not solely a matter of cosmic perception or contemplation; there are significant technical consequences as well for science, politics, and economics. A vast vacuum free of gravity requires no pump (Shapin and Schaffer 1985), inviting scientific research while holding it to new standards, those of the laboratory beyond the atmosphere. To a properly equipped eye in orbit, the stars above and the land below grow sharper; earth, sky, and weather all can be monitored more intimately (Lambright 1994; Mack 1990). Points on the globe need no longer be connected directly to each other but can instead acquire new significance through their relation to the zone above the atmosphere. In a sense, what has been a geometry of two dimensions becomes a geometry of three, as connections are no longer restricted to the surface sphere of the planet. A platform in space offers not only an imperial vantage point across continents but also a potential beacon between them, circumventing geographical markers on the ground and altering their meaning.

The foregoing sketch abbreviates many stories. European conceptions of time and space shifted dramatically between the nineteenth and twentieth centuries, as witnessed by artistic movements under various banners of "modernism," while the establishment of universal time zones, news services, telephones, radio and television networks, and aircraft radically altered the rate and topography of everyday life (Kern 1983; Read 1992). Yet to evoke

the meaning of the Space Age, with all its powerful technological and representational possibilities, a certain degree of abstract distance is necessary, for while the airplane opened the sky and moved through it at dramatic elevations, and while the radio tower filled the air with waves (bypassing ground connections), neither made the limits of the earth entirely visible or transparent. Space technology closed the sky again, bounded it from above and sealed it whole. Only then could the sky become fully modern in an active technological sense, and only then could what lay beyond it become meaningful as space, a vast sea of darkness surrounding a blue and green point of unified, singular human place. To illustrate this general redefinition of human space through the realization of outer space, let us turn to the example of the development of satellite communications and the consequent redefinition of the equator.

The development of satellite communications is one of the most fully realized transformations of the Space Age as well as one of the best illustrations of placeless space: the effortless spread of information across the globe (Pool 1990). Yet the system of communication satellites that frees worldly connections, lifting news and advertisements across national boundaries and exchanging calls between time zones, does not itself float free. Communication satellites are restricted to a well-defined geosynchronous orbit that conforms to the geometry of the planet and matches its motion. The significance of this point was first grasped in 1945 by a young British astronomer and future science fiction luminary, Arthur C. Clarke, who pointed out that, rather than rising and setting in the sky, a satellite in such an orbit would remain constant relative to a chosen area of the globe and thus be in a position to provide it with continuous communication support.[3] Signals could be sent from one location within that area and then transmitted to another. With a carefully positioned set of such space platforms, signals could even be relayed between them and thus from one side of the world to another (Clarke 1968, 37).

After the launch of Sputnik I in 1957, Clarke's proposal took on a new aura of practicality, and during the early 1960s orbiting bundles of mirrors and circuits named Telstar and Early Bird became its fledgling realization. Just twenty years later, satellite communication had become an industry standard and the primary focus of commercial activity in space, while the artificial satellite was a naturalized part of the sky. High above the equator, revolving along with it, lay a string of essential hubs for the networks spread below. The ritual marker of mariners had become a concern of rocket engineers, transformed from a line of division on the surface of the globe to a newly significant range of points above it. The process of achieving geosynchronous orbit, however, redefined geography with a new practical

physics, one with technological consequences on the ground, for to have satellites in orbit, after all, one must first get them there.

