

Making a Global World: the Iridium Satellite Venture

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Shalom, and thank you to our Israeli hosts. I should emphasize that I am perhaps a bit of a fish out of water here, as a historian, and I would ask you to appreciate the perspective of a historian. What I am interested in, and what other historical colleagues are interested in, is understanding larger patterns of change, particularly, for the purpose of this conference, understanding a relationship between Space applications, Space flights generally, and the changes in our larger culture and out larger world, and in turn, how those technologies have changed the experience that we have today.

The story that I want to share with you for the first time today, the Iridium satellite program, captures that kind of tension, and at the center of that tension are fundamentally these choices, if governments or markets take on Space activity.

So let us begin with the first [referring to presentation] "hello" from the autumn of 1998. This "hello" signaled the inauguration of Iridium, a satellite constellation providing telecommunications first; a completely global cellular telephone service, initiated by Motorola, a United States Fortune 500 company, near the end of the Cold War. Iridium, as this image suggests, created a dial tone that reached not only the world's many population centers, but also remote sectors, like deserts and oceans. More than a decade in the making, the new Motorola-sponsored company symbolized a dramatically changed international order that emerged at the end of the Cold War, and continued to the 1990s.

Globalization as phenomenon, as an idea, as excitement, as perceived relentless force, took on a new, invigorated meaning. Not only for what was happening on the ground, but for what was happening in Earth-directed Space applications. In this talk I want to explore several facets of the global and the post-Cold War moment, as seen through the story of Iridium. Before delving into that story, though, let me offer a few introductory thoughts. What we call globalization today primarily has its roots in the 1970s and 1980s, as tighter international economic integration occurred, and the spread of communication technologies, and then the de-regulation of markets, all very dry subjects, but exceedingly important. Witness Israel's own success, adapting to and taking advantage of these changes. But as a historian, my

sense is that the role of Space-based applications, particularly communications and global positioning systems, has been underappreciated in understanding the vast changes we have seen in international life.

Let us go back to the first signal, hanging over a desert and the satellite constellation, they made it possible. In the parlance of the field, that is a low Earth orbit system, one with an important technical feature. Satellites could pass signals across the constellation, to enable communication between any two points on Earth, for example, from Tel Aviv, to the top of Mt. Everest, anywhere. This is an artist's sketch [referring to presentation] with no pretensions to technical accuracy. But it does convey something of the infrastructure that made global dial tone possible. This engineering graphic of the satellite beam coverage, of telephone cells, cells on the ground, conveys the point more forcefully. Then it is engineering matter-of-factness. Note the complete absence of geographical features, the specifics of Earth itself. If I was asked to characterize the recent era of globalization in one minute, I might turn to this image. It conveys the tendency of global markets and some technologies to erase or disregard place. In response, communities and nations tend to say, 'hey, no, wait'. The political and cultural ideas of our place, our piece of ground, do matter and need to be respected.

As this image suggests, Iridium was at one extreme of this dynamic. Its entire history might be capsulated in the phrase, take places out, and then put them back in. When yesterday we watched the video from STS-107, and they pointed to borderlessness as an ideal, they were speaking of the value of trans-cultural good will. Not the actual dissolution of boundaries. I think any country today would be unable to say they really want to let their borders go. To appreciate the significance of this Iridium image, and the whole set of ideas and actions attached to it, we need some comparison.

As one of many possible points of contrast, consider Spacecom's Amos-3 satellite. Though the technical and operational aims of Iridium and Amos are different, this example is useful. In the specific geographical coverage, Amos-3 suggests a different business aim, one that built on a business and technical legacy, that was 40 years in the making for satellite communications. It too exemplifies the global, but with an important difference. Enhancing regional and national political and cultural interest included, in this case, the importance of linking the Jewish nation with the Jewish Diaspora. Indeed, place and culture are important. In the history

of satellite communications, such regional or national aims have been the norm - for Israel, Indonesia, or Canada. But to get at our global moment, we need one more example, that of the US's Global Positioning System. Like Iridium, GPS is total in its embrace of the planet. Like Iridium, it is a grand technological gesture, rendering the globe into a multitude of abstract positional coordinates, and if I had a map of GPS's cell patterns on Earth you would see that. But it was achieved in a significantly different way, through the vast resources of the US government, and for the preeminent purpose of national security. It was more than a 30 year project; it originated in the early 1970s and became fully operational only in 1995, moving from a context that was defined distinctly by the Cold War, to one like Iridium, marked by the end of the Cold War, in a world oriented toward markets and a global outlook.

