

synchrotron of 70 billion electron volts maximum energy is being constructed. Physicists there hope for their first accelerated beam by the end of 1967. Sometime in 1969, devices for ejecting large portions of the accelerated beam should be complete, and the time should be ripe for exploitation of large bubble chambers.

The announcement that the French bubble chamber, called Mirabelle, will be installed at Serpukhov was made in Moscow on 6 May, under a broad agreement for cooperation in peaceful uses of atomic energy signed 4 May 1965.

The agreement means that French physicists will have access to an accelerator which will be for some years the world's largest. The 70-Gev Serpukhov synchrotron, more than twice the size of the two largest machines now operating (at Geneva and Brookhaven), is likely to be ready for experiments perhaps 5 years before projected American and European proton synchrotrons of 200 and 300 Gev, respectively, come into service.

And this is an optimistic estimate, for, at its June meeting, the Council of CERN heard proposals that would give Europe a completed 300 Gev machine toward the end of the 1970's. Delays in the American program are not inconceivable either.

The offer for research at Serpukhov of the largest hydrogen bubble chamber yet to be built in France is by no means the first such French venture. Physicists at Saclay and other centers of high-energy physics research in France have taken the lead in offering men and equipment for international work, and to some extent the election of Bernard Gregory, a Frenchman, to succeed Victor F. Weisskopf as the head of CERN is a recognition of this cooperation. French bubble chambers have operated at CERN from its earliest days; a French bubble chamber was installed with the 7-Gev British proton accelerator, replacing a 1.5-meter British hydrogen bubble chamber, at CERN; and another French chamber was installed with the 7-Gev German electron synchro-

tron, Desy, late in 1964. The French are now constructing a 12,000-liter heavy-liquid bubble chamber, called Gargamelle, which will be placed in the large new experimental area CERN is constructing for further neutrino experiments.

These moves in the field of high-energy physics show that the French have followed a quite idealistic policy about international scientific cooperation—at least in some fields—and that their generosity can pay very large dividends, such as the opportunity to work at Serpukhov and perhaps to launch satellites deep into space on Soviet rockets.

As General de Gaulle noted in his speech at the university of Moscow, "Exchanges of ideas, of methods, of discoveries among the elites of different nations are essential to elucidate, hasten and enrich the success of each one of the nations."

The President of France, at least, expects significant benefits from the agreements he made in Moscow.

—VICTOR K. McELHENY

## What the French President Saw: A Gallic View of Novosibirsk

*London.* One of many steps to prepare the way for French President de Gaulle's state visit to the Soviet Union was the trip to France, in May, of Academician Mikhail A. Lavrentyev, leader of the development of the Siberian science center, Akademgorodok, near Novosibirsk. De Gaulle visited the center on 23 and 24 June.

Lavrentyev, who studied at the Sorbonne many years ago, visited France as the guest of the faculty of sciences at Orsay and of the Institut des Hautes Etudes Scientifiques at Bures-sur-Yvette, both near Paris.

On the occasion of Lavrentyev's visit, French scientists and the general public had a chance to learn a good deal about the science center President de

Gaulle would visit. In speeches, Lavrentyev extensively described the development of Akademgorodok since the decision was taken in 1956 to create a new scientific center in Siberia. And on the occasion of his visit, Jean Cantacuzene, who was for 3 years the French scientific attaché in Moscow, published two articles about Akademgorodok in *Le Monde*. Some of Cantacuzene's observations went beyond the information offered in a London speech delivered 16 March by the English mathematician Michael J. Lighthill.

Cantacuzene asked Lavrentyev how he had succeeded in getting leading scientists to migrate to Novosibirsk (each of the 15 institutes there is headed by a full member or a corresponding mem-

ber of the Soviet Academy of Sciences). The answer, Lavrentyev said, was not salaries, which are about the same as in European Russia, but a promise of carte blanche to first-rank researchers and practically unlimited funds for equipment. The cost of developing the institutes and the town of 35,000 inhabitants around them has amounted so far to about 200 million rubles, or \$220 million at the official rate of exchange.

The task of financing such an enormous undertaking has been aided by the great autonomy that Lavrentyev enjoys. Although Akademgorodok is a project of the Siberian section of the Soviet Academy of Sciences and is theoretically dependent on the academy's presidium in Moscow (Lavrentyev is a vice president of the academy), it receives its funds directly from the government of the Russian Republic, largest of the Soviet Union's 15 republics.

