In addition to their theoretical significance, these mathematical functions were directly applicable for determining the proper concentration of morin in the fluorescent system. The combined effects of the opposing functions indicated the one region of free morin content that gives linearity and also maximum sensitivity for this system. Working curves prepared with this optimum amount of morin are linear over a wide range of thorium concentration.

A transmission fluorimeter was designed and built for use in this investigation. Its light source, sample cell, and phototube are arranged on a linear axis with a lamp and phototube on opposite sides of the sample. This arrangement is superior to that of conventional fluorimeters for theoretical studies, because it simplifies the development of the mathematical relationships of light absorption and fluorescence.

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Ground Water in the High Plains of West-Central United States

THE vast High Plains of the west-central United States constitute a region of transition—rather abrupt transition—between the humid East and the arid Southwest. Here, water problems are the more trying because, from year to year, the region "vacillates" between a semiarid or arid environment and a moist subhumid environment. Here, then, "average" water conditions can be misleading indeed.

The High Plains are unique in many respects. Once the grass-covered home of buffalo and nomadic Indians, they were conquered and settled first by cattlemen, who found the virgin grasses ideal for stock raising; then by dry-farmers, encouraged by the Homestead Acts, who discovered the high fertility of the soil; and finally by farmers who found that in parts of the area the uncertainties of meager precipitation could be offset by irrigation—first from streams and later from wells. To a growing agricultural development, discoveries of large oil and gas fields have added substantial industrial development.

The agricultural development has not been without failure and hardship, for nature has tried many times to undo man's accomplishments and often has succeeded over all but the most persevering. Severe drouths and dust storms have ruined dry-farming periodically, but, thanks to irrigation (largely from wells), a stable and prosperous agricultural economy has been established at many places.

Available information indicates that the groundwater reservoir beneath the High Plains probably contains more than 2 billion acre-ft. An estimated 2,700,000 acres now is irrigated by pumping from about 26,000 irrigation wells. The Llano Estacado in Texas and New Mexico, the most heavily pumped part of the High Plains, typifies a large part of the area where ground water is the sole source of supply. Some areas remain undeveloped but some are overdeveloped.

Basic information, collected and studied over a period of more than 20 years by the U.S. Geological Survey, in cooperation with the several States, has materially aided the understanding and orderly development of ground-water resources, but much more investigation and study are needed to realize full development.

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Preliminary Report on the Geology of the Aleutian Islands

SINCE 1946 the U.S. Geological Survey, in cooperation with the Department of Defense, has been making a reconnaissance study of the geology of the Aleutian Islands. The Aleutian Islands form a volcanic island arc extending 700 mi westward from the Alaska Peninsula. A deep submarine trough, the Aleutian Trench, lies along the southern convex side of the arc. The northern concave side is marked by a line of stratovolcanoes and is bounded, in part, by a steep scarp that extends to the floor of the Bering Sea.

The oldest rocks crop out on Attu, Agattu, Rat Island, and Amchitka in the western Aleutians and along the southern edge of many of the central and eastern Aleutian Islands. The association of rocks is typical of volcanic geosynclines in orogenic zones and consists of a thick sequence of pillow lava, submarine pyroclastics, siliceous mudstones, argillite, sandstone, and conglomerate. The pillow lavas are basaltic and spilitic. Many of the submarine tuffs are keratophyres. These oldest rocks have yielded no identifiable fossils, and they differ somewhat in lithology from island to island; neither their age nor their interisland correlation is known. On Attu and Amchitka an unconformity separates them from overlying rocks containing early Tertiary fossils.

On Attu and Amchitka, the spilitic suite is overlain by several thousand feet of conglomerate and banded, well-bedded siliceous mudstones, argillite, sandstone, and limestone, all deposited in shallow water. Foraminifera suggest an Eocene-Oligocene age. Rocks of early Tertiary age have not been recognized in the central and eastern Aleutians.

Both the spilitic rocks and the early Tertiary sedimentary rocks of the western Aleutians have been intruded by dikes, sills, and small plutons of gabbro and by a few stocks of albite granite. Batholiths and stocks of diorite and quartz diorite have been found in the central and eastern Aleutians. In general, the intrusive rocks of the Aleutian Islands belong to the calc-alkalic circum-Pacific suite.

Unconformities younger than the plutonic intrusive activity have been mapped on Attu, Kiska, Umnak,

and Adak. These unconformities cut across the spilitic sequence and early Tertiary marine sediments on Attu, the early Tertiary sediments on Kiska, and the old deformed marine sediments and pillow lavas on Umnak and Adak Islands. On Attu, subaerial conglomerate and lava flows overlie the unconformity. On the other islands, lava flows associated with the late Tertiary to Recent stratovolcanoes overlie the unconformities. Unalaska has both deeply eroded dioritic batholiths and a stratovolcano, but an unconformable contact between the two has not yet been found.

