in the works with France. Originally scheduled for launch in time for the next solar maximum in 2011, the *Small Explorer for Solar Eruptions* is now expected to fly a year or so later. China is responsible for one *SMESE* instrument, a spectrograph for detecting x rays and gamma rays. The mission will also be able to image in the UV and IR. The main goal, says Cheng Fang, a solar physicist at Nanjing University and a principal investigator for China's contribution to *SMESE*, is to study solar flares and coronal mass eruptions. "China's contribution is roughly €5 million [$6.7 million]. The French side is much more."

The other Franco–Sino mission is a gamma-ray burst mission that is not listed in the CNSA's five-year plan, but which will likely fly, according to a source who requested anonymity. It's scheduled for launch around 2012.

Further in the future, perhaps around 2015, astronomers in China hope to launch the *Solar Polar Orbit Radio Telescope*, an array of interferometric low-frequency antennas rotating around a mother spacecraft and together forming a virtual dish about 150 meters in diameter. In solar polar orbit, *SPORT* would image coronal mass ejection plasma clouds to study and forecast space weather.

International partners

In the current five-year plan, says Zhang, China encourages international collaborations. "It means we should take every opportunity to participate in good, scientifically motivated programs if we believe the science interests match the interests of Chinese scientists. And it means the Chinese space program welcomes international collaboration." Through such collaborations, Zhang adds, "We can be part of the international community. That is what we want."

To date, China's collaborations in space science are with Russia, the European Space Agency, and several European nations. The Alpha Magnetic Spectrometer is an isolated case of a US–China collaboration—but NASA has put it on hold (see PHYSICS TODAY, May 2007, page 30). Hopes in both countries' space science communities that collaborations might be established grew at the prospect of NASA administrator Michael Griffin's visit to China last year, but dimmed thanks to a narrowed itinerary and new US sanctions on China's space industry, according to Gregory Kulacki, a China specialist at the Union of Concerned Scientists.

The chill in space relations was exacerbated after China shot down one of its own satellites in January (see PHYSICS TODAY, March 2007, pages 29 and 100). Scientific collaborations between the two countries are in any case complicated by International Traffic in Arms Regulations, US laws that regulate the export and import of articles and services considered to be potentially militarily sensitive.

Toni Feder

Russia leads international team on revived UV space telescope

Thanks to an upswing in Russia's economy, a long-dormant plan for a UV space telescope is now taking shape.

A UV space telescope originally planned in the Soviet Union has regained traction as the Russian-led *World Space Observatory* and is set for launch in the first part of the next decade.

"It will be a multipurpose observatory," says *WSO* principal investigator Boris Shustov, director of the Russian Academy of Sciences' Institute of Astronomy in Moscow. Topics of study will include a search for missing baryonic matter in the intergalactic medium, the composition of atmospheres of exoplanets, and accretion physics in star formation and galaxy evolution. The *WSO*, he adds, "is the only large-scale facility planned in the UV in the next 15 years."

"The *WSO* is a follow-on to the *Hubble* [*Space Telescope*]," says the University of Leicester's Martin Barstow. "Whereas the *JWST* [*James Webb Space Telescope*, NASA's successor to the *HST*] doesn't deal with the optical and UV part of what the *Hubble* does, so the *WSO* observes in the UV, and doesn't do IR." Among the *WSO*'s strengths, adds Michel Dennefeld of Paris's Institute of Astrophysics, "are that its instruments will be entirely dedicated to

The *World Space Observatory*. (Artist's conception courtesy of the *WSO* team; the background is an image of the giant galactic nebula NGC 3603 taken by the *Hubble Space Telescope*, courtesy of NASA, ESA, Wolfgang Brandner [JPL/IPAC], Eva K. Grebel [University of Washington], and You-Hua Chu [University of Illinois at Urbana-Champaign].)

UV observations and, with its high orbit, it will allow long observations of faint objects."

Global participation

Russia will cover the largest chunk of the *WSO*'s estimated €300 million ($400 million) tab, supplying the satellite bus, launch facilities, ground equipment, and a telescope with a 1.7-meter primary mirror. The rest will be provided in roughly equal parts by Russia's four main partners.

Germany has designed a high-resolution spectrograph, sensitive in the 103–310 nm range. Scientists in China are working on a long slit spectrograph (LSS) for observing extended and faint objects. Italy is developing an imaging camera with three channels that together cover the wavelength range from 115 nm in the UV through 700 nm in the visible. In addition, says Isabella Pagano of Italy's National Institute for Astrophysics, who is overseeing her country's participation in the *WSO*, "The Italian Space Agency is discussing using the Italian station in Kenya for this project. It would be nice because it's close to the equator and [with other ground stations] would give us control of the satellite 24 hours a day."

