

GEOGRAPHY

Human Eagles Make Geography

Group of Young Flying Map Makers at Harvard Increase the Accuracy of Our Knowledge of the Earth

By DR. FRANK THONE

WHEN the younger grandfathers and the older fathers of the present generation of school kids were themselves kids in school, their first introduction to the mystery of maps, in geography class, was usually worded something like this:

"Now, children, just imagine yourselves able to fly, like eagles, until you were very high up above the earth, so that you could see a long way in every direction. You would see everything spread out flat beneath you, but everything would look very small. You would see not only this town that we live in, but many others besides, and rivers and lakes and hills and mountains. And if you made a drawing of the country, as you looked down on it from away up there, it would look like this . . ."

You were doubtless a little dizzy from this flight of fancy by the teacher, but it fascinated you just the same. All of us have a hankering for heights, clambering up trees and adventuring on the ridgepoles of forbidden barns as children, just to see what we can see; going mountain climbing, or at least taking elevator rides to the top of the Empire State Building, in later years for exactly the same purpose. Of all legends and tales, those of wing-footed Mercury, wing-shouldered Daedalus, the flying carpet of the Arabian Nights,—all that told of rising high and seeing far without the weary labor of climbing, have always been our favorites.

Dream Came True

Just about a generation ago, the dream of all youth for ages suddenly became real. Only a few months after the splendid tragic failure of Langley came the shining success of the Wrights. Men could fly at last; men could mount high and see the earth laid out beneath them like a map. The wings of Icarus were no longer broken; whereas we had before been forced to view our world with the short sight of beetles, now we could use the eyes of eagles.

Men were not long in realizing what

their first-grade teachers had gently imagined for them. Pictures from the air were so obviously useful, as well as interesting. And when a world war broke out, just a decade after the first successful airplane flights, the evolution of air photography and air mapping was intensely speeded up under the lash and spurs of military necessity. The mechanical eyes of our mechanical eagles quickly reached an amazing accuracy and speed of operation.

When the guns stopped—the blind guns for which they did the seeing—the eagles had no need to droop their wings. Unlike Othello, they did not find their occupation gone. On the contrary, in the service of peace and civilization, they had more occupation than ever. During the post-war years, airplane mapping has become one of the standard methods of geographers, map-makers, surveyors. The

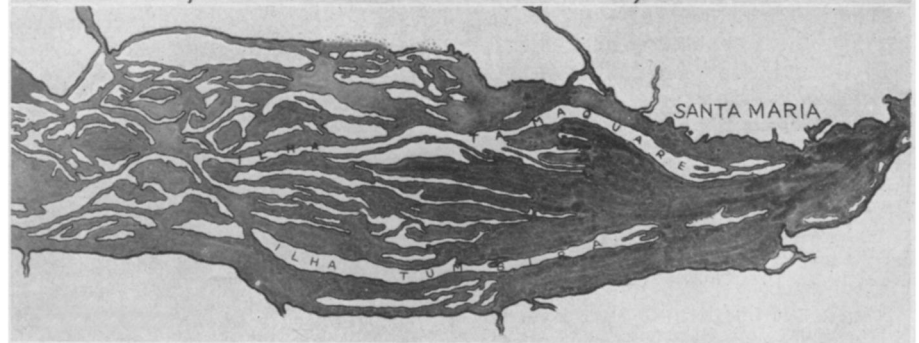
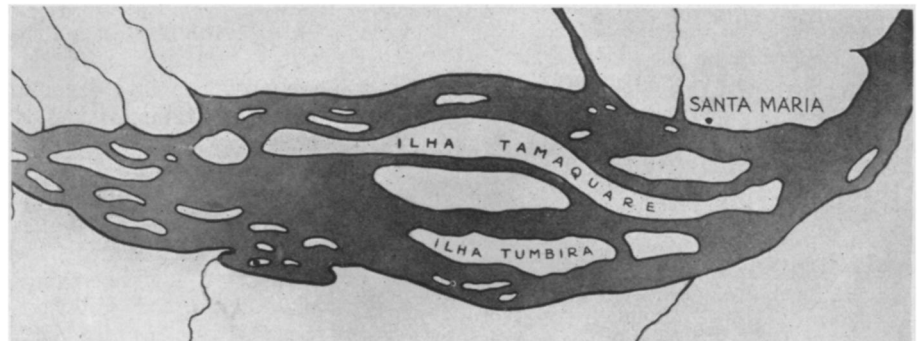
eagles' eyes make our daily lives safer and far more interesting than they used to be.