Although a large number of nations currently use satellite technology, relatively few possess the technology to launch payloads into space. By virtue of other factors of economic history, the industrial centers of the world, including the original giant twins of the space race, are located relatively high in the Northern Hemisphere. In terms of achieving geosynchronous orbit, this position is less than ideal, as the further one is from the equator, the more fuel must be expended to place a satellite above it. The primary launch sites established by the United States and the former Soviet Union were both well north, the former (Cape Canaveral, Florida) at 28° and the latter (Baikonur) at 45°. The location of these sites was driven by other considerations than those of proximity to the equator, especially the need for sparsely populated land to increase military security and decrease the risk of accidental civilian death, allowing the rockets and missiles of the cold war to fall mistakenly without mishap in preparation for their planned trajectories. In the case of Cape Canaveral, eastward access to the ocean gave the added benefit of launching over open water in the direction of the earth's rotation, allowing rockets to use the planet's momentum to help reach escape velocity. An ideal launch site for communications satellites would combine such positive attributes found at Cape Canaveral with a location as near as possible to the equator. This fact has not escaped the notice of certain states located deep in the tropics, and several of them (e.g., India, Brazil, and most recently Papua, New Guinea) have sought to capitalize on this newfound advantage of their geography.[4] In so doing, they expose a technological irony of rocketry: the more remote a location, the better suited it is for explosive experiments. Thus, when seeking to leave the globe, wasteland becomes valuable and underdevelopment can appear a virtue. The same tropics that in the nineteenth century bore a sinister reputation for disease and disrepair beckon a key technology of the twentieth century. Nowhere is this reversal more apparent than in the place where such a launch site has been realized most successfully, Kourou, the example to which we now turn.

A Case in Point: European Space in French Guiana

Although the United States and the former Soviet Union dominated early space exploration, the field beyond the sky was not to remain theirs alone indefinitely, and a growing number of states and corporations have begun to seek a share of launch business. One semi-private cooperative European effort based in France, Arianespace, now even controls half the non-military

market (European Space Agency [ESA] 1992). The French government has long played an eager third in the space race, committing early to the idea of a launch vehicle to go with its independent nuclear deterrent and sending the test satellite Asterix into orbit in 1965. The primary military launch site at Hammaguir, however, was due to be abandoned under the terms of withdrawal from Algeria, forcing the French to shift future operations elsewhere (McDougall 1985, 425). They turned again to another integrated territory of the former empire, this one far more peripheral but less rebellious and equally well positioned in terms of latitude.

Part of France's first imperial expansion, the area of the globe north of Brazil known as French Guiana (or *Guyane française*) has survived as a continuing segment of French overseas presence. Over the nearly four centuries in between, it has witnessed a remarkable series of efforts to transform its low swampy land and large rain forest into a more profitable landscape. One after another they failed, due in large part to poor planning and execution but also to the attributes of the chosen location. Poorly positioned relative to trade winds and the rest of the French empire, French Guiana never received an adequate supply of slaves to match the plantations of the neighboring Dutch possession, and those that were established were often built on poorly chosen ground. A disastrous attempt to establish a European settler colony in 1763 gave the area a sinister reputation, one confirmed by its choice as a site for deportation during the French Revolution. Following emancipation in 1848, anemic attempts to encourage contract labor and immigration from Asia largely failed, and instead French Guiana was chosen as the primary penal colony of France, a notorious role it would play through World War II. Although the convicts represented only a minority of the colony's population, they cast a long shadow over its reputation, particularly after the highly publicized deportation of Dreyfus to Devil's Island at the end of the nineteenth century (Miles 1988). Other economic activities in French Guiana (subsistence agriculture and the exportation of gold, rubber, wood, etc.) never had significance on a world scale. Upon its formal integration into France as an overseas department in 1947, the area hardly seemed destined for anything other than a future matching its past: a continuing role as a marginal and insignificant appendage to a European nation (Henry 1981; Jolivet 1982; Mam-Lam-Fouck 1992).

From the perspective of France's emerging space program, however, French Guiana offered many appealing characteristics as a launch site. Its low population density now could be counted as an asset in addition to its northeastern coastline, its lack of geologic or meteorological turbulence, and its favorable latitude.[5] No other location beneath French colors, after all, could offer a base just 5° north of the equator. In 1964, after a study of fourteen

potential sites worldwide, the decision was taken to construct a space center at Kourou for the use of the national space program (Centre National d'Etudes Spatiales [CNES] 1994). A cooperative European effort to build a joint launcher, after briefly being based in Australia, also moved to French Guiana. An early phase of the project under the initial European launcher consortium (ELDO) experienced a string of failures, but since the advent of the Ariane program in 1973 and the first successful launch of an Ariane rocket in 1979, a refined version of the European consortium has grown to dominate commercial satellite launches, primarily into geosynchronous orbit for communications purposes. This time Ariadne's golden thread leads from the Guiana Space Center up through the sky (Naddeo-Souriau 1986).[6]