As we set the histories of Iridium and GPS side by side, two aspects stand out. One is the rise of these technical systems that take on a continuous basis the absolute entirety of the globe, not just parts of it, as their field of operation and concern. The other is GPS strange status as a system that exists outside the market, but is fundamentally integrated into the market. Its military and commercial uses are now completely entangled. It is there at no cost to users, except for US taxpayers, in contrast to communications with its long history of national and international conflict, GPS has invoked little to no opposition, although we saw a little bit of that in the case of Iran, in an earlier talk today. There is no legal, regulatory or political framework that in any meaningful sense seeks to control it: in short, by the very novelty of its service the system circumvented the politics of place. That is the distinctiveness of the historical forces at the end of the Cold War, in which Iridium, as a communications venture rose.

Motorola at that time - many of you may know that Motorola was one of the first multinationals to establish a facility here in Israel, back in 1984 - Motorola at that time was one of the US and the world's leading high-tech firms. It was the preeminent manufacturer of cellular phones and systems, and through the 1980s in competition with the Japanese over semi-conductors, Motorola had to recast its corporate culture to achieve, for US manufactures, unprecedented levels of quality, in marked contrast to the American automobile sector. Motorola's reputation, within the US and internationally was at its zenith as the Cold War ended, and market-based, rather than state-centered initiatives were seen as the primary force

for change. We get a sense here of Motorola's extensive reach as a multinational corporation. Motorola was not alone in such thinking. Other corporations also sought to develop satellite constellations; I shall not go through the list. For telephony and data, including Bill Gates and Microsoft, whose idea, "Teledesic", was even more ambitious than Iridium, aiming to deliver internet services worldwide. The 1990s were truly sort of a moment of optimism with respect to these technologies. It was in this context that Iridium was conceived and took shape. In 1987 three Motorola engineers, sitting in the company's military products division, sketched out a new business idea. A telephone service, implemented through a constellation of low Earth orbiting satellites, ground stations and hand-held phones, to provide digital wireless communications over the entire surface of the planet. The fortuity of this moment was to fail. At the end of the Cold War the idea would never have been realized as a government-funded military project but occurred just at the time when Motorola's commercial ambitions were at their highest and US geopolitical clout formidable. Motorola had the wind at its back. Yet, even so, every part of the concept reflected big ambition. No one had ever designed, built, launched and operated a constellation of tens of satellites. No one had ever operated a communication satellite system in low Earth orbit. No one had tried to develop a global phone company that can provide communications from Antarctica or Mount Everest or New York City. No one had attempted to do such a massive Space or technological project with private funds alone. Motorola itself was not an aerial Space company, with an established tradition of organizing and implementing large scale projects. It excelled in the mass production of consumer products and components. To do all this, to bathe the planet in radiation as one of the founding engineers described the effort, there was a hefty price tag: 78 billion US dollars, the biggest private investment in a start-up company in business history.

The decision to proceed with the project coincidentally came on the very day the Berlin Wall fell in November 1989. In June 1990, Motorola announced Iridium with a big coordinated global media splash, with simultaneous press events in London, Melbourne, Beijing and New York. The New York Times carried it on page 1 with the headline "Science Fiction Nears Reality, pocket phone for global calls". Soon thereafter Iridium was established as a separate company, with Motorola controlling the largest single share of the enterprise. Within a few years, more than a dozen investors joined in, representing a diverse sampling of countries and

corporations around the world. These included notably state derived investments from the former Cold War adversary Russia, and the People's Republic of China, and India as well, as seed money from companies in Taiwan, Japan, South Korea, Thailand, Germany, Italy, Saudi Arabia, Venezuela and Brazil. Each of which then placed a director on the new company's board. The venture's global scope and representation led the magazine *Wired* to dub the undertaking as the United Nations of Iridium, a new, market-driven corporate-organized re-invention of the state-centered United Nations. With Superman reference at hand and his quote, the magazine heralded it: It is a bird, it is a plane, it is the world's first pan-national corporation, able to leap geopolitical boundaries and barriers in a single bound.

As Iridium got on the way, its coverage in the media, including the newly emergent domain of the web, came across as engagingly Hollywood, as the project arched from spectacle and promise in 1990 to tragedy in 1999 and 2000, when Iridium entered bankruptcy protection, a mere nine months after its commercial launch in November 1999. It re-emerged in late 2000 as a legally new, much smaller, much less ambitious company, with a group of US investors, supported by the US Department of Defense supplanting Motorola and its United Nation partners as owners.

