

professional training.

Already, according to the Reuss subcommittee staff study, immigration totals in a given year can equal two percent of the scientists graduated by U.S. institutions, almost 10 percent of the engineers and more than 25 percent of the physicians.

"Contributions of this magnitude to U.S. scientific manpower can hardly be regarded as unimportant," says the study. The total is over 10,000 a year.

Traditionally, the U.S. view has been that individuals are free to move where their aspirations dictate. The best the U.S. can do, this policy holds, is to encourage developing countries to develop environments in which their trained professionals can work.

Lately, however, there has been a shift: a new category of nation is emerging, where more specific assistance might be justified.

These are nations sufficiently industrialized and having a sufficient self-generated growth in national product to have outgrown the programs of the U.S. Agency for International Development. These post-AID countries, as they are being called, might qualify for special assistance in the creation of institutes of science and technology, the

existence of which should help stem—if not reverse—the brain drain.

One such institute was established in South Korea about a year ago; there are already indications that the outflow of professionals from that nation may be falling off and some reverse migration replacing it.

"We can't do this kind of thing just for the brain drain," says an official of the White House's Office of Science and Technology. "But if there are other reasons to justify an injection of more science and technology into an economy, then a damper on the brain drain is a satisfactory second result."

Other nations said to have reached this level of development include Turkey, Mexico and Taiwan.

Along with broader recognition by policy makers that the problem exists, Reuss is expected to urge:

- frank discussions with aided nations of alternative cooperative measures to reduce drain.
- greater efforts to expand the U.S. domestic supply of physicians and surgeons.
- consideration of the effects on foreign scientific manpower of proposed major Federal research and development projects. ◇

MALARIA

Single pill against falciparum

Limited field trials of a new compound against the drug-resistant Plasmodium falciparum malaria will begin in Vietnam within three months.

The single-pill treatment for a strain of malaria that has beset thousands of American fighting men (SN: 11/19/66 p. 417) has been developed by researchers at the Harry S. Truman Laboratory of Comparative Medicine in Kansas City, Mo. under the direction of Dr. John Arnold.

The new treatment dramatically reduced the recovery time of inmates at the Jackson County jail who volunteered to be infected with the drug-resistant strain, Dr. Arnold says. Ten of 11 infected inmates were cured with a single pill. The 11th man required a second dose.

The compound—trimethoprim and sulfamethoxypyrazine—has shown no dangerous side effects, according to Dr. Arnold, who says he has been unsuccessful so far in inducing resistance to the combination. The treatment affects the malarial parasites' ability to either synthesize or utilize the vitamin folic acid.

Presently soldiers infected with the drug-resistant falciparum strain are hospitalized for exhaustive drug therapy that can last up to 30 days. Dr. Arnold believes his new drug can get a man

back into fighting trim within two weeks or less.

In the present treatment, patients receive daily doses of quinine, pyrimethamine, and diaminodiphenyl sulfone, and the regimen often leaves them in need of a transfusion.

Dr. Arnold says sulfamethoxypyrazine competes with p-aminobenzoic acid in folic acid synthesis and trimethoprim inhibits the enzyme dihydrofolic acid reductase. The combination thus blocks the falciparum parasite from either synthesizing or absorbing folic acid, one of the most important products of intermediate metabolism in all forms of life.

Folic acid is necessary in the synthesis of thymidine, a compound required for the manufacture of deoxyribonucleic acid (DNA), the ingredient that passes genetic information.

All the volunteers in the prison tests were watched for 60 days for traces of relapse. Dr. Arnold says the doses of the sulfamethoxypyrazine and trimethoprim considered effective do not cause a reduction of red blood cells, white blood cells or platelets.

The only side effect observed was gastrointestinal distress, which tends to prevent overdosage. The doctor considers this a favorable type of toxicity. ◇

PLANETARY SCIENCE

New model for Chandler wobble

The earth's rotation on its axis is a mixture of several different kinds of wobbling.