Replaying the historical sequence in explicitly technical terms gives us a first point to consider: wilderness can have its uses, even for high technology. Or, more pointedly, space technology did not erase wilderness but rather found parts of it useful once it was properly redefined. Unlike a factory or railroad, which might value uninhabited land only in terms of its potential for development, for its transformation into a different kind of productive space, or for a destination, the space center found value in the openness of the land itself, in its marginal status relative to human networks, and in its position. Here, then, we have an example of a modern technology that acknowledges place.[7]

Yet the space program in French Guiana would also entail the construction of its own infrastructure—bridges, an expanded port, and an airport, to name a few—as well as inspiring waves of migration by creating labor markets for both skilled and unskilled workers. Engineers and technicians arrived from Europe, and laborers arrived from elsewhere in South America and the Caribbean. Social issues tied to development crept through the back door; the space center served as a catalyst for transformation, changing the local setting even while using certain of its physical and social attributes. As a consequence of the space program—partly planned and partly unintended—Kourou grew from a quiet Créole village of 650 into a town of 14,000, the second largest in French Guiana, one with a significant migrant population and many of the goods and services common to a European landscape. And French Guiana grew with Kourou. Its population, which in the mid-1960s hovered around 40,000, has more than tripled since then. Even more significant from the perspective of local politics, much of the growth has come from legal and illegal immigration, particularly from Haiti, Surinam, and Brazil. Guyanais Créoles, the largest single ethnic group, now no longer represent a majority of the resident population. Although the space center has not been the only causal factor involved in this social transformation, it is the most prominent, and the wider influence is recognized by both its supporters and its detractors (Bilby 1990; Jolivet 1982; Mam-Lam-Fouck 1992).[8]

Thus the analytic picture before us grows more complicated. A technology that sought a measure of continuing wilderness for its work, a well-positioned margin for experimentation, nevertheless transformed that margin in the act of making it useful. To use the location, additions were made, both to create a site adequate to the needs of the project (such as the construction of a series of launch pads) and to create a network of support structures for the technical personnel (such as living quarters and recreation areas). Further personnel not directly tied to the technical project arrived to provide services approximating those of a culturally appropriate landscape for the technical personnel (e.g., restaurants, schools), and, due to the remarkable level of investment relative to the economy of the surrounding region, the project acquired another layer of unofficial personnel in marginal service categories (e.g., gardening, babysitting). In this way, a site that was chosen for characteristics of place becomes increasingly an epitome of the placeless space of modernity, full of objects and people that could be—and have been—elsewhere. Like the Ariane rocket it serves, the world of Kourou is an assemblage of imported parts; unlike the rocket, however, it remains awkwardly earthbound.

Life on the Ground

> Kourou, ville maudite [Kourou, cursed town]. (Graffiti on wall near Kourou marketplace, 1992)

Beside the opening postcard with its glowing machine, let us now place a series of other snapshots, these taking their inspiration from ethnographic observation. The specific notes from which they are drawn date primarily from late 1992 and the summer of 1993. I splice them here in an uninterrupted and flowing present, evoking the illusion of presence and omniscience of the kind suggested by film.[9]

Before us we have an almost cool December night on the coastal savanna. Although the light has faded too far to distinguish distant forms, in one direction stretches a green ocean of rain forest and in the other a sluggish brown sea. At the juncture where a slow river flows away from land lies a motley assortment of houses in Caribbean style, dimly lit by streetlights and serenaded by insects. People are out on the sidewalk visiting, four older men play a domino game, and a woman lounges at a corner, perhaps waiting for a lover or a customer. All the signs are in place; this is the tropics, and the pace is slow. Yet the town does not end with this tranquil image, and moving farther along the shore one passes an uninviting huddle of shacks amid puddles, displaying all the requisite symptoms of squalor. Farther still and

the scene changes dramatically; huts give way to concrete apartment blocks and then suburban houses, laid out with the methodical certainty of large-scale planning. Automobiles are parked in driveways, large, expensive models of the sort designed for cooler climes. Here and there a window flickers with the light of a television, and the streets are eerily empty.