Spain—so far the only country besides Russia to have made a formal commitment to the project—is developing a space flight control and scientific operations center. Norbert Kappelmann of the University of Tübingen says the German team is waiting for the others to catch up with their R&D before applying for further *WSO* funding. China and Italy are both expected to sign interagency agreements with Russia later this year.

Many other countries have been involved in planning the *WSO*, and some may participate in smaller ways. "The UK financial situation is quite tight at the moment, so we are trying to participate in the LSS along with the Chinese," says Barstow. "But whatever happens in terms of hardware, we will participate as much as we can in the science program." Argentina, France, Israel, Mexico, the Netherlands, and others are similarly strapped for cash but intellectually engaged in the project. Ukraine and Kazakhstan are both involved, and South Africa hopes to host a science operations center.

Notably, the US is not on board. "The US scientific community told us it's not a high priority," says NASA press officer Grey Hautaluoma. US astronomers may fear that lobbying for an international project could jeopardize funding for a much larger UV telescope, which is currently stalled, or for the Cosmic Origins Spectrograph, a UV instrument slated to be installed on the *HST* next year. Moreover, some *WSO* scientists suggest it's better for the US not to be involved because US concerns about potentially sensitive information could cause delays.

In any case, the *WSO* will be open to the entire international astronomy community. "One of the things that is different about this compared to other Russian missions," says Barstow, "is that, after a lot of sweat and tears and negotiations, we have a scheme for how data will be handled that is much like what you might loosely call the western approach. There will be guaranteed time for the instrument people and a guest observer program for everyone else."

Dreams converge

"Before the Russian space agency approved the *WSO* about a year and a half ago," says Pagano, "it seemed like a dream." The project's genesis goes back to a plan from the late 1980s that languished after the Soviet Union collapsed, plus efforts begun in 1997 for a successor to the European Space Agency-NASA-UK *International Ultraviolet Explorer*. The convergence of the two was spearheaded by the late Willem Wamsteker, who was based at the European *IUE* station in Spain. That's why, says that country's *WSO* liaison, Ana Ines Gomez de Castro of the Universidad Complutense of Madrid, "Spain is so firmly committed to [the *WSO*]."

Meanwhile in Russia, says Shustov, "for more than 10 years, from the beginning of the 1990s, it was the dark ages for space science. If you compare the late 80s to the mid-90s, the official drop in funding was a factor of 20. That meant no real project could be realized." Beginning in 2004, he adds, "money rose. There is not as much money as [there was] in the Soviet Union, but now the federal space program looks more realistic."

Toni Feder

Germany forms alliance for terascale physics

Germany's high-energy particle physicists have formed a network to increase their international visibility and competitiveness as their field gears up for the start next year of the Large Hadron Collider (LHC) at CERN and, eventually, the International Linear Collider.

The terascale alliance, as it's known, gets started this month with €25 million ($33 million) over five years from the Helmholtz Association. The German government puts about €150 million annually into CERN. But, says the University of Wuppertal's Peter Mättig, who is co-coordinator of the alliance with the German Electron Synchrotron's (DESY's) Rolf-Dieter Heuer, "Universities get only €12 million per year of federal funds to exploit CERN. This disproportion is in some sense rectified through the alliance." The alliance will focus on the study of elementary particles, the forces acting between them, and related technological advances.

The alliance encompasses two Helmholtz centers—DESY and the Karlsruhe Research Center—plus the Max Planck Institute for Physics in Munich and 17 universities. "The overall goal is to combine the complementary aspects of what we have in Germany to shape one body," says Mättig. "The alliance is pretty huge," Heuer adds, "but I think it's very well focused on particle physics at the high-energy frontier." With the LHC, the energy frontier moves to the terascale, or 10^{12} eV (see the figure).

A large portion of the alliance money, roughly €15 million, will go toward 50–60 new jobs for researchers and technicians. "We want to create long-term positions for young people by offering tenure track," says Heuer. So far, universities and DESY have committed to more than 20 new permanent positions—if the researchers they hire pass muster—after the alliance pays the salaries for the first five years.

Most of the rest of the money will be used for infrastructure, including a data analysis center at DESY. "One university might have a specialty in chip design, and another might have experience in readout electronics," says Heuer. "We want to develop more tools in grid computing and to improve existing infrastructure for detector development." With the alliance, infrastructure will be bolstered, technical support will be added, and scientists at any of the participating institutions will have access to the facilities located at all alliance partners.