4,000 Persons Visit Wizards' Chambers

(Continued from page 1)

First research site visited by the guests was that staffed by the Massachusetts Institute of Technology of Cambridge, Mass. Explained Gerald Gill, MIT researcher:

"We're trying to measure the gradient of wind on a 55 - ft. tower. We have two types of instruments.

"One type we call the slow response, with instruments at 2, 4, 8 and 16 meters up the tower. We measure the wind speed at each of these levels in miles per hour. Those needle charts right now show the wind velocity as 26-miles-per-hour at the top of the tower, 13 miles-per-hour at the 6-meter level at the bottom.

"We also record wind direction on charts at each of these levels and the temperature at the various heights. It's one-tenth of a degree cooler between 4 and 8 meters, as you can see from this chart," and he pointed to multi-colored roll of paper threading through a battery of instruments.

"This we call the lapse rate—meaning its warmer on the ground and cooler as we go aloft."

Doctor Gill pointed out the movie cameras trained on improvised panels loaded with illuminated dials, meters and switches.

"Another type is fast response equipment. I'm referring to this hot .wire anemometer. It measures wind speed, direction and temperature changes and produces a fast response."

Pointing to a different panel, elsewhere in the hut, Gill said:

"Each of these pairs of dials tells us what we need to know from our complex bivanes. The bivanes are two-directional weathervanes, which measure wind up-and-down and from side-to-side."

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Fashionable to Photograph—

The bivane was designed by Gill and built by John E. Luby of the MIT staff. Luby, a widower with four boys planted in a "Y" camp for the summer, is the MIT's jack-of-all trades.

"I can design anything and John will build it," quipped Gill.

It's fashionable at the wind test colony to photograph everything and make certain that the date, hour, minute and second appear somewhere in the frame of the picture.

The bivane dual readings are photographed every second. Temperature readings, for example, are photographed on dials to indicate one-tenth of a degree centigrade changes in temperature occurring within one second.

The MIT photography is done on 35-mm film. Later, it is developed and enlarged. Trained people view the films and abstract the desired information.

"For every hour of data we gather here, it will require six people about two months to extract the information we need. We record about 10 minutes every two hours on days and nights when we are 'operational'," Gill added.

Other MIT staffers here are Dr. Harrison Cramer, Dr. Frank Record and Jim Peers.

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'Child's Size' Brain—

Next stop was at the Iowa State college hut or tent (actually a GI crossbreed — developed into mighty suitable quarters for temporary field laboratories).

"We're not much interested in the weather," said sandy, short and bespectacled Dr. A. R. Kassander, who heads the Ames delegation. "We're mostly interested in automatic analysis of data. This is one of the big problems in meteorology. You collect a lot of data and then it takes people months and months to analyze it.

"As soon as the data comes in by way of our own wind tower, anemometers and thermometers and the data is recorded on magnetic tape, within a few minutes we can automatically compute and analyze it.

"This is a small child's type electronic brain," Doctor Kassander said wryly, pointing to an imposing box of spaghetti, dials, radio tubes and switches. "It is an automatic computational type device.

"We're a good long way in the direction of being able to have the data already computed when a test of this type is completed," Kassander added.

Robert W. Stewart, a tall, dark, handsome native of Salt Lake City and also an ISC staffer, explained the tinfoil ceiling, air conditioning and electronic shielding needed to protect the delicate equipment.

An improvised sign read: "We sleep here while the machines work." An arrow pointed to a cot neatly tucked under a workbench.

Kassander devised and Stewart, R. M. Richards & Co. of the Iowa State physics staff built pingpong ball anemometers, which appear to be doing their job admirably well. The halved 10-cent balls mounted on a small spindle rotate with the wind. A feeble voltage connects to the spindle and counts the turns. This voltage excites a few thousand dollars' worth of tape recorders and amplifiers and, presto, the data goes on file.

Most of the Iowa State equipment has been designed by Kassander for this job.

Fine thermometers take the temperature of the air two hundred times a second. The thermometers are 13-one-thousandths of an inch in diameter—a barely visible metal ball that increases and decreases current flow as the temperature changes. This excites tape recorders, the recorders touch off intricate relays, and 110 counting machines begin to chatter on a massive bank (or control board). This is the electric analyzer converting warm Nebraska wind into cold statistics of special interest to scientists.