Farther inland, a crowd surrounds a number of air-conditioned buses in a large parking lot. People are talking in small groups. Both male and female, they are dressed in casual but expensive clothes, and while they are of varied ages, the majority of them are light-skinned. Boarding the buses with them, one is lulled by the ride down the coast, passing a small colony of rather nondescript buildings sprinkled amid the thick scrub. From inside the window, the architecture could be that of post-industrial Belgium: glass, steel, and a few bright colors amid spotlights. Far beyond these architectural outposts, out amid the dark vegetation, a white pavilion casts its own pool of light. The passengers climb off the bus and walk to the pavilion; equipped with a round of drinks, they resume their conversations, occasionally glancing up at a series of televisions, which display shots of stern men sitting before machines, or out along an open corridor toward a small, brightly lit object on the horizon, about the size of a match. The atmosphere is of a garden party, at the edge of some immense golf course. As a voice intones a descending series of numbers in French, the lights are lowered and the crowd falls silent, uniformly turning to face the distant match. The concentration grows palpable as the mood of the televised broadcast spreads beyond its screen. There is a flare, then a flash of light as bright clouds billow around the base of the sky. A new sunrise graces the night as the rocket slowly and ponderously begins to rise above the ground. Then, as if gathering confidence, it climbs faster, the light diminishing even as artificial thunder begins to sound. Growing smaller and smaller, it finally vanishes over the ocean, amid general applause. The lights go up, the mood relaxes, and drinks flow. A few minutes later, more cheering erupts as the figures in the control room smile and shake hands. Both humans and machines have performed as expected.

Champagne is served to invited guests beneath the tropical stars, toasting the newest addition to the heavens. Now that the rocket has successfully risen and vanished over the horizon, checkpoints around the launch zone are opened again. At a lonely intersection, a part-time Haitian security guard prepares to leave his post. The last Chinese store has closed, and an Amerindian checker at the Euro-supermarket has also departed to watch her television. In a crowded nearby shantytown, a Saramaka Maroon turns the page of his calendar filled with rockets while a Brazilian maid in an empty villa puts an Italian child to sleep. Somewhere above, marking the same equator but

focused on another sky, a Japanese satellite will begin to broadcast. Europe's spaceport is working.

Let us compare this little collage to the opening postcard with its glowing machine. Where the postcard features a technology of things, we now find some human shadows; the focus that rested on a stable center shifts outward along the range, and the center grows blurred. Rather than a single universalizing object, we now have an amalgam of particular lives, imperfectly anchored around a technical event. Technology in action unravels along many lines, blurring the object in question (Latour 1987). By descending to the level of particular detail—even cursory detail—it becomes apparent that the launch of a satellite involves far more than a row of buttons or a single screen, that the machine at the center of the postcard is only one point in a vast array of worldwide connections. Kourou intersects with Japan, China, and Italy as well as the neighboring rain forest. The lines attached to every launch run through many patient and impatient hands, to a cellular phone in a New York broker's convertible, to a glass of beer before a French legionnaire, to a Brazilian mother's washing machine. Not all the links in these lines are equal in status, pay, or technical efficiency. Yet separating them into clearly defined categories ordered by criteria of causality becomes less certain the more one considers place, for the control room is a placeless space of modern technology, the launch zone is a distinctive place redefined by modern technology, and the people who move between them—assembling, directing, cleaning, serving, consuming—cross arrays of cultural and technical spaces negotiated between rhythms of modern technology and the tropics. A rocket launch indeed represents the center of this motion, but it is a center that materializes and dissolves rather than holding steady, a center that can only take its literal and figurative meaning in motion. A rocket, after all, is a transport vehicle, as its engineers like to point out. Thus the clear vision of an empty control room floating in some placeless, modern space is at once strikingly accurate and perfectly misleading; its distortion lies not in an inverted choice of subject matter but in an inverted choice of focus. Back beyond the postcard, in the heat and bright sunlight, we again find a muddle of lives clearly—if not simply—attached to the earth.