Lately there has been established at Harvard University a veritable nest of young human eagles, in training to fly forth into the skies over all the earth, to see and record and perfect our knowledge of the cities we dwell in, the ground whereon we walk, the seas on which we sail our ships. It is the Institute of Geographical Exploration, the dream-made-real of a young teacher of scientific geography, Weld Arnold.

Not that all the work of the young men of the Institute is done thrillingly on the wing. Not even eagles spend all their time among the clouds. Research students at the Institute have many exacting hours over the drawing-boards, many necessary nights with their books. Only the elect are admitted, and only those who can "take it" may stay. Many feel that they have been called, but only a few are chosen. And of these few, some are given wings to fly.

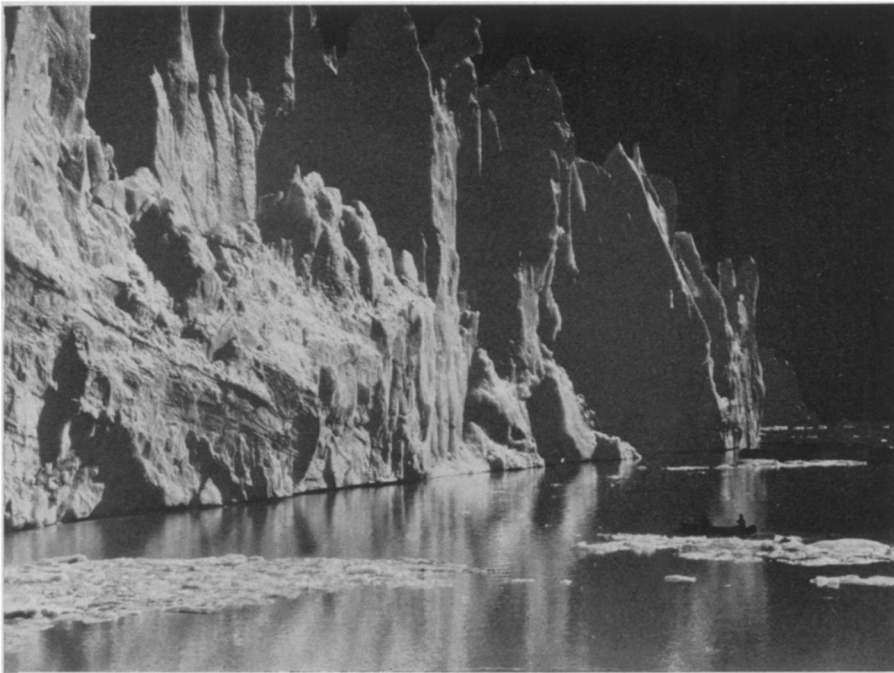
BEFORE

Made 20 years ago by conventional mapping methods, this chart of a Brazilian river is crude, incomplete and full of errors.



AFTER

A half-day's flight and camera shooting, with patient draftroom work afterwards, corrected twenty-year-old errors in the map of a tangled tropical river.



BEAUTY SURVEYED

Towering cliffs of solid ice, where Crillon Glacier, in Alaska, meets the sea. Note the two explorers "taking a chance" in an Indian canoe.

These fortunates, however, fly far and see much. The familiar skies of home, over Cambridge and Cape Cod, may see their first sky-circlings; but in the end their motors have roared to the echoes of the glacier-groaning mountains of Alaska, over "Ind's enameled peaks that rise around that inmost One," among the mysterious dead pueblos of our own Southwest, above the matted green tree-tops of the mightiest of equatorial river basins.

The skies of home are chosen first not merely as a matter of convenience or safety, but because the home city and the home state offer some mighty good training in the new geography. Boston and Cambridge present most interesting combinations of the old, tangled, "cow-path" streets dating back to earliest Colonial times, and the new, straight-line boulevards of modern motor traffic. The state of Massachusetts as a whole gives a wonderful range of topographic jobs to work on, from the flat shores of Cape Cod and the rocky coast of Nantucket to the mountainous lift of the Berkshire Hills.