At the science center are about 30 full members or corresponding members of the academy, 200 researchers with the Russian rank of doctor of sciences, and 1000 with the *kandidat*

## From De Gaulle's Speech in Moscow

... It is true that today there are, everywhere, armies of savants, researchers, technicians, engineers, workers—no longer isolated and exceptional individuals—who are working for progress. But it remains true today, as it has been always, that the efforts and the results cross all frontiers; that whatever is attempted and whatever is accomplished is done, after all, to the honor and profit not of a single people but of humanity; that, further, exchanges of ideas, of methods, of discoveries among the élites of different nations are essential to elucidate, hasten, and enrich the successes of each one of the nations.

On that subject, I must say here how much France appreciates the contacts which certain of your savants, your professors, and your students already maintain with their French counterparts. How France hopes to see these contacts expand and multiply! What importance she attaches to the studies and projects currently under way and to those which, doubtless, will be undertaken in common by our two countries in fundamental and practical domains!

The greeting that I bring you today from the French spirit is also particularly warm because the University of Moscow is one of the principal centers of this cooperation. You, *monsieur le recteur*, have just proved this by coming to see our Sorbonne.

Culture, science, progress. These are the things which, in place of the dreams of conquest and domination of yesteryear, quicken and justify national ambitions in our time.

This is the ground on which the peoples from whom modern civilization springs must meet.

This is the goal by which the new alliance of Russia and France can be sealed.

degree, similar to the American Ph.D.

Cantacuzene described a visit to one of the most important projects of Lavrentyev's own institute, the institute of hydrodynamics. This project is the "water cannon," now patented internationally and used in Soviet coal mines. The demonstration model of the cannon, from which water emerges at a pressure of 2000 atmospheres, can pulverize a brick wall 1 meter thick. A more powerful "cannon," from which water emerges at a pressure of 60,000 atmospheres, can cut a hole 1 centimeter in diameter in an ingot of copper several centimeters thick. One of the co-inventors of the water cannon, Voitsekhovskiy, was one of the three researchers from Novosibirsk to win the latest round of Lenin prizes in science.

The largest of the institutes at Akademgorodok, according to Cantacuzene, is that of geology and geophysics, with over 700 on its staff. Among many other projects, this institute is studying the possibility of drilling into the earth's upper mantle.

The institute of organic chemistry under Academician Nikolai N. Vorozh-

tsov, 59, with 500 on its staff, concerns itself with topics ranging from fundamental studies of synthesis and mechanisms of reaction to work, in its department of natural substances, on the properties of Siberian medicinal herbs.

The average age of researchers in the institute of nuclear physics, headed by Academician Gersh I. Budker, 48, is only 25. The institute works on problems of thermonuclear fusion and particle physics at high energies. In the field of accelerators, the institute is seeking to develop a machine which will not have to use large quantities of iron in generating the magnetic fields which focus the particles. The idea, naturally, is to reduce the diameter, weight, and cost of accelerators. Also, the institute has built rings for storing particles accelerated in a standard accelerator and has conducted experiments in which particles moving in opposite directions in two storage rings are induced to collide. On this clashing-beam work the physicists in Budker's institute collaborate with the Orsay research center in France.

Also cooperating closely with France

is the institute of catalysis, whose director, Academician Georgi K. Borekov, 59, visited a similar institute at Lyons, France, while he was making plans for the institute at Akademgorodok. One department of Borekov's institute works on the development of analog computer techniques which, it is hoped, will allow developers of new chemical processes to move more directly from the production of small-scale laboratory apparatus to that of industrial-scale equipment.

Another Akademgorodok scientist with French contacts is Academician Vladislav V. Voevodsky, 49, director of the institute of kinetics and combustion. Voevodsky is a specialist in the study of free radicals.

In his talks in France, which led to increased collaboration, Lavrentyev noted plans to set up an institute of advanced studies at Akademgorodok, with facilities for senior visiting researchers; the institute would be similar in some respects to the Institut des Hautes Etudes Scientifiques.

Lavrentyev spoke at length about experiments in education at Novosibirsk and, like Pyotr L. Kapitsa on his recent visit to England, earnestly discussed the problem of finding individuals of superior scientific intelligence. He described the recruitment for the 600-student scientific high school at Akademgorodok (*Science*, 27 August 1965; *New York Times*, 24 November 1965), founded in 1963, where instruction in internationally accepted modern biology has proceeded despite the left-over influence of Lysenkoism in Soviet education.

Cantacuzene added that the university of Novosibirsk, at which many of the science center researchers teach, has drastically changed the curriculum for future chemical researchers. Rather than lengthen the 5-year university course (3 years of theoretical courses and laboratory work at the university, then 2 years of work at the research institutes), it has been decided to cut out a good deal of traditional instruction in chemistry to make room for instruction in modern physics and mathematics.

Because of the experimental spirit that prevails at the science center near Novosibirsk, it is clear that Lavrentyev and his colleagues will play a large role in the Soviet Union's increasing scientific collaboration with France—and with other countries.

—VICTOR K. McELHENY