Yet perhaps this ethnographic collage itself remains too smooth, too concentrated, too distant. Perhaps we should suspect it as well, for what, after all, does it lose of place even by framing it? But then again, in focusing more closely, which particular stories to highlight? That of the engineer who wishes he were in Florida? That of the security guard who worries about his family in Haiti? That of the journalist who commutes from Cayenne for a Kourou dateline? Different experiences of the Guiana Space Center occur with

different frequencies and are accorded different weights, depending on point of view. Behind the spectacular moment of the launch (a moment present for all but officially witnessed by few), everyday interactions ebb and flow around the space center. The distance in the earlier description of Kourou is not simply an illusion. A placeless place in terms of most of its architecture, the new town divides people between long avenues and cul-de-sacs with spatial units appropriate for different social classes (Jolivet 1982). As in much of French Guiana, ethnic terms near stereotype are alive in everyday speech and practice amid the order of society. Kourou is sometimes called a "White" city, for although Europeans may only account for perhaps a quarter of its population, they dominate the upper echelons of the space center and set most norms of behavior and consumption. The "City of the Stars" is a place that evokes strong reaction, much of it negative. The local Créole left resents what they perceive as a legacy of colonialism, referring to the "Centre Spatial *Européen*." Middle-class residents of Cayenne often dismiss it as a "town without a center," and reports in the local media identify it as an increasing locus of crime. Rotating space personnel themselves either enjoy or hate Kourou, depending on whether they interpret their experience as adventure or exile. Yet I have met few people who live there for the town itself; it is not local enough for those seeking tropical French Guiana and not global enough for those seeking urban France. Rather, it seems a place where lives muddle but rarely mingle, a suture between worlds.

In a way, the launch itself reflects the presence and absence of the space center in French Guiana, for it is not necessary to be there to witness the event. Not only is a video feed transmitted by satellite to CNES, ESA, and Arianespace offices in Europe and elsewhere (Zabusky 1995), but it is also broadcast live on local television. And yet a chartered plane of invited guests arrives from Paris for most every launch while members of some circles in French Guiana fish for formal invitations. Physical presence, even when technically bypassed, remains a mark of social distinction. And yet as the rocket rises, carrying its load, the signals of other satellites are raining down; in enclaves of Brazilian immigrants, one finds satellite dishes set to catch soap operas and soccer from farther south, providing them with alternative spectacles. Negating absence maintains other cultural distinctions. And yet if it is Europeans who care most for the launches, then it is also Europeans who travel to the interior in pursuit of the "real" jungle. What represents the local comes to be defined in global terms and vice-versa.

Just before leaving French Guiana in 1993, I had dinner with two young residents of Kourou, one a French citizen of Iranian descent who had grown up in the town, the other a Saramaka Maroon (a refugee from Surinam). The

first was dressed well enough to attend any polite gathering in France—indeed he was now in university there—and the second wore a less transportable array of clothing and sat quietly because he spoke little French. The student gestured toward his companion and said to me, "Between us, you have all of Kourou." He meant, he went on to say, that between them lay extremes of circumstances, opportunities, and histories, the one treated as a metropolitan Frenchman and the other as a foreigner only recently emerged from an alien forest. The distinction between them was that between villa and shantytown: co-existing, interacting, ever separate lifeworlds. What was unusual, the student noted—with insight and regret—was that the two of them should be not just next to each other but actually sharing a meal.[10] Cultural twists and social divides are hardly unique to Kourou, of course; I could describe equivalents in France or the United States. But in French Guiana, they lie on the surface, concentrated and exposed.

The Modern Sky and Technological Frontiers

> At last the Middle Kingdom is represented. Nature and Society are its satellites. (Latour 1993, 79)

Modern machines, then, can create a sense of universality, but at differing costs. By opening the possibility of outer space and reordering connections on the globe, a modern sky redefines human place. Categories as distinct as heaven and earth grow intertwined while artifice extends beyond horizons to see the world as one. Connections between what can be considered modern (civilization in an older rendering) and what is not (wilderness) lie exposed; certain boundaries between them blur. The same news broadcast can be heard simultaneously in Paris and Kourou, while a rocket can find a home in a rain forest. But at the same time, other boundaries are reinforced or even more starkly overlaid. The rocket comes and goes; it uses open space, preserving aspects of it, transforming others along its greater trajectory. A modern outpost, even a central one, is still not quite a center but rather an element of a frontier. And while the sky above us may be thought modern and by definition may bind the entire globe as one, it does not render an older human geography obsolete.