Sixty thousand dollars worth of equipment and time invested — all custom-built and assembled for the O'Neill job. And integral parts of the Iowa State system are sliced 10-cent pingpong balls and the inexpensive rubber tip of a crutch.

"Turbulence, which we are studying here, is very important to agriculture and the results of the O'Neill test will have a direct application in agriculture," Doctor Kassander explained. "The eddys in the wind are the chief agency for transporting dust, pollen grains and moisture. The amount of turbulence determines the best times for spraying fields for insects and weed killing. Too much turbulence spreads the spray all over and it won't do much good. There are groups that are working on forecasting the best and most efficient times for dusting and spraying, taking into consideration atmospheric turbulence.

"There is an enormous industrial application of our electronic analysis equipment. We're getting lots of inquiries from big companies. Equipment of this type is being used for automatic process control and automatic factories, which we're beginning to hear a lot about, also in census-taking, and in fields where an enormous amount of data must be handled."

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Housewife Overlooked—

Thus, Iowa State's contribution seems to have rather vital military, agricultural and industrial applications. The only fellow ISC overlooks here is the housewife.

The Texas A&M research foundation has on the line, next in order, a shiny silver trailer that groans under the weight of its equipment. Dr. A. H. Glaser says his machine does the same thing only in a different way.

"Most of the equipment we're working with is owned by the Woods Hole Oceanographic Institute of Woods Hole, Mass. The work is under navy contract, and we are here to observe wind gusts, wind fluctuations and temperature fluctuations and from that derive the heat flux from the surface of the earth.

"Some of the our Texas A&M equipment measures wind gusts in both the horizontal and vertical directions. Our instrumentation is largely self—or automatic—computing.

"There are a variety of purposes why we are interested in heat flux. One is agriculture. The heat flux to and from the earth's surface determines largely the life and growth on the earth's surface," Glaser said.

Glaser, a native of Seattle, Wash., succumbed to a Texas bid once-upon-a-time and has been a Texan (minus the drawl) ever since.

Wind at the Texas A&M-Woods Hole lab is measured through a tiny rod that is whirled at high speed. The wind direction and force are traced, electronically on a graph and the computations are produced via another electric brain, which does "10 or 20 very complicated calculus or trigonometry problems every second.

"These senseless wiggles on the chart (graph) are transformed into numbers, which we can use, with a special machine," Glaser continued.

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'Nervous Breakdowns'—

"Our electronic brain has had a number of 'nervous breakdowns' — just about like people have. Some adjustment is set a bit too sensitive and there comes a shock of some kind. Then of a sudden we begin getting wrong answers. We have to stop it, throw the switches and twist the dials and start all over again."

The Woods Hole group also operates a PBY seaplane out of Lincoln (also lands at Norfolk). It measures temperature and wind changes with elaborate equipment aboard and hovers over the site for extended periods of time.

Dr. Vern Suomi of the University of Wisconsin says his mission —along with three other graduate students and staff members —is to measure "what happens to the sunlight" or the "heat budget."

"The sun is the source of energy for our weather. We want to know how much penetrates into the ground and warms the soil, how much is reflected back into space, how much is used to evaporate the water, and how much is used to heat the air near the ground.

"We expect to use a lot of our findings in behalf of agriculture," Doctor Suomi declared.

A Wisconsin staffer pointed out in the Wisconsin trailer what he described as a Brown self-recording potentiometer. Want to know what it does?

"Its purpose is to take the signals from the various instruments, measuring the various perimeters of interest to us, and record them on these charts so we can look up the charts later on and evaluate the data.

"We're studying below the earth's surface and up to a height of about 60 meters," Doctor Suomi added.

Also on the Wisconsin site are Lee Simms and Bill Lowery.

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Inconspicuous—

Mingling in the vast crowds of gaping sightseers were Dr. Heinz Lettau, ranking German meteorological scientist now working for Uncle Sam, a director of the project, and Ben Davidson, civilian scientist affiliated with the geophysics research directorate of the Air Force-Cambridge research center.

Mr. Davidson is the official coordinator for the O'Neill work which is officially designated as the "Great Plains Turbulence Field Project."