Five Lenses

At Cambridge and Boston, and at Massachusetts, then, the map-making eagles first direct their high-altitude eyes. They are most remarkable eyes, those Fairchild cameras that are the tools of the map-making skyman. They look with five lenses at once, one straight down,

and one to each of the four quarters of the compass. Each picture thus comes out in the shape of a Maltese cross, with an undistorted square in the middle, and on each of its four sides a rectangle wider at one end than at the other.

These flare-ended side pictures give plenty of drill at the plotting-board, for their distortions have to be herded back into straight-lined rectitude by proper mathematical formulae before they can be considered orthodox enough for really accurate mapping purposes. It is fascinating work, but exacting. Small wonder that Weld Arnold is proud of the record of his men, in making Massachusetts the first state in the Union to be completely mapped from the air.

Far Afield

Having won their right to wings over the home nest, the young eagles of geographic science are flying in many alien skies.

Worthy of eagles was their task on the Washburn Alaska expedition. Here they photographed the towering snow-wrapped mountains with their terrific precipices of sheer white and their awesome slow glacier-rivers of creeping ice. Those glaciers were their special quarry. They circled over them, charting their curving courses, getting details of their banded surfaces, marked with tell-tale rhythmic zones of annual growth, like the annual rings in a tree. In small boats they sailed

impudently up to their towering faces where they front the sea—a most uneasy kind of adventure, since if one of them should suddenly "calve" an iceberg it would set up a miniature tidal wave able to swamp any lesser craft.

Eagle-worthy also was the task of the expedition that went around to the "back door of the Himalayas," through China's Far West, that inner land where few white men ever travel. This expedition's chief goal was Minya Konka, a tremendous mountain seen by an earlier American expedition and estimated by them to be higher even than Everest. The Harvard geographers worked from the ground as well as from the air, making careful sketches of geological and topographical features. They found Minya Konka to be lower than the earlier estimates had made it, and so second to Everest after all; but a most splendid, awe-inspiring peak none the less. And incidentally they had the privilege of gazing upon the Great Buddha of Kiating, Szechuan Province, a 200-foot image of the great religious leader carved out of a huge mountain crag long ago, as Washington's face is being carved on a peak in the Black Hills, in our own land, today.

Exploring Wilderness

While these two expeditions were searching remote mountain fastnesses for their secrets, a third was in a land without mountains but with rivers harder to master than any mountain. For the Rio Negro and the Rio Branco, tributaries of the vast Amazon, wind into labyrinthine channels in which a boat can get hopelessly lost, and the thick forest that covers the face of the land makes travel on foot simply impossible. The only means for rapid travel is the airplane, fitted with pontoons for use on the bayous and quieter backwaters, which constitute the only practicable landing fields.

Over this wide wilderness the plane again proved its value as a map-maker's eye-carrier. Maps made twenty years ago, by laborious parties in boats, showed four principal channels and perhaps a score of good-sized islands, on one particular stretch of the Rio Negro. These surveys required weeks of work in insect-infested jungles. And in a half-day's flight with a good plane and camera the whole tedious job was made obsolete; the river is now shown split into nearly a dozen channels by several times as many narrow, ribbon-strip islands, some of which curl and double on themselves like fish-hooks or carpenter's shavings. It is a simply astonishing demonstration of the tenfold

greater accuracy and the thousandfold greater ease of doing one's geography from the air.

But the making of modern maps by modern means is not the only occupation of the students of the Institute. They take their turn at making ancient maps by traditional means, quite as though they were artist-scribes in a medieval monastery. The eagles can play owl, on occasion.

Among the historical treasures of the Institute are several ancient books of geography, dating to pre-Columbian Europe. In these there are no maps, but cities and other places are set down in long lists, each spot given its latitude and longitude, sometimes with marginal notes on natural resources, commerce, or customs of the people. Graduate students have worked out maps from these, carefully drawing them in the antique style with quaint old-fashioned lettering. They have successfully recaptured the spirit of the old geographers, and are looking on the late-medieval world with late-medieval eyes.

Some of the marginal notes, transferred onto appropriate spaces of one of these maps in the original archaic Low German, are really amusing:

"Ibernia: In that land is Saint Patrick's hell or purgatory."

"Canaria: . . . is a rich island of wine."

