Science and Industry in Chicago is weighing in with a grand exhibit called "America's inventive genius."

So, it would seem any Americans hungering for immersion in science and its contributions to the Republic will have to go where they always have gone—to museums.

The NSF has laid aside whatever fancy dreams it had and is concentrating its resources ($300,000 of its own money from the public understanding of science program—the $200,000 from ARBA has already been given out in grants) on a series of three international symposia, called "Knowledge: 2000." The Xerox Corporation is donating the use of its international training center in Leesburg, Va., with its spectacular assortment of communications equipment, for the meetings. The symposia are designed to fill in the rather large gaps in projects nationwide—the paucity of corporate involvement, the lack of futures orientation, the thin interest in science and technology, and the absence of international cooperation. The symposia will deal, respectively, with the generation, transmission, and use of knowledge. The meetings will be tightly structured, with participants drawn from six sectors of government, business and academia. The chief purpose is to distill discussions into hour-long video tapes accompanied by discussion guides and action guides. These are to be disseminated as widely as possible, and it is hoped the films will be good enough to interest the Public Broadcasting System.

Apart from this noble effort, science is getting short shrift. Why? The easy answer is that there has been a singular lack of leadership from Washington. ARBA has failed to exercise even the kind of initiative that its limited mandate permits—that is, ideas—and has settled down to a level of visibility that would be the envy of any subversive organization. As for the President, people can be pardoned for guessing that his idea of the best way to celebrate 1976 would be a Gerald Ford victory in November. A government official who attended one of the White House's periodic Bicentennial discussions came away appalled at the vacuousness of the talk, which was mainly devoted to questions of who would be allowed to use the Bicentennial logo and raise the Bicentennial flag.

As far as the scientific and academic communities are concerned, the whole thing got off on the wrong foot. Many scientists have perceived the Bicentennial as a vast public relations caper, which may have prevented them from perceiving opportunities for enhancing public understanding of science. Detlev Bronk of Rockefeller University believes "the whole thing is badly loused up" and describes with distaste certain souvenir bedspreads with American flags emblazoned on them. (Bronk, who headed an ad hoc NAS committee to see what could be done about the Bicentennial, says NAS approached a television executive with an idea for a series on science but failed to inspire any interest.)

Certainly, the Bicentennial spirit has caught on in many communities, but the absence of any philosophical framework has hindered any cohesive national recognition of the occasion. Most people *Science* talked to thought the Bicentennial looked like no more than a massive accumulation of county fairs and 4th of July type festivities.

This circumstance has worked to the disadvantage of science. The Nixon blight, the current climate of anti-intellectualism, the recession, and the distortion of the concept of patriotism wrought by the Vietnam war—none are conducive to a unified and serious appraisal of the past and future of the United States. The nation is too young to have the sense of history that is woven into the consciousness of Europeans, and too sophisticated to fall for anything simple. Back in 1876, the Centennial celebration, in Philadelphia, was built around a technological symbol of the dawning age: a Corliss steam engine. President Grant turned it on, and it supplied the power for all the exhibits. In 1876, the public gawked at such wonders, says Joel Bloom of the Franklin Institute. Now they are more skeptical, and the attitude is, "What will it do for me?"

A truly national celebration requires vision. They had it in 1776, but times have changed. The kind of imagination that is going into the current celebration is exemplified by ARBA's vision for the 4th of July in 1976. On that day, a Sunday, the nation's people are to spend the morning in prayer. The afternoon is to be devoted to town meetings and speeches, and at 4 p.m. (11 a.m. Hawaii time) all the bells in the nation will ring out simultaneously. Then there will be fireworks and a 4-day weekend.—CONSTANCE HOLDEN

ERTS: Americans Took Pictures of Soviet Union—To Be Friendly

The 1972 U.S.–U.S.S.R. joint space agreement, which reached its apogee with the recent Apollo-Soyuz mission, has been, by and large, an open and well-publicized instrument of détente. But it includes an unusual, slightly bizarre chapter. In late 1972, a group of U.S. scientists went beyond the letter of the agreement and unilaterally decided to program an American satellite to take an unusually large number of pictures of the Soviet Union—pictures they believed their Soviet colleagues wanted but could not ask for directly.