Lettau is a quiet, distinguished looking, fortyish fellow who brought his wife and three sons to O'Neill for the summer. Off the test site, he gets a big wallop out of artesian wells and hay crews at work. But then, that's a different story.

Davidson also has his wife and three children here.

"They're having the time of their lives," the youthful-looking Davidson happily explains.

Why O'Neill?

That's a question we've often asked since last spring when the word was passed that some sort of a scientific test would be pulled off this summer.

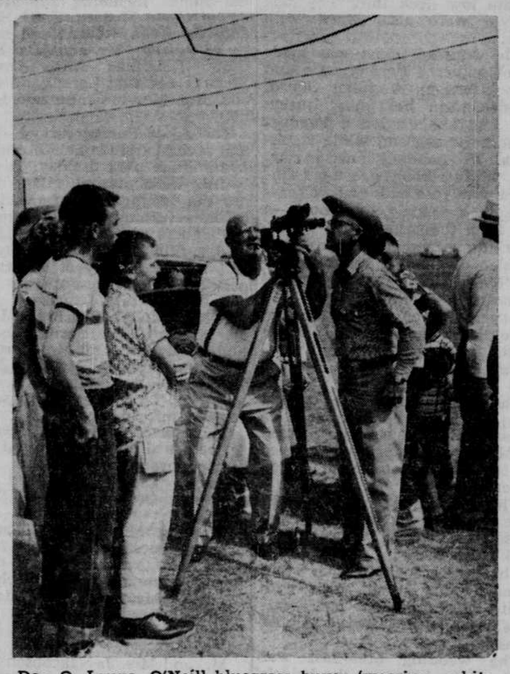
Lettau and Davidson steadfastly maintain that O'Neill's quirk winters and freakish storms in recent years have nothing to do with the selection of the site. They say weather bureau records were checked over a period of 70 years, steady wind conditions could be expected here during August and September, and by the nature of the test the site had to be somewhere in the mid-continent area.

(Continued in column 6)

Camera at Wind Test

—Official U.S. Air Force Photos.

An unidentified teen-age gal strains to peer into a photo theodolite camera.



Don O. Lyons, O'Neill bluegrass buyer (wearing white T-shirt and suspenders) crouches for a gander at photo instrument.

Robert Greenawalt (center, wearing dark glasses) explains functions of 10-thousand-dollar aerial cameras modified for the O'Neill project. Greenawalt served with the navy in Europe during World War II. His English wife and daughter are with him here.

The substitute 'copter is pictured about six feet off the ground. The whirlibird was the greatest single attraction on the lot.

Major Tibbetts, commander of military, lectures on smoke bomb and lighted balloon techniques to curious throngs.

Frost Protection—

The University of California at Los Angeles, cooperating with the Davis college of agriculture near Sacramento (ag campus of the University of California), measures wind and temperatures up to 50 feet and soil temperature changes. The Cal boys are working on a navy meteorological contract, but also have frost prevention studies in mind in connection with California's vast citrus industry.

John Vehrencamp of UCLA has cut out a circle of prairie sod. It floats on sensitive instruments that can measure the amount of drag or friction the wind causes on the soil surfaces.

But Sunday's wind (13-miles-per-hour near the surface) has little bearing on frost. When California has wind blowing at that clip in the valleys the prospects of frost are remote.

Hence, when we visited Vehrencamp's trappings the wind was out of the range of his delicate potentiometers.

For those of you who are interested, John's gadgets can measure force as small as 50 - millionths of a pound of pressure.

The Davis representative is Dr. F. A. Brooks. Some of the equipment they've brought along includes sensitive instruments that simultaneously record soil temperatures in 16 buried positions (as in a large orchard).

"The intelligence is automatically chalked up on an electric typewriter—16 temperatures every three minutes," according to David Rhoades, who was manning the typewriter when we dropped in. Rhoades hails from Davis, Calif.

Explains Vehrencamp:

"We want to know what effects combinations of heat produce, or, what's going on, weatherwise, in an orchard all the time. We sample the wind and temperatures up-and-down the tower and temperatures in the soil. We use thermocouples to pass a voltage through the sensitive recorders and come up with degrees Fahrenheit.

"Shearing stress is the technical term applied to the drag of wind passing over the ground," John added.

