

NEWS project manager and a coinvestigator on the Soviet Phobos-2 mission in 1988 that ended prematurely because of a computer glitch, says he believes Phobos and Deimos were blasted off the surface of Mars by an impact event. If that turns out to be the case, “then we have a much simpler Mars sample-return mission,” he points out.

Alternatively, if Phobos was an asteroid, then its soil can provide planetary scientists with a sample of

the raw material from which the planets were formed. In January 2006, NASA’s Stardust space vehicle was the first to successfully bring back samples of a comet to Earth. They are believed to contain material that existed before the solar system came about. Material in the asteroid belt, on the other hand, is thought to be the debris left over from the formation of the planets.

Given that NASA has now put its own Mars Sample Return project on hold

until 2020 or later, could Phobos-Grunt also be a dress rehearsal for an eventual Mars sample-return mission? Mikhail Marov of the Keldysh Institute of Applied Mathematics in Moscow, principal investigator on the Phobos-Grunt mission, explains: “The experience gained from Phobos-Grunt will be extremely valuable for the follow-up Mars missions that are now in the Russian Science Academy’s [planetary exploration] blueprint.”

—BARRY E. DIGREGORIO

Low Power to the People

A South Carolina city is the latest battleground for low-watt community radio

On Sunday evening, 10 June, WMXP-LP/95.5 FM, in Greenville, S.C., signed on the air for the first time. The event marked the end of a seven-year battle to provide an alternative to the city’s large commercial stations for the African-American community, which makes up one-third of greater Greenville’s 300 000 population. WMXP is a community radio station owned and operated by the local chapter of the Malcolm X Grassroots Movement for Self-Determination, situated in the heart of a long-depressed but rebounding black community that abuts Greenville Downtown Airport [see photo, “Against All Odds”]. The fight to get WMXP on the air exemplifies a growing movement that has pitted community activists, public interest lawyers, and electrical engineers against the National Association of Broadcasters, the lobbying organization in Washington, D.C., that represents commercial radio stations in the United States. NAB members fear that their listenership—and their advertising revenues—would suffer from the presence of alternative programming.

The Greenville radio station is a new beachhead in a conflict over whether political, ethnic, and religious groups, as well as neighborhoods and school authorities, may operate low-power FM (LPFM) radio stations, which—by dint of their small broadcast ranges—are necessarily focused on local interests. Starting in the late 1980s, activists and advocates created



AGAINST ALL ODDS: Seven years after applying for a low-power FM license, Efia Nwangaza, director of Greenville’s Malcolm X Grassroots Movement, stands outside the home that hosts WMXP’s broadcast tower.

pirate LPFM stations and went to court, challenging radio rules. The aim was to change regulations that effectively shut out community organizations from the broadcast spectrum in favor of corporate media. The result was the Federal Communications Commission’s 2000 decision to create LPFM licenses for community radio stations.

Currently there are approximately 600 LPFM stations in the United States that, like WMXP, broadcast at 10 to 100 watts. But organizations such as the

Prometheus Radio Project, a Philadelphia-based activist group, say they won’t be satisfied until they have helped knock down legal and administrative barriers that are preventing hundreds more from

going on the air. Six hundred low-power stations may seem like a lot, but there are roughly 6000 full-power FM stations, many of which are capable of transmitting signals at up to 100 000 W, says Timothy L. Warner, an IEEE member in Asheville, N.C. Warner, an audio, acoustic, and communications systems designer, helped build the Greenville radio station.

The LPFM framework, as originally set up by the FCC, promised to make stations like WMXP and others that Prometheus has helped build—in places as diverse as Tennessee, Oregon, Tanzania, Nepal, and Guatemala—available in most cities. But commercial broadcasters lobbied the U.S. Congress intensely, claiming that low-power stations cause interference that prevents radio receivers from tuning in to the full-power stations’ broadcasts.

In response, Congress inserted restrictions into the LPFM rules regarding usable frequencies and minimum distances between transmission towers; these hold

low-power stations to more stringent standards than commercial stations. For example, high-powered repeaters that extend the signals from full-power stations hundreds of kilometers beyond the boundaries of their stated broadcast range can operate on the second-adjacent channel from a local station (meaning that the frequency at which its signal is broadcast has to be on average 400 kHz above or below the protected station’s) as long as other conditions are met. Low-power stations, however,

NEWS have to be at least 800 kHz away from local stations' towers and stations' repeaters, dramatically reducing the available frequencies. For example, if there had been stations in Greenville using frequencies anywhere between 94.9 MHz and 96.1 MHz, WMXP would not have been able to broadcast at 95.5 MHz.