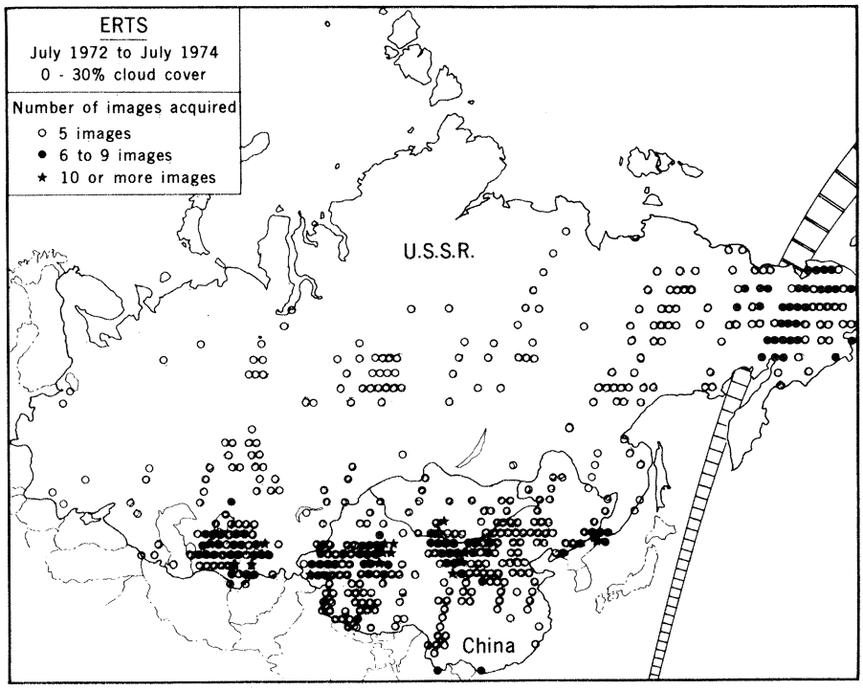
Known as ERTS, the satellite took pictures of land areas worldwide for 2 years, using technology for multispectral, low-resolution ground imaging which, as far as is known, the Soviet Union did not have. (ERTS has been officially renamed Landsat-1; its successor, known as Landsat-2, is now in orbit.) ERTS' colorful pictures of vegetation patterns, water, geological, and other features have become popular aids to scientists since the satellite, the first of its kind, was launched in July 1972.

The Americans' quiet decision to program the satellite to take repeated pictures of certain places in the Soviet Union was meant as a friendly gesture, a tacit form of scientific aid aimed at furthering the cause of détente.

The ERTS satellite was used mainly to carry out the experiments of more than 300 scientists from all over the world, but principally from the United States. The satellite is entirely unclassified and its work, with few exceptions, has been widely publicized.

The Soviet scientists who were to benefit from this aid were never directly informed about the programming decision. The American officials also deliberately avoided giving the resulting ERTS pictures to the Soviets.

This gingerly approach was taken because the Soviet government is sensitive about American satellites flying over the Soviet Union. The decision to repeat its coverage of certain places "was a diplomatic risk" says Arch B. Park, who at the time was an official of the National Aeronautics and Space Administration



Map by Eleanor Warner

ERTS coverage of the Soviet Union and China. Acquisition of 5 or more images is shown. Elsewhere, 4 or less, or no images, were acquired. The curved line at left indicates the satellite's path and how frequently images were acquired. [Adapted from official NASA map]

(NASA), and who participated in the decision.

"The papers were full of the use of satellites for economic espionage. It could have happened that they [the Soviet authorities] would have said, 'Out. You guys go. You're using that stuff to spy on us.'" Also, ERTS is something of an embarrassment to the Soviets because, as far as is known, they have no comparable satellite.