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Far-Fetched?—

It's a little far-fetched to have an elaborate van like California's transplanted 1,700 miles to study Nebraska wind — some of it so great it's out of range of the delicate instruments. Yet that's California's role in the O'Neill project.

"This Nebraska wind! Gee whiz, you've got it!" grinned John, whose home town is Sun Valley, Calif.

There's not a doctor's degree, master's degree or even a bachelor's degree in charge of the Sixth weather squadron's mobile weather unit from Tinker Field, Okla. But the outfit is in good, dependable hands—Davidson, Lettau, et al will testify to that.

The NCO in charge is T/Sgt. Donald Heggedahl of Kenyon, Minn., who launches weather balloons which will radio temperatures and humidity readings up to 10 thousand feet. Miniature transmitters are sent aloft aboard free balloons. A seven-ft. diameter cone picks up the feeble signals from the balloons, tracks the tiny light until it disappears, or until the batteries on the transmitter and light peter out, or until the balloons go aloft so high they disintegrate.

Heggerdahl's balloons are rated at 350-grams. The photo theodolite balloons, for example, are rated from 10- to 30-grams.

Johns Hopkins university of Baltimore, Md., measures wind, temperature, dew point, radiation of heat and the thirst of soil for water. Its findings will be practically adapted to agriculture.

The Johns Hopkins group is headed by Dr. Maurice Halstead of Bridgeton, N.J.

The Argonne Laboratory meteorology group from Chicago Ill., is concerned primarily with measuring wind and has a very sensitive electronic wind vane.

A detachment from the air force's Fourth weather group at Baltimore, Md., is operating captive (tied) balloons that send temperature and humidity readings to the ground by wire.

Offutt air base, Omaha, is furnishing vehicles and support personnel.

Airmen Edward G. Populo of Pittsburgh, Pa., and David A. Miller man the big diesel-powered AC generators that run night-and-day. The photography section is headed by T/Sgts. Robert T. Ashforth of Cincinatti, O., and John C. Best of Baltimore, Md.

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Real McCoy—

Troop carrier command has provided the helicopter to replace the one lost on July 30, when Dr. Guenter Loeser, another German scientist, and five air force personnel were killed in a crash near the test site.

The 'copter's belly and nose were opened Sunday for the curious visitors, most of whom had never before seen a whirlibird. Later, the pilot, Capt. J. T. Butcher, put the machine through some exhibitional paces. From it smoke bombs are dropped to measure winds during the day.

That's it. Once over lightly — very lightly. The biggest single event in meterology history . . . a study that will find its way into textbooks around the world . . . a new reference point in this phase of science.

The schedule calls for the windup of the project by September 11—most of the college people having to be back on their respective campuses immediately after that date. Cleanup operations will be carried out for several weeks after that.

Never before have so many experts and so much equipment been assembled at one place to attack the problem of turbulence in the lower blanket of air in which we live. The air is expected to "tell all" in the elaborate O'Neill test.

Mr. Davidson explained:

"We want to get a connected picture of everything that happens in a section of atmosphere for a whole day. To do that, each group has concentrated on measuring one thing with a great deal of precision."

The air force needs the information because turbulence in the air is of importance to everything that passes through it.

"Turbulence is the irregular motion of anything," soft-spoken Mr. Davidson points out. "If you don't stir your cup of coffee, the sugar on the bottom does not spread. When you stir, that is turbulence."

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'Book Larnin' '—

One of the New Mexico scientists got an earful from an affectionate father emerging from the UNM trailer.

The father put his arms around his son and reassured him:

"Only book larnin', son, only book larnin'."

Nobody here says anything about it, but the military application has something to do with guided missiles, chemical warfare and atomic radiation. This was foretold in June at a meeting of the American Meteorological society held in Santa Barbara, Calif. The forthcoming O'Neill test was discussed there and news dispatches were used liberally in the U.S. press.

I have a hunch if Doc Loeser were still around he'd derive a lot of satisfaction out of the smooth goings-on and the enthusiasm shown by the fellow scientists. Right down the line they think it's the real McCoy—a very worthwhile effort already highly successful.

It was Doc Loeser who helped conceive and who sparked the thing, transforming a half of a square mile of prairieland into a wizard's paradise.