An engineering study ordered by the FCC found the commercial broadcasters' contention regarding interference laughable. Nevertheless, Congress voted down proposed amendments to the LPFM restrictions introduced in 2005 and 2006 that would have liberalized the restrictions in favor of low-power radio. But groups such as Prometheus haven't given up. Senators John McCain, R-Ariz., Maria Cantwell, D-Wash., and Patrick Leahy, D-Vt., introduced a bill this summer containing amendments striking down the restrictions—which community radio advocates hope will become law.

Controversy over interference threatened to shut down the Greenville project before the station ever powered up. The original construction plan, submitted to the FCC in 2000, immediately after LPFM licenses first became available in South Carolina, called for the transmission tower to be located on the Malcolm X Center's premises. But that plan was scuttled, along with the entire low-power FM application, when the owner of a high-power commercial station located a few hundred kilometers away filed a motion asserting that erecting a tower there would inhibit the expansion of its broadcast area. "The preeminence of commercial stations over low-power FM stations resulted in our initial construction permit being withdrawn," says Efia Nwangaza, the Malcolm X Center's founder and director.

With the assistance of a team of attorneys and engineers who volunteered their time or offered it at greatly reduced rates, Nwangaza, an attorney and longtime human rights activist, filed an amended application, and eventually the center received the broadcast license. (Nwangaza gained a measure of fame when, as a Green Party candidate for the



EACH ONE TEACH ONE: A retired radio engineer [top] uses skills honed during a career in the U.S. Army to ready a used sound board. A veteran of low-power radio projects in Central America [center] leads a workshop focusing on technical know-how—including ways antennas and receivers work. As an activist from Amman, Jordan, recounts the experience of building a community radio station there [bottom, left], the budding radio reporter in the middle gathers audio with guidance from the seasoned journalist to his left.

U.S. Senate in 2004, she was one of two women barred from debates sponsored by the League of Women Voters.) The revamped plan required the transmission tower to be located in one of two sites, both of which were in residential areas. As fate would have it, one of the spots was in the backyard of another longtime community activist, who readily agreed to host the tower.

Once the station's advocates had overcome that hurdle, the Prometheus Radio Project organized a three-day event, a "barn raising," to help build the station. Prometheus is a standard-bearer in an ongoing fight, in the words of Pete

Tridish, one of the organization's cofounders, to "help demystify technology and put it in the hands of communities." Volunteers from across the globe gathered in Greenville to lend their engineering, construction, programming, news gathering, community organizing, and fund-raising expertise (or just additional pairs of willing hands) to build the station from scratch and prepare locals to run it.

An important part of the task was creating a wireless Ethernet bridge connecting a 6-meter mast on the center's roof to the 10-story freestanding transmission tower that had already been built in the community activist's yard 3 km away. An IEEE 802.11a link carries the encoded digital signal from the station to the tower, where it is decoded, amplified, and routed to the broadcast antenna.

Although the accelerated construction timetable required almost an around-the-clock effort, sawing and soldering were only one part of the goings-on. Workshops each day offered bare-bones explanations of the physics of sound and radio transmission, as well as tips on applying for a radio license. Volunteers gave short courses on how to conduct interviews and elicit stories of interest to the local community [see photos, "Each One Teach One"].

When the participants weren't working or learning, they gathered at Greenville's Phillis Wheatley Community Center, which served as home base. From Friday afternoon through Sunday evening it resembled a commune, with some participants bunking and

showing there, and most of the workers eating meals prepared by other volunteers. By the time the switch was flipped on Sunday evening, old friendships had been renewed, new acquaintances made, a radio station completed, and a battle for the expansion of community radio won.

"It's been an interesting experience," Nwangaza says. "I have to give great credit to Prometheus in their commitment to the issue of community radio and their willingness to work with community people. I am certainly an example of that commitment and will be ever indebted to them—and so will Greenville."

—WILLIE D. JONES

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