From this vantage, the story seems to have a beginning, middle and an end, and a second chance. Its rise, fall and partial resuscitation neatly bracketed a post-Cold World phenomenon, the boom and bust of communications in the 1990s, then in the 2000s, a reconfigured sense of the global, one in which, like GPS, the commercial and the military become intimate partners in satellite communication. The new company, Iridium satellite, is a going concern but with a different business model. Still, for the historian, the saga of Iridium from its originating concept is not the end of the story. One still wants to understand why and how the historical actors looked at the world and made choices. It is important to know how much talk of the global permeated the 1990s. It preoccupied the historical actors of this time. Satellite factory workers, managers, corporate executives, investors in the US and in other countries, regulators at the international and national levels, politicians, the media and other, saw themselves a participants and contributors to a new sense of a new world, the global.

In Iridium, three interconnecting expressions of the global emerged, and I will call them the political, the engineering and the ideological. The political: I have already

mentioned Iridium's numerous geographically dispersed investors. Iridium system design, in sense of the global, was balanced against the realities of the political landscape of the post-Cold War world. Iridium's stand-alone technical design is that the satellite constellation needed but one ground station to operate tested long-standing national schemes that regulate communications.

Over most of the 20th century, most countries controlled communications, either directly through state-run entities, or through designated corporate monopolies, such as AT&T in the United States. Through regulation, Iridium or any other communications venture, needed permission to send signals in and out of any national territory. For a global service, this meant the negotiation and arrangement of permission, under unprecedented scale, in every country in the world. Even with the move in the 1980s towards privatization of communications, states carefully examined granting control to those out of their territories, to foreign firms, making legal and regulatory accommodations essential to the Iridium venture. When Motorola announced Iridium in June 1990, there was no regulatory framework that could legitimize the enterprise. In the tightly regulated world of radio communications, no spectrum had been allocated for the service, in international or national bodies. No specific authorization from Iridium as a business entity existed. The necessary political acts had to be negotiated and constructed. First, through the international telecommunications union empowered to establish international spectrum allocations and the US federal Communications Commission. Then, as noted, each individual country had to do this. The venture became defined by an effort to embed it, in a newly created legal and regulatory framework, including the world trade organization. These actions helped define the 1990s sense of the global. That is, who got to do what, under what guidelines? In each instance, public relations, lobbying and the tactics of political campaigning, primarily by Motorola, recalled at numerous facilities they have around the world with the aid and support of the US government, helped secure the new legal and regulatory framework. Such politics of the global also manifested itself in the business particulars of Motorola and Iridium. As noted, Motorola had plants and sales office in tens of countries, having already established working relationship with government officials in most of these places. This preexisting relationship served as an in-nation resource for negotiating support for Iridium. Motorola's broader international emplacement was especially valuable in China, where Motorola had well established business

networks, and in India, where the state maintained rigorous oversight of foreign investment. As you can see from this graphic here - you cannot read the fine print of course- but if you follow the little red lines, they indicate the, the places where Iridium gateways would be organized, and thus would be sites around which they could organize political support.

As Iridium started, these Motorola relationships became entwined with an organizational feature of the venture, as I was just describing. Most investors, in return for providing equity, also acquired the right to establish a gateway, in a given geographical area, which might be as small as South Korea or as vast as China. The gateways were a technical and business construct, connecting the satellite system to the public switch telephone network, and serving as commercial hubs for the venture. As a technical system, with its in space inter-routing capabilities, Iridium did not need, as I have mentioned, other than one gateway. The gateways were a concession to the everyday, messy realities of composing the global from many instances of the local, as a matter of spreading financial risk and as a means to create local, regional and international political support. Going back to my introductory remarks again, another example of one had to be put back in place as one went through this project, and no worthy, political effort to create a new framework to the global, yielded one striking result. The international telecommunications union, the body responsible since the mid- 19th century for coordinating transnational communications, gave Iridium its own unique country code. In an important symbolic and regulatory sense, the corporation, pan- national in scope, was now on par with a nation state. But its nation was the entirety of the planet. The global was no longer an imprecise metaphor, but a word that really meant the planet as a whole: the global as engineering.

The idea of low-Earth based communications network, global and extant, was ambitious, but not because it stretched the state of the art. The pragmatic aim of making profits pushed managers in Iridium to use known technology instead of untested innovations. The project, though, did have a make-or-break challenge process, the problem of coordinating the many steps and building a complex system. How, in a few years, would they create an Earth-circling communications system, at a fixed cost and operated, a feat unprecedented in the annals of space flight.

