MT. WRANGELL EXPEDITION

Arthur Beiser, at left below, is a member of NYU's Cosmic Ray Research Project and has been on a number of previous cosmic-ray expeditions. The others in the photograph are Robert Goodwin of Anchorage, Terris Moore, president of the University of Alaska, and Philip Bettler and Charles Wilson, both of the University of Alaska's Geophysical Institute. The group is at Copper Center, Alaska, at the start of the expedition. The NYU Cosmic-Ray Project is sponsored by the Office of Naval Research, and aid was also received from Quartermaster Corps and the Air Force.

THE SUMMIT OF A DORMANT VOLCANO nearly three miles high and located in the wilds of central Alaska—this is the unlikely site of a cosmic-ray laboratory that was put into operation during the past summer. Established by an expedition under the joint sponsorship of New York University and the University of Alaska, and with the substantial assistance of the Army, Navy, and Air Force, the Mount Wrangell Observatory can now be added to the roster of the world's high altitude stations.

Originally conceived by Serge A. Korff, professor of physics at NYU, and Terris Moore, president of the University of Alaska, the project was begun with a survey they had made early last year (see *Physics Today,* July 1952 for a report of their findings) concerning the feasibility of a permanent high-altitude scientific laboratory in Alaska. They then concluded that 14 006-foot Mt. Wrangell was ideal for such a laboratory, and since the NYU cosmic-ray group, headed by Dr. Korff, required a site of this kind for its experiments and the University of Alaska was interested in furthering the scientific progress of the Territory, the two institutions decided to collaborate in launching an appropriate expedition. Both men were familiar with

The completed laboratory, with the active crater at the right. The crater is actually over a half-mile away and proved quite docile. The upper hut is 16 x 16 feet in size and contains living quarters for six as well as space for some apparatus. The lower hut, fifty yards away, is occupied by generators and additional equipment. The ridge on which the huts are located is kept permanently free of snow by volcanic steam from the interior of the mountain.

By ***Arthur Beiser***

the work involved: in the early thirties, working under Millikan on a National Research Fellowship, Dr. Korff established a cosmis-ray laboratory at the 15 000-foot Cailloma Silver Mine in the Andes; Dr. Moore was a member of a 1931 expedition that scaled 24 900-foot Minya Konka in China. Dr. Korff has since been on numerous other expeditions in search of cosmic rays, and has done pioneering work on Geiger and proportional counters in his more terrestrial moments. Dr. Moore, well-known as a mountaineer and a flyer, has also climbed Chimborazo and other mountains in the northern Andes, and Mt. McKinley, among others.

Although the groups in New York and in Fairbanks were over five thousand miles apart they cooperated closely in the preliminary work: the author made two trips to Alaska, in the summer and winter of last year, working to facilitate this cooperation.

We planned a significant departure from orthodox mountaineering practice in using Dr. Moore's Piper Super-Cub for transporting men and supplies to the laboratory: the plane was ski-wheel equipped to land on the snow field at the summit of the mountain. Dr. Moore had flown supplies to a party under Bradford Washburn at 10 000 feet on the Kahiltna Glacier on the west buttress route to Mt. McKinley in 1951. Now he was to attempt a similar feat at nearly half again that altitude, a highly uncertain undertaking to the rest of us, although he seemed to have no qualms whatever. The plans were for him to fly us in at the base of the mountain, which we would then climb on foot. Following our ascent, summit landings would be attempted, the ground party providing a safety factor.

Early in June the members of the expedition assembled at Copper Center, Alaska, a little town on the Richardson Highway about forty air miles east of the mountain. Copper Center lies 250 miles from Fairbanks and 150 miles from Anchorage, with paved road all the way to the latter and much of the way to Fairbanks. In addition to Drs. Korff and Moore the party consisted of Philip Bettler and Charles ("Bucky") Wilson, physicists with the Geophysical Institute of the University of Alaska, Robert Goodwin, an experienced mountaineer from Anchorage who had climbed 20 300-foot Mt. McKinley the previous year, Hugo Neuburg and the author, both members of NYU's cosmic-ray group. Everyone had done some climbing previously. Robert Haymes, also from NYU, was to remain in Fairbanks to serve as a liaison man for the expedition.

Hauling a sled loaded with nearly a half-ton of air-dropped supplies to the laboratory site. A dog's life. Behind is one of the five peaks of Mt. Wrangell, about 200 feet above the plateau.

A BROAD SNOW DOME at an altitude of 8500 feet was selected as the base camp, and Dr. Moore flew us there, one by one, with equipment. (Our packs weighed sixty to seventy pounds and the sponsors of the project had been reluctant to import Sherpa porters from the Himalayas!) This took three days because of the bad weather that was to be a constant source of irritation and delay during our entire stay on the mountain. It was two more days before Phil, Bucky, Bob, Hugo and I could start up the mountain; the incessant cold winds, snowfalls and poor visibility of those first few days were just an introduction to some of the storms we later encountered on the summit. At last, we began climbing and, three days later, reached the top. The summit turned out to be a vast field of snow which feeds the more than twelve glaciers that scar Wrangell's sides and from which issues the system of streams that includes the Dadina, Chetaslina, Cheshnina, and Kuskulana rivers. The snow field fills the original crater of the Wrangell volcano, now dormant, and lies at about 13 800 feet; one of the five small peaks around the crater's circumference makes up the rest of the mountain's elevation. From our first summit camp we could see over to a smaller active crater, nearly a quarter mile in diameter, that spewed out varying amounts of sulfur fumes and volcanic ash and kept things from getting too dull.

