rate science institutions in the U.S. The number of recipients now totals 17, each of which supplements NSF grants from other sources. The new awards will go to:

North Carolina State: $3,555,000 for graduate research and training in engineering and biomathematics, with about two-thirds of the money to go for personnel.

Purdue: $3,600,000 to complete and renovate its life-science facility and to install a tandem Van de Graaff accelerator.

Rutgers: $3,708,000 for personnel and equipment to help develop both the mathematics and physics departments.

Tulane: $3,685,000 for faculty, facilities, and equipment in the biology, mathematics, and psychology departments.

The University of Rochester: $1,950,000 to supplement the $2.5 million received from NSF last year; the supplemental funds will be used to enlarge the biology faculty and to help finance construction of a new science building.

Publications

The Manufacturing Chemists' Association has released a 39-page publication called "Source Materials for **Air Pollution Control** Laws." The booklet, prepared by the association's air quality committee, outlines the basic provisions desirable in air pollution laws; and to illustrate the different approaches to control programs, it presents the full texts of legislation passed by several states. In addition it contains a listing, by states, of all relevant statutes in effect 1 January 1966. The booklet is available free of charge from the Manufacturing Chemists' Association, 1825 Connecticut Avenue, NW, Washington, D.C. 20009.

Quarterly Reports on Sulphur Chemistry. Interpretative bibliographies of topics of current interest; each issue to feature a different topic. Vol. 1, No. 1, March 1966. Norman Kharasch, editor. (Intra-Science Research Foundation, P.O. Box 2428, Santa Monica, California 90405. $12 a year, individuals; $24, institutions)

Visual Medicine. Developments and applications of audiovisual techniques for communication in the medical and dental sciences. Vol. 1, No. 1, March 1966. Biagio J. Melloni, Editor, (Appleton-Century-Crofts, 440 Park Avenue South, New York 10016. Quarterly; $12 a year, U.S. and Canada; $14 elsewhere)

Scientists in the News

J. Graham Sullivan will join the U.S. Office of Education this summer as Deputy Commissioner of Education, replacing **Henry Loomis** who resigned in March to enter private business. Sullivan had been assistant superintendent of public instruction for the California Department of Education.

REPORTS FROM EUROPE

Franco-Russian Collaboration in Science: De Gaulle's Visit

London, 23 June. Charles de Gaulle, president of France, is giving the world an elegant lesson in how to use cooperation in science and technology as a tool of diplomacy.

General de Gaulle will come home from his 12-day state visit to the Soviet Union, the first by a major Western head of state, with agreements to expand still further the scientific and technological collaboration between France and Russia.

Some will regard these agreements as window-dressing for the fact that the talks between General de Gaulle and Soviet leaders produced nothing concrete about those questions of East-West politics which are so often called "fundamental," such as the division of Germany. Also window-dressing, it will be felt, were De Gaulle's moving address to the university of Moscow on 22 June (see box), his flight to Novosibirsk and the nearby "science city," Akademgorodok, on 23 June, and his visit, the first by a Westerner, to the Asian rocket-launching base of Baikonur.

But this is to misunderstand things. There are real limitations on what any leader of France, no matter how nimble or ambitious, can achieve. These limitations are imposed by the number of people in France, the natural resources at their disposal, such social factors as the supply of investment funds through a stock market, and the adequacy not only of the French research effort but also of the organization for applying it to industry. These are the limitations which have pushed France to join international collaborative efforts in big-scale technological development; such limitations have forced France, even while employing a nationalist rhetoric and forcing certain modifications of the international programs, to remain in these programs and even to move vigorously to force Britain to stay in them (*Science*, 10 September 1965).

Presumably these limitations are what the acerbic McGeorge Bundy had in mind when he said in his Senate testimony the other day that the United States could "endure" General de Gaulle's mistaken view of the Atlantic alliance.

As to the "fundamental" political questions concerning which General de Gaulle initiated what turned out to be a rather philosophical discussion in Moscow, it must be remembered that most of these questions are so "fundamental" that they must rest without solutions unless one wishes a major war to occur.

In such a situation, agreements on specific matters, especially scientific and technical matters, become more significant. They can represent an end run around apparently insoluble problems. They certainly will have some economic impact; two examples are the 1965 Franco-Soviet agreement on developing a French modification (called SECAM) of the RCA color television process and agreement on transmissions between the Soviet Union and France

via the Russian communications satellites called Molniya.

Although General de Gaulle and the Soviet leaders did not talk conclusively about broad political questions, there are the strongest of political motives behind the supposedly trivial agreements, initialed 22 June, concerning cooperation on technology and on space research.