As a project that self- consciously saw itself transitioning from a Cold War

environment to a market world, Motorola engineers saw defining and elaborating a new style work culture as their distinctive professional contribution. Once the basic concept of Iridium had been articulated, project engineers answered their basic problem through metaphor, to make a virtual factory. The factory did not exist in an actual sense. Rather as a matter of technology and politics in the global system, the project was composed of a variety of independent entities, dispersed across the international landscape. In the US, Motorola, Raytheon, Lockheed, and others, names that are probably familiar to most of you, and outside the US, launch facilities in Baikonur cosmodrome and Taiwan China.

But the idea of the factory did not perform specific work. It conveyed that all these entities were bound together in a project, and more important, that within the factory walls, a deeper view of community and common purpose held sway. Via a shared set of technical practices, employee behaviors and commitments, and a market oriented view of the world. And this should be contrasted with the way governments build satellites. The goal was to establish a project way of life that could be transported and replicated, be it with difficulty, to all these different locations and cultural sites. It is worth notice that the project itself, was a community, one that had its own identity, and at the heart of that identity was what Motorola learned in its competition in the semi-conductor markets with Japanese firms in the 1970s and 1980s. The company devoted considerable effort, to learn and adapt Japanese lean manufacturing techniques, and invented its own quality control methodology called Six Sigma. I am not going into what Six Sigma is, but if anyone is interested you can take courses in Six Sigma here in, in Israel. The mix of individuals and institutions represented in the effort reflected the distinct engineering traditions that had to be brought together. Military and commercial elements of Motorola as well as those at Cold War's stalwarts, Lockheed and Raytheon, not to mention launch organizations in the USSR and China. Iridium also became home to an influx of individuals from Apple computers, commercial aviation firms and telephone companies. In the world of the market and the global, engineering practice it became a carefully managed trans-national blend of technique and culture. The third aspect of the global was ideological. I shall not dwell on this too long.

To go back to my earlier thought that Iridium erased the idea of place and then put it back in as a necessity to working in a global world as seen in the discussion of the political and engineering aspects of the project, but with the ventures aimed

to be completely global, it had to find a way to make the notion of transcending national borders fit with preexisting, widely shared, international values. The point of departure, not surprisingly, was to draw the language and ideas of the market. To do so, to draw the language and ideas of the market and which, the idea was that all individuals shared common essence and aspirations; to be discreet and independent political and economic actors.

Individuals thus were defined, not by the particular circumstances of their lives, or locally grounded cultural attributes, but had a transcended template - the empowered universally ideals of western individualism. Markets generally and Iridium in particular, as the technology comprehending the planet, signified the possibility of attaining these ideals once individuals could readily travel the planet and communicate. The market ensured it was not merely a system of exchange, but a way of imagining the present and the future, and if we kind of look at some of the commercial space plans that are out there now you can see how very much that is a part of how they present their work.

As noted already, soon after Iridium's commercial launch, it went into bankruptcy. I shall not explore the reasons here, but you can just pull in your pocket and take out your cell phone, it is one of the indicators. But note that the question of whether the venture could be salvaged, focused on its unique feature, its being global. Motorola threatened to de-orbit the satellite, but Iridium, despite its staunchly commercial phase, had close ties with the US military since its inception and built a separate gateway for military use in Hawaii, that was completely independent of the commercial gateways. Iridium's global scope had clear value to the military and it played a key role in rescuing the company from bankruptcy. This happened several months before the US post 9/11 invasion of Afghanistan. Iridium was used extensively there, giving the new company, Iridium Satellite, crucial revenue. Use of the system even trickled down to ad-hoc phone services in the Iraqi streets.

You can go out on the street and purchase a telephone and make a call via satellite telephone. Iridium satellite is planning to launch an updated more powerful constellation, and will be using this satellite to host payloads for other entities who want to monitor or act over the entire planet, including possibly environmental monitoring, or enhanced GPS. In conclusion, the story highlights some of the critical ways in which the global was created in the 1990s. Enhanced communications modalities, highlighted by the emergent web and the widened use of communication

satellites, as well as the media's constant attention to such changes and made the global a circulating trans-national idea. Satellites in particular, communication satellites, gave the global a powerful new connotation, not just as a metaphor, for trans-national flows of money and culture, but as an indicator of an emergent capability to act over the totality of the planet through commercial and military means.

Through projects such as Iridium, the global became a way of life, a referent for thinking and acting for nation states, for corporations and for first and third world peoples.



right: Orna Marie Orshan, Israeli Space Agency