"Norwegen: In that sea one finds the best stockfish."

"Sicilia: In that land there is a mountain that always burns and is called Aethna."

Egypt bears the alternative title, "the New Babylon, where the Insoldan or Great Emperor lives, who has possession of the Holy Sepulcher," and the Nile bears the name "Zenlus."

And off to the northwest of the British Isles is shown part of another island, labeled "Ciliven or Tileben," with the further information, "When the sun is in Cancer, the people have one month of day; and in Capricorn, one month of night."

There were diligent geographers in Germany in those days, but their diligence might have been better rewarded had they possessed better means of exercising it. The world had to wait long for its far-seeing eagles!

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A chain of old forgotten Spanish missions, swallowed by the desert a generation ago, has been found in California.

ASTRONOMY

Dunlap Observatory Dedicated On Director's 70th Birthday

See Front Cover

PAVING the way for new advances in astronomy's knowledge of the architecture of the universe, the David Dunlap Observatory was officially opened on Friday, May 31, the seventieth birthday of its director, Dr. C. A. Chant, whose lifetime has been spent in fostering Canadian astronomical development.

Presented to the University of Toronto by Mrs. Jessie Dunlap as a memorial to her late husband, an enthusiastic amateur astronomer, the observatory, located fifteen miles north of Toronto, contains the largest telescope in the British Empire and at the present time the second largest in the world. It is a reflector, with a seventy-four-inch concave mirror. The observatory is shown on the cover of this week's SCIENCE NEWS LETTER.

"We shall participate almost exclusively in work on stellar velocities and spectral photometry," Dr. Chant informed Science Service. "With a telescope of such power we shall be able to secure much valuable material, never before obtained.

"While the major part of the observational program, planned for years in advance, will be devoted to work on the motions, temperatures and densities of stars from spectroscopic observations, it is possible that a little time may be given to direct photographic work, especially in future years when we hope to secure additional instruments especially designed for that purpose."

In addition to the great telescope, with its seventy-four-inch disk of pyrex glass, the observatory has a nineteen-inch reflector designed and constructed by its associate director, Dr. R. K. Young. This instrument also will be used for spectroscopic work.

The observatory's location was decided upon after extensive investigation of all possible sites near Toronto. Situated on the highest point of land in the district, and north of the city so that smoke will be carried away by the prevailing northerly winds, at least one hundred clear nights are expected yearly, Dr. Young explained.

The site, formerly farm land, will be developed as an arboretum, to be known as David Dunlap Park. The tree plantings will be a great advantage from an astro-

nomical point of view, since trees absorb much of the sun's heat by day, and thus minimize rising currents of air at night, which would otherwise create an unsteady atmosphere and interfere with the use of the telescope.

Sir Frank Dyson, former Astronomer Royal of Great Britain, Dr. Harlow Shapley, director of Harvard College Observatory, Dr. W. E. Harper, acting director of the Dominion Astrophysical Observatory at Victoria, B. C., and Dr. V. M. Slipher, director of the Lowell Observatory at Flagstaff, Arizona, received honorary degrees at a special convocation of the University, as did also Mrs. Dunlap and Dr. Chant.

Science News Letter, June 15, 1935

ARCHAEOLOGY

Single Hieroglyph Sheds Light On Ancient Toltecs

A SINGLE word sign on an old stone monument, detected by a young woman traveling near Pacific shores of southern Mexico, has revealed a new outpost to which the civilization attributed to "Toltec" Indians spread its ancient learning.

Miss Emma Reh, now in Washington, reports the discovery made at the ruins of La Labrada, in the Mexican state of Guerrero. Indians of the neighborhood called Miss Reh's attention to the existence of the ruins, the center of which was a tall, complex terrace, once stone-faced but now buried in forest.

Examining the carved monuments lying in underbrush around the terrace, Miss Reh quickly sketched about three feet of one twelve-foot monument. Later study of this drawing shows the significant "Glyph A," as Mexican scientists have called it, a picture sign found at ruined cities as far apart as Chichen Itza in Yucatan, Monte Alban in the southern highlands, Xochicalco in south-central Mexico, and now in the coast of the country. The ancient influence which spread common writing symbols over this wide area is often called "Toltec," a civilization preceding the Aztecs who were in power when Cortez conquered Mexico.

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