General de Gaulle, who is anything but the narrow nationalist many glib observers believe him to be, is seeking more than glory for France in his efforts to create a Europe that is really independent of the two "colossi" on either side. To this end, he acts—in the American view, destructively—to make the North Atlantic Treaty Organization looser. He is thought to be alone in his views in Europe, but this is not the case, as articles by such responsible journalists as Arnaud de Borchgrave (*Newsweek*, 25 April) attest. It is widely felt that there is more than a trace of "hegemony" in the American control over the Atlantic alliance, and more than a minor threat of tighter hegemony in the very great technological and economic strength of American corporations, particularly in those fields where future growth is likely to be the most rapid. There are many who agree with the French view that the real political and military situation in Europe has changed, and that a truly independent Europe must include the 100 million people of Communist eastern Europe. In this view, the present shape of the Atlantic alliance does not forestall problems or solve them, but creates problems and preserves artificial barriers.

Such worries in Western Europe are linked strongly to feelings of the kind Presidential science adviser Donald Hornig heard expressed many times when he attended a meeting of European science ministers in Paris last January—expressions which led him to speak out in public several times about the importance Europeans attach to the threat of American technological and commercial dominance. Also linked to this problem, of course, is the agitation for a reduction in the small but extremely significant American programs of grants to scientists in Europe.

Of course, there are Soviet pressures behind the recent agreements for collaboration with France. It is well to separate these pressures from the continuing Soviet wish to escape the consequences of successful American efforts to contain the Soviet Union militarily.

Western specialists in international relations have received solid new evidence recently that the Soviet desire for increased trade with the West and for agreements like the one with France is inspired by more than a desire to score points off the United States. There is widespread feeling among the Western specialists that highly placed Soviet scholars and officials are worried about their country's continued economic inefficiency and political and military isolation. There is evidence that such scholars, perhaps including the physicist Piotr Kapitsa, are now applying inside the Soviet Union the same drive that led them to such steps as taking part in the Pugwash movement.

Viewed in this context, the significance of steps toward Franco-Russian scientific and technological collaboration becomes somewhat clearer.

These steps did not begin yesterday. They have been taken quietly and steadily over the past 3 years. An important early landmark was the visit to France in January 1964 of Konstantin N. Rudnev, chairman since 1961 of the State Committee for the Coordination of Scientific Research Work. In October 1964, Gaston Palewski, then the French science minister, returned Rudnev's visit. In fact it was Palewski who was talking to Chairman Nikita Khruschev when the Soviet leader was suddenly called back to Moscow to the meeting at which he was stripped of power. Palewski was accompanied to Russia by several important French scientific administrators, among them the heads of the atomic energy agency, the scientific planning group, the scientific advisory committee, the basic research agency, and the Paris Observatory. Palewski visited, among other places, the new Siberian science center at Akademgorodok.

During 1965 the color-television agreement was made, throwing into confusion a meeting in Vienna held to decide on a uniform color television system for all Europe.

In October 1965 a delegation from the Soviet Academy of Sciences, headed by Keldysh, the academy's president, came to France (earlier in the year, Keldysh and others had visited Britian). The Russian delegation visited Paris, the tidal power project on the Rance estuary in Brittany, and Grenoble. At Grenoble, as at Akademgorodok, an attempt is being made to build up a genuine center of scientific excellence in a provincial city, a center whose researchers will not only be restored to a vital role in universities but will also work in close collaboration with industry.

In the first part of 1966, a number of French space scientists visited the Soviet Union to explore further the suggestion that French experiments or complete satellites be launched on Soviet rockets. This suggestion came up during Keldysh's visit. In discussions at that time, members of the Soviet delegation, who put the idea forward, were a bit surprised to find French scientists not only demanding quite specific data about the shape and power of the rockets that would be used but also asking to be present at the launchings. Nonetheless, the Soviet representatives did not then exclude, nor have they excluded since, the possibility that French scientists could attend launchings, presumably at Baikonur, which General de Gaulle is scheduled to visit.

As noted earlier in *Science* (24 December 1965), there was strong interest in France in the idea, for large Soviet rockets would make it possible for very large French payloads to be sent out in eccentric orbits to great distances from earth for geophysical experiments.

An important question, however, is that of whether increased space-science collaboration with the Soviet Union would choke off the extensive collaboration that now exists between the United States and France on such matters as very-low-frequency radio propagation and winds in the ionosphere. Some observers in France fear that the attitudes of some high French officials on this subject may be rather blithe. It is thought that Alain Peyrefitte, the new science minister, does not understand the extent of the U.S.–French cooperation in many fields and does not appreciate how vital it is to France.

While, at the time of General de Gaulle's visit, increased cooperation in space exploration between France and the Soviet Union remained in an exploratory state, the two countries had taken a more definite, and very significant, step in the field of high-energy physics.

An extremely large hydrogen bubble chamber, with a volume of more than 6000 liters, now under construction at Saclay near Paris, will be installed by about 1969 at Serpukhov, south of Moscow. At Serpukhov, a proton

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 synchrotron, 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 member 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*