The oscillation with the longest known period is that called precession, caused by the gravitational pull of the sun and moon on earth's equatorial bulge, resulting in a motion similar to that of the axis of a tilted spinning top. This motion of the earth's axis causes each celestial pole to complete a circular path every 26,000 years. It is a very large, but extremely slow motion.

The axis of earth's rotation also has a small, nodding movement called nutation, which is caused chiefly by changes in the position of the moon's orbit. The celestial pole completes a nutation about once every 19 years.

Another small polar shift is caused by seasonal fluctuations in the snow cover, resulting in a small change in the gravitational pull of the sun and moon on earth's mass; this has a period of a year.

There is another: a small but rapid wandering of the earth's pole, first observed in 1891 by astronomer S. C. Chandler. It has never been satisfactorily explained unless a new proposal, put forth by two scientists in the Jan. 14 NATURE, does the job.

They discovered, after working independently, that both had developed the same explanation for what is called Chandler's wobble—that it results from interaction between the earth's layers.

Chandler's wobble is a circular oscillation of the earth's axis of rotation somewhat like the wobbling of a badly thrown quoit. It has a period of 428 days, about 40 percent larger than predicted by Leonhard Euler in 1744, who proposed the first general rule for variations in a rigid, rotating body.

The reason for the difference, explained by Simon Newcomb in 1891, is that Euler's theory was based on an ideal body, unyielding, unchangeable in shape and unknown in nature. The elastic yielding of the earth and the mobility of earth's seas lengthen the period to 14 months.

Chandler's wobble is observed as an increase in latitude at one place and a simultaneous decrease in latitude at a place 180 degrees away in longitude, as Berlin, Germany, and Honolulu, where changes of up to 0.3 seconds of arc in latitude due to polar motion were first detected.

The free nutation observed by Chandler, and many others since then, has puzzled scientists because, according to theory, it should have died down. Many suggestions of mechanisms to excite the Chandler wobble have been put for-

ward during the past 75 years but none has proved satisfactory, and the question has been considered unanswered.

Drs. Irving I. Shapiro of Massachusetts Institute of Technology and Giuseppe Colombo of the Smithsonian Astrophysical Observatory, both in Cambridge, Mass., now suggest that the latitude variations are not a single motion but have a beat caused by a mechanical interaction between the upper layer and the remainder of earth.

The important interaction, effectively separating the earth into two parts, occurs in the mantle, they believe, somewhere between the depths of about 400 and 1,000 kilometers. The wobble is maintained by a beat—the result of differences in the frequency of motion of the two parts; the beat runs through a complete cycle every 80 to 100 years.

The scientists term the suggestion speculative and, for further evidence, are looking into recent data with the aid of Edward M. Gaposkin, also of the Smithsonian.

SPACE

Successes, tries and problems

Despite the craggiest site ever faced by a U.S. lunar lander, Surveyor 7 settled comfortably on the surface Jan. 9 almost bolt upright, only inches away from a rock that might have flipped the vehicle over if one of its three feet had landed on it.

When scientists at California's Jet Propulsion Laboratory signaled the spacecraft to lower its automatic chemical laboratory to analyze the lunar surface, the device stuck, apparently due to particles of lunar rock kicked up during the landing and lodged in the lowering mechanism. Maneuvering the remote-control scoop that had been included on the spacecraft to dig trenches, scientists pressed the experiment box gently down.

When shut down because of heat last week, the experiment had made some 20 hours of measurements, to compare the rough ground near Tycho crater with that of the smoother lunar, or maria examined by earlier Surveyors.

Not only did the box get its 20 hours, but Surveyor's camera managed to squeeze out some 10,000 pictures. The results are still being evaluated.