There is another way in which the opening postcard is an accurate illusion. The empty central panel awaits command; it is free, available, open to any viewer. And yet not just anyone can be in front of any machine; modern technology requires modern technicians. The room that could be anywhere welcomes an inhabitant who could be anywhere, or rather an inhabitant who

has been somewhere else to learn how to live properly within these glowing walls. Placeless space is not free from culture or social norms, even if blurs location. Rather, it depends on mastery of a set of cultural and social codes that allow for the possibility of universalized, mobile experience—the recognition of things one has never specifically seen before. The stationery store in Cayenne was, in this sense, familiar to me before I entered it, for to live a modern life is to live with such experience of dislocation, with neutralized environments and transported technologies. It is the ability to imagine oneself a part of a placeless community, one extending well beyond the local horizon (Anderson 1991). Technical knowledge divides those who can face screens, who speak the language of machinery, from those who cannot. And the borders of modern technical knowledge, as well as its certification, are perhaps the most mobile and yet entrenched of all. The final frontier, it seems, is indeed a technological one, if not quite in the manner conceived by some of its enthusiasts.

This invocation of the term frontier in relation to technology is a deliberate appeal to colonial geography—to extensions, appendages, and the space of border societies. A frontier is a space of change, of boundaries and bridges, translations and things partly known or understood (Certeau 1984, 127). Its images prove useful in Kourou, where the space of technical activity varies across social and natural landscapes: actions correspond to decisions made in Europe; buildings that could stand anywhere rise in a place chosen for its particularity; and people living in an Amazonian landscape receive information and commodities directly from Paris. Migration occurs in several directions: skilled workers from Europe, manual labor from surrounding countries. Materials are transported to an open shoreline, only to be assembled and sent aloft. Below, however, rest the attendant technologies, the air-conditioning, computers, telephone booths, cars, and video equipment, for engineers, while they may hunt for pleasure, can hardly be expected to hunt and gather. The last point runs deeper than irony, for in the Guiana Space Center we have the anthropological story in miniature: different ends of "development" collapsing together, rain forest to rockets, the sudden transition of humanity from Stone Age to Space Age. As one visiting French executive pointed out, where else can you buy wooden arrows one day and watch a satellite launch the next?[11] Irony lies on the surface here, but it is an irony born of technique. Beneath the swirl of unintended encounters (and attempts to talk about them) lies an instrumental rationale, translating the same set of local conditions into different languages of global possibilities. These encounters in turn call on other rationales and associated technologies, as production and consumption mingle together, as the culture of satellite extends back through the material of the rocket.

In a global system of science and technology, there are many divides and gaps (Worthington, 1993). The topography of technology lies unevenly over the larger units of politics and economics. Within any city, along streets and even between or within houses, one finds different tools and systems and different levels of familiarity and access. At many points, technology and nature lie in contrast (e.g., a jet landing in a jungle) or even twist together (e.g., a high-fidelity recording of local animals for sale next to their habitat). But at certain points the connection itself becomes purposeful, redefining nature within a technical system. In such places, the seam of development lies bare; modernity creates clearings around itself to define itself. These clearings serve not only as dumps for byproducts but also as ranges for experiment and testing. The peripheral, then, is ultimately essential, in technical as well as symbolic terms.

Kourou, and French Guiana around it, is really less an example and more an exemplar, less representative of a margin and more the epitome of one, a place right on the divide between categories of *nature* and *society*. Definitions become simultaneously the most difficult, acute, and revealing at their borders, for it is here that they are most unstable, just where they must keep still. When large technical systems are displaced—that is to say, when technical space is realized in environments simultaneously defined as natural or non-technical—the displacement reverberates through a range of social, cultural, and technical dimensions. Surrounded by languid tropical heat and rains, the Guiana Space Center tries to accommodate the rhythms of Paris, tries to be modern—at a distance. In this unlikely (but carefully chosen) point on the planet, global technology is revealed to be awkwardly local, and nature and culture are revealed to be concepts in action rather than stable end points on an analytic grid. Concentrating on location, one encounters motion; concentrating on placeless space, one finds a place.