The idea to program the satellite to aid Soviet scientists came up after a series of 1972 meetings of the U.S.-U.S.S.R. Joint Working Group on the Natural Environment, a subgroup of the joint space program. The meetings examined geologic, vegetative, and hydrological features of comparable land sites in each country. The Soviet side presented findings about a set of sites in their country which had been studied through aerial photographs and photographs taken from manned spacecraft like the Soyuz. The American side presented information on U.S. sites from aerial photographs and also, after it was launched, from ERTS images.

The formal agreement was that each side would study its own sites; this avoided the sensitive issue of either side taking pictures of the other's territory. In both countries, but particularly in the Soviet Union, the sites under study were in remote areas and had little known economic or strategic importance.

One purpose of the joint meetings was to compare techniques of ground observation. To the Americans, the superiority of ERTS' multispectral imaging over the conventional photography was clear. Photography produced black and white, sometimes infrared, pictures of either very large areas (from space) or very small areas of a few square miles (from aircraft). On the other hand, the ERTS images showed areas approximately 100 miles on a side, a scale more suited to this type of study. Because they are recorded in several parts of the spectrum, from green to near infrared, ERTS images also enable observers to "see" features which do not appear in ordinary photographs.

The Soviet scientists apparently showed keen interest in the ERTS images of U.S. sites presented in joint meetings. On rare occasions, Americans showed them ERTS images of Soviet territory. Park recalls the reaction of one Soviet scientist when he saw an ERTS image of a site in the Soviet Union that he had been studying for some time. "It hit him so hard emotionally. He nearly was in tears because all he had ever seen before of the area was black and white aircraft photographs 3 miles on a side."

William Nordberg, Director of Applications at Goddard Space Flight Center of NASA who was responsible for programming ERTS, says that the Soviet scientists never asked that ERTS be programmed to help them. But it was obvious from the joint meetings, some of which Nordberg attended, that they would benefit from repeat ERTS images of their sites. Moreover, once the satellite was thus programmed, the Americans made a point of not handing over the resulting images to the Soviet scientists. Both actions would have violated the understanding behind the exchange agreement. Nonetheless, "they knew where they could buy them," Nordberg says, referring to the Sioux Falls Center. William Fischer, of the U.S. Geological Survey who participated in the joint meetings, says that Soviet scientists involved in the exchange have ordered ERTS images from Sioux Falls. Although it is likely that they ordered pictures of their test sites, Fischer says he has no direct knowledge whether this is the case. Leonard Jaffe, Deputy Associate Administrator for Applications at NASA, who led the U.S. side of the exchange, could not be reached for comment.

Official NASA maps of the number of times ERTS successfully took pictures of the land areas of the world (see map, this page) show that it recorded extra coverage in specific parts of the Soviet Union. Most of these correspond with the test sites programmed in 1972. Some of the others are desert regions that were being studied by an American researcher, Edwin McKee of the USGS in Denver, Colorado. McKee requested coverage of 17 desert sites worldwide. Finally, there is repeat coverage of Soviet grain-growing regions.

Nordberg explains this coverage by saying that ERTS, as well as Landsat-2, has covered grain-growing regions in the Soviet Union, China, Argentina, Australia, and some other major food-producing nations "in anticipation" of a worldwide crop inventory project. NASA spokesmen say, however, they are only analyzing crop data collected over North America. Crop inventories of North America are a major activity of the present Landsat-2 satellite (*Science*, 2 May).

The number of pictures taken of the Soviet Union and China could feed suspicion that the satellite was programmed for "economic espionage" on these closed countries. But Nordberg denies having received any programming requests from intelligence agencies. Requests for extra coverage of foreign areas, he says, related to emergencies, such as oil spills, floods, or droughts.

One interpretation of this quiet, virtually secret, decision to program ERTS could be that the Americans were giving away more information to the Soviets than necessary, and that they were giving them something they could not otherwise have had. However, defenders of the gesture could argue that the Americans violated none of the terms of the exchange, that they avoided embarrassing the governments of both countries, and that they probably aided their Soviet colleauges. Whatever else, the story shows that using a satellite as a tool for making friends with the Soviet Union can still be a tricky business.

—DEBORAH SHAPLEY