The day after the ascent was completely clear, and Dr. Moore flew in, landing for the first time then. The following day, June 20, he brought in Dr. Korff and Captain Robinson Bridges of the Quartermaster Corps to visit us, as well as some mail and fresh food. Dr.

Top: The author melting snow, the only source of water, at the first summit camp. The exhortation on the box is unwarranted. In the left foreground are several of the flares which marked the drop area for the C124. *Center:* Bucky Wilson at Camp II (11 500 feet) on an especially clear day. Mt. Drum, about fifteen miles away, is in the background. ***Bottom:*** Drs. Korff and Moore after landing at the 8500-foot base camp. Moore made over thirty successful landings and takeoffs here and at the summit with his ski-wheel equipped Piper Super Cub.

Erecting a prefabricated hut. The floors and framework are of wood and the covering is insulated canvas. Less than a day was needed to build the hut, which is extremely durable.

Bob Goodwin, Phil Bettler, and Hugo Neuburg in front of the completed living quarters. The antenna at right is for our two-way radio, with which we could communicate with Copper Center.

Korff was to be a frequent visitor at the summit and he gave us much useful assistance.

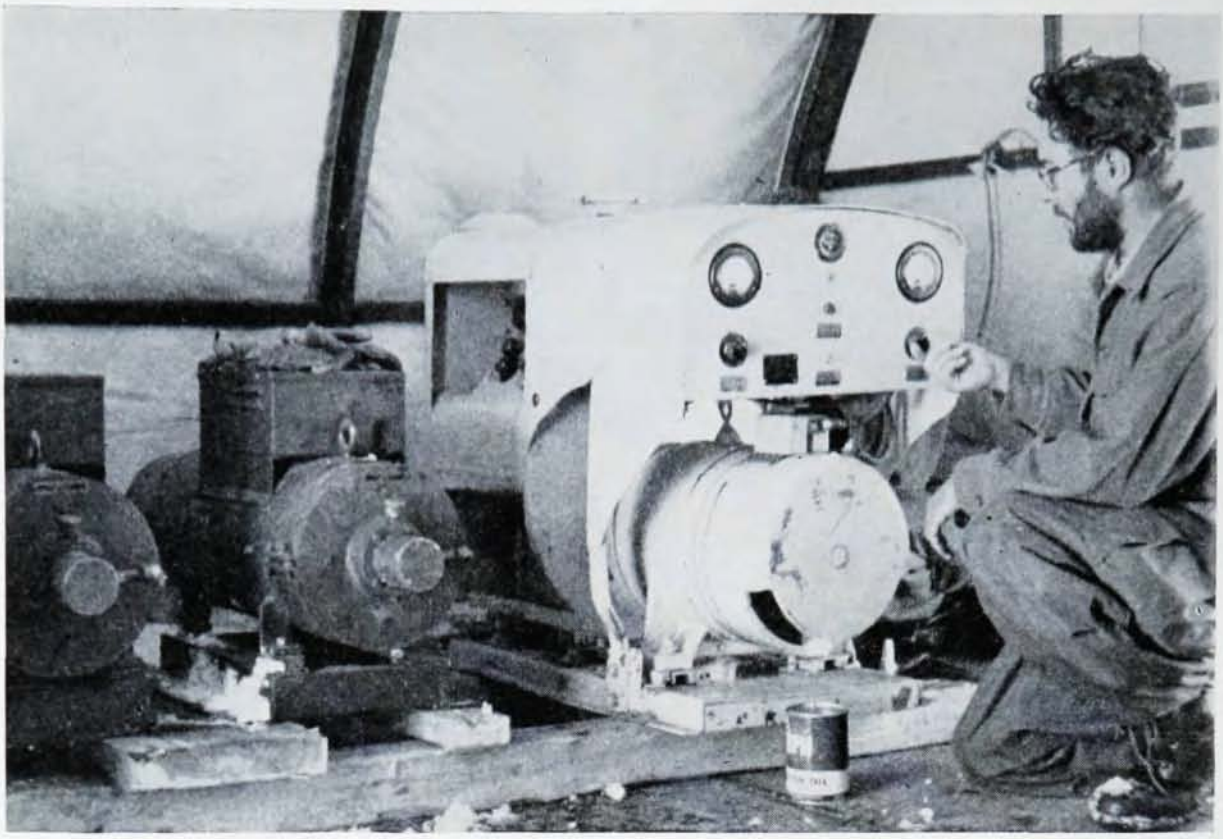
The next step was to drop some fifteen tons of supplies, including prefabricated Jamesway huts, motor generators, drums of gasoline, food, and other necessary items. A giant C124 cargo plane was used for this purpose, and, as it flew about one thousand feet overhead at 150 miles per hour, over fifty separate loads were parachuted to us with what seemed to be astonishing accuracy. Nearly all of the loads sank several feet into the soft snow, which, by lessening the impact shock, reduced damage to a minimum. Remembering the frequent snowfalls we placed wooden wands in the snow to mark the location of each load so that it could be found subsequently. Despite this precaution a number of loads, mostly gasoline drums, were lost, and presumably will appear in a few hundred years at the foot of one of the glaciers.