Elsewhere on the space front the National Aeronautics and Space Administration was running at full bustle:

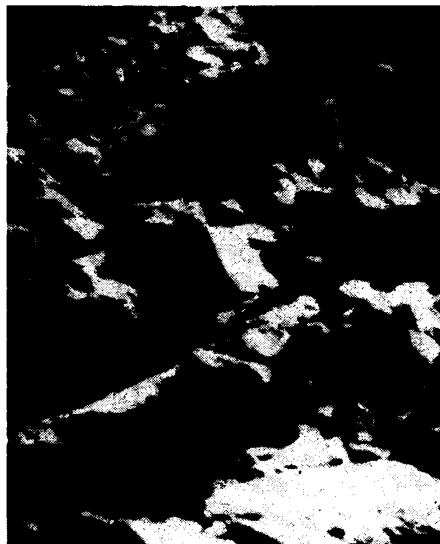
- At Cape Kennedy, preparations were winding up for the first flight of an Apollo lunar module, scheduled, after several postponements, to be launched

Jan. 22. The most important tests will be the firing of its descent and ascent engines, vital to return of the astronauts.

- Continental drift, movement of polar ice caps, impending earthquakes, and the true size and shape of the earth are to be studied with the aid of satellites such as the GEOS-2 probe launched Jan. 11. Equipped with blinking lights, radio transmitters and laser reflectors, the satellite will be used to determine the exact location of the world's land masses, distances between them and their movements.

- A second round of fireproofing tests was begun last week in a redesigned Apollo spacecraft, using a two-gas oxygen-nitrogen mixture instead of pure oxygen as originally planned.

- The most comprehensive study ever made of the northern lights, according to NASA, was to begin Thursday, Jan. 18, including a dozen flights



NASA

Surveyor's eye view of the moon.

in a Convair 990 jet, as well as sounding rocket launches and data from the fourth Orbiting Geophysical Observatory, now in orbit.

- Like most other agencies of the Government, NASA was having its budget troubles. The X-15 rocket plane, whose funding the space agency had taken over from the Defense Department scarcely two weeks before, is probably going to be permanently grounded for lack of money. Also, a two-week three-man flight planned as part of the Apollo Applications program has been cancelled, despite the fact that it had previously been described by the agency as a "fairly important milestone."

And from the Soviet Union, its first satellite of the year, Cosmos 199, was launched last week.

PUBLIC TRANSPORTATION

Proposed: expensive gambles

Ogden Nash once titled a book of verse "You Can't Get There from Here." Sometimes, in America's cities, the phrase seems to hold more truth than poetry.

Swallowing (and often choking on) a heavy breakfast of automobiles each morning, regurgitating them each night, with kinks in the intestines and grief in the tubes, the city has been crying for help.

Transportation doctors have rushed forward with ideas. These tend to be highly imaginative, and, like many prescriptions, immensely expensive, with no guarantee of health to follow.

At the Washington meeting last week of the Highway Research Board, and elsewhere, proposals have been made to provide:

- small buses directed by computer to individual homes;
- one-passenger electric automatics running on exclusive one-way tracks;
- overhead four-passenger automatic cars;
- subway systems with rotating loading platforms so the cars don't have to stop;
- two-passenger overhead downtown carriers combined with suburban high-speed pneumatic-tube trains;
- huge airliners carrying self-contained buses which would collect and distribute passengers on the ground.

All these varied proposals have three things in common: they are aimed at solving the transportation mess, they would be very costly, even on a pilot scale, and nobody knows if they would work.

So many factors enter into public acceptance of a particular type of transportation that choosing one to try out is a form of economic Russian roulette. No private industry is going to finance such experiments without government support and the political consequences of an expensive failure are enough to chill the public blood. The four-passenger overhead system could cost \$700,000 per mile and \$12,000 per car, for example.

The Bureau of Public Roads, trying to reduce the odds, has hired a research firm to build a computer model that would give planners some idea of the kind of transportation needed for different situations, and evaluate the chances that a particular scheme would fill those requirements.

The program, called AFT for "Analysis of the Functions of Transportation," is nearing completion of its first generation form. It is designed to allow planners to feed in data on the amount of cargo, human and otherwise, to be