Paleontological evidence for confidently correlating the various unconformities is lacking. All of them, however, are overlain by subaerial volcanic rocks and underlain by marine sediments and geosynclinal volcanic rocks. Although these unconformities perhaps differ somewhat in age from island to island, they seem to represent a major uplift of probable middle Tertiary age that extended the length of the Aleutian chain and, perhaps, signaled the birth of the present Aleutian Island Arc.

Normal faults and broad open folds characterize the structure of the Aleutian Islands. Evidences of deep burial or strong compressional tectonic forces, such as thrust faults, isoclinal folds, or strong regional metamorphism, are absent. Most of the faulting occurred during the middle Tertiary uplift, but some faulting has continued to the present.

The late Tertiary to Recent history is one of stratovolcanism involving eruption of calc-alkalic rocks, severe glaciation, and several changes in sea level relative to the land. Today, the Aleutian Island Arc is an area of many active volcanoes and earthquakes, a restless segment of the earth's crust, that contains a record of volcanism and crustal deformation beginning in pre-Tertiary time.

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Long-Term Recovery of Metabolic Products from Rats[1]

FOR many metabolic studies in rats, it is desirable to collect quantitatively, for periods of several weeks, respiratory gases and unmixed excreta uncontaminated with food. A technic has been developed that accomplishes this and avoids any possibility of cross-contamination between urine and feces. Without interrupting collections, blood may be withdrawn and materials may be injected intravenously, intraperitoneally, or subcutaneously.

The hindquarters of an animal are enclosed in a plaster of paris cast, which extends upward to support a bottomless wide-mouthed glass jar of appropriate size that is placed around the animal's head and forequarters (Fig. 1). An airtight seal between the animal and the glass jar is made by cementing a 1-in.-wide belt of sheet rubber around the shaved body of the anesthetized animal midway between the front and hind legs. A sleeve of sheet rubber is cemented to this belt and turned up over the outside bottom of the jar. Enough cotton sheet wadding is wrapped around the body to allow freedom for breathing but, at the same time, to restrict the animal so that it cannot reach and damage the rubber sleeve with its claws or teeth. Better results are obtained if the cast is not padded about the legs. While the cast is being applied over the sheet wadding, jar, and hindquarters of the animal, the hind legs are extended at right angles in the same horizontal plane as the trunk. To prevent contamination of the cast and resulting loss of the excreted products, the plaster is cut away liberally around the external excretory organs.

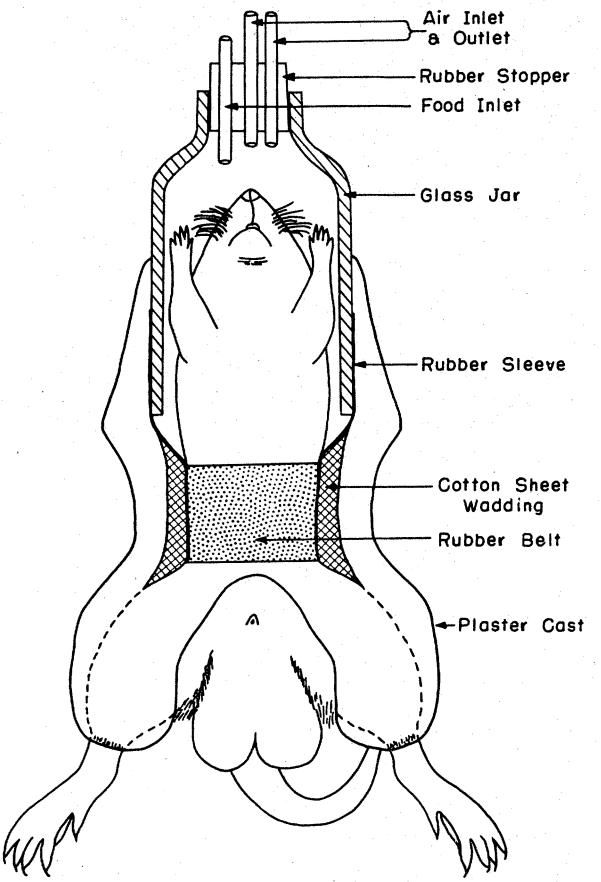

FIG. 1. Diagram showing position of rat with relation to other parts of the assembly.

The encased animal is suspended over small beakers that serve as collecting dishes for the excreta. Complete separation and collection of urine and feces are easily accomplished with male animals but may be less successful with females. The mouth of the glass jar is closed with a rubber stopper that has three holes,

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