Questions of technology address both the centers and edges of modern knowledge and power. Between them, an anthropology that remembered technology beyond the study of material culture and its diffusion, and a social study of science that remembered anthropology beyond ethnographic technique, would find and describe place beyond villages and space beyond laboratories. Now place, now space, now twisting away from both stable categories, this topography would stretch over uneven terrain, shifting between natural settings, modern artifacts, and reinterpretations of both, between abstraction and specificity. Enacted in practice, such topography would constitute a mobile frontier, one often hidden behind other divisions and boundaries yet essential in defining human relations. Conceived in these terms, the vast expanse of a modern heaven weighs heavily on the ground.

Notes

1. This essay derives from a series of research trips in French Guiana and France between 1990 and 1994, totaling fourteen months. It is part of a larger study of the establishment of the space center in Kourou relative to the colonial history of development in French Guiana and its penal colony (Redfield 1995). Beyond personal experience, conversations, and sources cited in the References, I acknowledge the archival holdings of the Centre des Archives d'Outre-mer in Aix-en-Provence; the departmental archives in Cayenne; the European Space Agency (ESA) library in Paris; brochures and other materials made available by the Centre Spatial Guyanais, the ESA, the Centre National d'Etudes Spatiales (CNES), and Arianespace as well as the local press of French Guiana and the Reuters Bureau of Cayenne.

2. For a sampling of recent discussion related to spatial concerns in anthropology, see Appadurai (1986), Augé (1995), Gupta and Ferguson (1992), and Trouillot (1992).

3. The period of any orbit is a function of altitude and velocity. At approximately 17,000 miles (28,000 kilometers) per hour, an object can break free from the surface of the earth; at an altitude of some 22,000 miles (36,000 kilometers), it has a period of 24 hours and matches the rotation of the earth. Satellites can only orbit the center of another body and, as the earth spins, an orbit at any angle other than directly above the middle plane of rotation would not stay constant with the ground below. Thus, to maintain constant contact with a defined region on the globe, a satellite must travel in synch with its midriff, and the equator, projected outward into space, becomes a key to communication. At extreme latitudes (e.g., those of the former Soviet Union), a highly elliptical orbit can be used to maximize contact with the ground in lieu of geosynchronous stability; the great majority of commercial communication, however, takes place *over* the tropics (Blonstein 1987, pp. 1-9; King-Hele 1992).

4. Shifting plans for the establishment of tropical launch centers can be followed in general and industry news stories such as those in *Aviation Week and Space Technology* (see also *Space Policy*). The journal of the Guiana Space Center itself, *Latitude 5*, regularly monitors active launch competition in the United States and Russia as well as the potential threats in China, India, and Japan and development of rival launch sites in places such as Brazil. For historical grounding, see the collection in CNES (1972); the most interesting alternative to a tropical land base remains a floating platform, once contemplated by the United States, as built by Italy and as recently discussed by a consortium including Russia and Norway ("Norway's Kværner" 1994). None, however, exists on a scale adequate for commercial satellite launches. For a discussion of space technology relative to development, see Wise (1990). I also thank John Leedom for providing me with regular clippings and local perspectives on the New Guinea situation.

5. Exposure to the north and to the east offers an additional boon, easing the flight of satellites launched into low polar orbit for the purpose of earth observation or scientific experiments. The evolution and changing emphasis of these technical criteria by those involved in the maintenance of the center at Kourou are themselves of interest, as is the varying scientific and commercial focus of the space operation and degree of European cooperation. A constant from the French perspective, however, is that of political control of the land involved.

6. Some notes on jurisdiction: the Guiana Space Center (Centre Spatial Guyanais, or CSG) has come to serve as the principal launch site of not only the French national space agency (CNES) but the ESA as well. In 1980, a corporation named Arianespace was established to market the new launcher commercially. Arianespace came to dominate commercial launches in the 1980s, capturing more than half the market while succeeding in 45 of its first 50 launch attempts, placing a total of 85 satellites in orbit. The bulk of Arianespace's business lies in communications satellites. However, the CSG also periodically sends earth observation satellites

into sun synchronous orbits such as those used by the French SPOT system as well as other low orbit research satellites, test rockets, and balloons coordinated by the CNES, giving it a total output of more than 400 launches (CNES 1990; ESA 1992; Desobeau 1990; Naddeo-Souriau 1986).