When we had put up one of the huts the following day—over a week of cramped living in small mountain tents made a 12 x 16-foot hut appear to be the ultimate in luxury—a location for the permanent laboratory was selected after some exploration of the summit. A ridge of rock and soil that is kept permanently free of snow and ice by the steam issuing from the volcano seemed ideal, and the next three weeks were spent in re-locating the dropped material, digging it out of the snow and transporting it to the laboratory site on plastic sleds.

At present, as set up, the station consists of two huts, one 16 x 16 feet and the other 12 x 16 feet. The larger hut contains the living quarters for six people and some space for experimental apparatus. The smaller one, fifty yards down the ridge, is used to house the generators and provides further space for equipment. One five-kilowatt and three 300–500-watt gasoline-powered generators supply electricity to both huts, and a 1500-watt, 28-volt dc wind-powered generator with Edison cells to stabilize its output will be provided.

DURING THE SUMMER the outside air temperature varied from the freezing point down to about − 10° F. In direct sunlight it was frequently warm enough for us to take off our parkas, sweaters and shirts if there was no wind. Goggles had to be worn at all times to prevent snow blindness, which would probably have occurred in less than an hour of unprotected exposure to the brilliant glare from the sky and snow. Because of these goggles, with our sunburned faces and white circles around the eyes we had a distinctly opossum-like appearance. Wind speeds ranged as high as an estimated 60 mph during severe storms, but, while an aluminum tentpole was bent double in one three-day storm, the huts withstood the wind without any trouble. From one to two feet of snow fell each week, although a 15 x 50-foot area on our ridge was always clear. Temperatures averaging 40° colder are anticipated in the winter, but more stable weather conditions at that time should increase the number of clear days and occupation of the laboratory at that time seems entirely feasible. In fact, a group will occupy it starting this February.

Two-way radio communication with Copper Center from the summit, put into operation at the end of June, was extremely convenient, enabling us to advise Dr. Moore of the weather at the summit before he took off from the Copper Center airstrip (where the summit was usually obscured by intervening clouds although the mountain itself might be clear at the time). Thus



The author adjusting the five kilowatt generator. The two rotary converters at left provide 115 volt ac current.

wasted flights could be held to a minimum, even though changes might take place in the weather during the hour and a half flight. The communications with Copper Center were scheduled, usually in the morning and evening, and in case of an emergency this meant considerable delay before word could be sent. For emergency use, therefore, we had a 3105 kc aircraft transmitter and receiver, and we could communicate with the Civil Aeronautics Administration station at Gulkana which continuously monitored that frequency.

NOW THAT THE STATION has been established, plans for its utilization in cosmic-ray research, meteorology, high-altitude biology, and vulcanology are in progress. The armed forces have already indicated their interest in using the station for testing arctic and mountain equipment.

The initial cosmic-ray work will make use of a coincidence telescope for determining the directional intensity of mu mesons. The apparatus has already been used at the summit of Mt. Evans in Colorado, which is within a few hundred feet of the elevation of Mt. Wrangell, and it should be possible to evaluate any variation in the zenith-angle and east-west effects with geomagnetic latitude. At present the telescope is operating in the Geophysical Institute building near Fairbanks, and will be taken up to the laboratory next February.

Another experiment contemplated for the Mt. Wrangell site involves a neutron-monitoring "pile," consisting of a number of large BF_3 counters enriched in B^{10} to enhance their detection of neutrons and surrounded by lead, paraffin, and water. Neutrons are especially sensitive indicators of cosmic-ray fluctuations, and, since their intensity increases with altitude, a mountain station offers great advantages for such a program of measurements. It would be very interesting to compare the behavior of cosmic-ray neutrons at high latitudes with that at lower ones during such phenomena as magnetic storms. An extremely well-regulated power supply is needed for precise measurements, and the group occupying the laboratory early next year will determine whether the existing power equipment is adequate. As soon as a sufficiently steady source of power is available the neutron monitor, which is also at the Geophysical Institute, is to be installed on the mountain. Both of these experiments were designed by the NYU Cosmic-Ray Group. In addition, several sets of nuclear emulsions are to be exposed at various elevations for Marcel Schein's group at the University of Chicago.

The use of the laboratory facilities by other interested organizations is under consideration. Dr. Moore is the administrative director of the Observatory, and will devote his entire attention to it after his resignation as president of the University of Alaska early next year. Dr. Korff will remain as scientific advisor.