7. I do not mean to suggest that a launch site is the only example of modern technology involving place or an open horizon. Nuclear test sites, for example, present interesting inverse parallels.

8. Estimates for percentage of direct and indirect investment in French Guiana related to the CSG range up to 55 percent during the period between 1965 and 1975, a figure that drops over the next decade with the dramatic demographic expansion of the department but remains at a significant 27 percent. Direct expenditures of the departmental and regional governments aside, the space program remains the single largest factor in French Guiana's economy (Mam-Lam-Fouck 1992; Remondiere and Colmenero-Cruz 1987; CNES 1988).

9. To balance the presentation that follows, I offer these assembled social facts: The CSG occupies approximately 900 square kilometers of coastal land, approximately 1 percent of the total area of French Guiana. The primary technical activities conducted at the center are those of final preparation and assembly of the three launcher stages and the payload, preparing and launching the assembled rocket, and monitoring its ensuing trajectory and performance. The CSG provides both facilities and logistical support for visiting teams in charge of particular payloads in different launch "campaigns," including testing and laboratory space as well as housing and social services. The center seeks to average eight or nine payloads a year using the Ariane 4 rocket, even while an additional launching area is being constructed for its successor, the Ariane 5, and the possible (if increasingly doubtful) future European space shuttle Hermes (CNES 1988; CSG 1994; ESA 1992). The Guiana Space Center itself employs approximately 850 persons, and Arianespace employs another 250; thus the space industry directly employs something on the order of 10 percent of Kourou's population and 1 percent of French Guiana's. Most of the technical and upper administrative positions are filled by Europeans, and almost half of the center's workforce is composed of Europeans on temporary overseas contracts (CNES 1990). Kourou has the greatest overall number of workers within the CNES, outranking the administrative headquarters in Paris and the satellite control center in Toulouse. In 1987, the internal breakdown of the CSG's labor force into official categories was as follows: 30 percent engineers, 24 percent technicians, 17 percent secretaries, 15 percent laborers, and 14 percent administrators. Compared to a similar breakdown for the CNES as a whole, this distribution displays a lower proportion of engineers to technicians and laborers as well as a higher proportion of administrators and secretaries. Outside of the (expansive) administrative and secretarial categories, the workforce is predominantly male (CNES 1991). In addition to those directly employed in technical tasks, the presence of the center has created a need for a wide range of non-technical support occupations, officially estimated at 2.1 for every direct employee of the CSG (CNES 1988). Such positions include mid-level bureaucratic posts within the town, largely filled by Guyanais Créoles, as well as manual labor and maintenance, largely performed by illegal immigrants. In addition to the detachment of the foreign legion, security guards and units of the French army are also deployed during launches. Finally, one must add rotating teams of engineers and other representatives of Arianespace and the CSG's clients present to oversee the preparation of their satellites for launch. Numbering between 200 and 400 at any one time, these *missionaires* stay an average of two months. The town has a number of expensive hotels and restaurants to cater to them, while a unit within the CSG attends to their logistical needs and arranges entertainment, including jungle tours.

10. For additional flavor of Kourou (and the rest of contemporary French Guiana) as experienced by Maroons, see Bilby (1990) and Price and Price (1992). Jolivet (1982) provides

a caustic description of Kourou in terms of class, while Chalifoux (1987) offers an overview of factors affecting ethnic identity in French Guiana and Mam-Lam-Fouck (1992) presents a fair selection of views of the space center from the perspective of the social history of French Guiana.

11. The quip works more richly in French because one of the terms used for a rocket launch, *tir*, also describes the shooting of an arrow. While the artifacts in question are of the souvenir variety, meant to authenticate a jungle experience, hunting with guns and the consumption of exotic game animals remain popular and controversial activities in French Guiana.

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