TABLE 1. Installed capacity of water power plants of the world and of the U.S. compared, 1920–52.

Year* (Dec.)	Total capacity of water-power plants (in thousands of hp)		Comparison with 1920 (%)	
	World	U.S.	World	U.S.
1920	23,000	7,500	100	100
1923	29,000	9,087	126	121
1926	33,000	11,177	143	149
1930	46,000	14,885	200	198
1934	55,000	16,075	239	214
1936	60,000	17,120	261	228
1938	63,900	17,949	278	239
1940	69,400	19,000	302	253
1941	71,600	19,816	311	264
1945	77,800	24,223	338	323
1947	86,900	24,500	378	327
1950	101,000	27,500	439	367
1952	115,600	31,000	502	413

* Years when estimates were made by U.S. Geological Survey.

tries of the world prior to 1920. Development in all countries is continuing at an unprecedented rate.

Water-power developments now in progress will total more than 5,000,000 hp in the next few years in the United States and more than 3,000,000 hp in Canada. The Union of Soviet Socialist Republics reportedly has plants under construction that will total 6,000,000 hp. Developments are in progress in Australia that will total more than 1,000,000 hp. In China consideration is being given to a project on the Yangtze River that would have a capacity of about 15,000,000 hp.

The capacity of water-power plants (1952) and the estimated potential water power for the various continents are listed in Table 2.

Africa is seen to have the largest potential power and the smallest installed capacity of the continents. Actual development of much of this power presents almost insurmountable obstacles owing to inaccessibility and remoteness from possible points of use. Much of Asia's potential power is on large northern rivers, also remote from possible markets.

TABLE 2. Water-power plants and potential water power.

Continent	Capacity of water-power plants, 1952 (in thousands of hp)	Potential water-power based on ordinary minimum flow (in thousands of hp)
Africa	715	250,000
Asia	14,392	156,000
Europe	48,516	64,000
North America	46,430	90,000
Oceania	1,778	23,000
South America	3,962	62,000
World (approx.)	115,793	645,000

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Total-Intensity Magnetic Anomalies of Three-Dimensional Distributions by Means of Experimentally Derived Double Layer Model Fields

MODEL experiments have been used for many years in magnetic interpretation because the magnetic fields of geologic bodies can be determined with greater facility experimentally than by calculation. Experiments in the past have usually dealt with the vertical and horizontal components of the magnetic field. We recently completed a series of experiments at the Naval Ordnance Laboratory wherein the total magnetic intensity in the direction of the inducing field was measured for a series of models to devise a rapid method for the interpretation of total-intensity aeromagnetic maps.

Any irregularly shaped magnetic body may be approximated by the proper arrangement of prismatic rectangular slabs of constant thickness and varying horizontal dimensions. The contoured total-intensity magnetic fields of such slabs buried at different depths and subjected to inducing fields of varying inclinations may be determined experimentally. It can be shown that for sufficiently small areas, the direction of the anomalous field may be assumed to be codirectional with the earth's ambient field. Consequently, for an irregular magnetic mass distribution, the field may be obtained by superimposing the appropriate contoured maps and adding numerically the effects at each point.

Experiments were conducted in a building constructed entirely of nonferrous materials. In this building, Helmholtz coils are used to establish a field simulating the earth's magnetic field at the center of the system. With the aid of a potentiometer arrangement, this can be done with accuracy of 10 gammas. Models constructed of a uniform mixture of 1 part powdered magnetite and 2 parts plaster of Paris by volume are placed on a fixed tray in the center of the system. Below the model is a detector, placed on a vertical tower and capable of moving in either a north-south or east-west direction. The detector is a second harmonic flux-gate type magnetometer. The signal is amplified and recorded as a continuous profile as the detector is moved over the model.

The thickness of our models was 0.5 in., and the horizontal dimensions (in inches) were 5×20, 5×30, 5×5, 10×30, 10×10, 20×20, $2\frac{1}{2} \times 20$, 10×20. Fields were mapped with the long axis oriented first parallel to, then normal to magnetic north. Fields were measured in a horizontal plane for model-detector depths at intervals of 0.5 in. between minimum and maximum depths of 5 and 10 in., respectively. The magnetic dips of the inducing fields were taken to be $I = 0°$, $20°$, $30°$, $45°$, $60°$, $75°$, $90°$.

All the experimentally derived field maps will be made available in a "normalized" form, that is, one that is independent of the susceptibility of the model and the strength of the inducing field, and dependent only on the geometry of the prism. In this manner, complicated bodies may be built up by the proper combination of prismatic blocks, and the total normalized field computed by arithmetically summing up at each point the normalized fields due to each of the prismatic slabs. Multiplication with the susceptibility of the known rock and the inducing field strength will result finally in the desired anomalous magnetic field.

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Oligocene Plants and Correlation

A SMALL area of freshwater shale at Florissant, Colorado, has long been noted for its outcrops containing abundant and well-preserved plants and insects and less well known for its scarcer mollusks, fishes, birds, and mammals. The isolation of these fossiliferous strata has caused much speculation about their correct position in the geologic column, but most opinion has fluctuated between Oligocene and Miocene assignments. Within the last 20 yr paleobotanists have reasoned that the flora could not be very much younger, relatively speaking, than that in the middle Eocene Green River formation, because the two have many identical or closely related species in common. A confirmation of this view came with the discovery of an opossum whose affinity was considered to be with Oligocene forms; and more recently, an Oligocene oreodon jaw was taken from beds lying just above the plant-bearing shales. The Oligocene age of the shales, therefore, seems no longer in doubt.

The Florissant flora, according to a restudy by MacGinitie,[1] approximates 150 species, which include pine, spruce, fir, sequoia, white cedar, poplar, willow, hickory, oak, elm, zelkova, Oregon grape, hydrangea, mountain mahogany, hawthorn, rose, redbud, ailanthus, cedrela, smokebush, sumac, maple, dipteronia, koelreuteria, grape, linden, and many others. Can this rich flora now be used for dating other floras in the Rocky Mountain province?

In 1952 my assistant and I spent two days in the hilly area west of the south end of Ruby reservoir, 12 mi south of Alder, in southwestern Montana. From fissile, pinkish shales, somewhat like those at Florissant, we collected many fine leaves, seeds, and insects. The insects include craneflies, bugs, beetles, wasps, ants, mayflies, and grasshoppers, many of which, it appears to me, can be matched in the Florissant fauna. The most startling correspondence, however, is in the floras, although some species present at Alder are absent at Florissant, and vice versa, a circumstance that is not particularly surprising. The species of *Chamaecyparis, Pinus, Picea, Sequoia, Typha, Cercocarpus, Cotinus, Ailanthus, Mahonia,* and *Fagopsis* are, in my judgment, identical in both floras. *Cotinus* and *Fagopsis,* until now, have been unique in the Florissant flora. They have characteristic features that make them readily recognizable. That the Alder locality is in Oligocene deposits is attested by fragmentary mammalian remains from nearby correlative, or slightly higher, whitish strata.

In 1953, together with a U.S. Geological Survey field party, I examined the shales intercalated with ashy and tuffaceous deposits on the west side of the Canyon Ferry reservoir, east of Winston, Montana. These strata had already been dated as Oligocene on the basis of mammalian remains. The shales yielded leaves, seeds, and insects, but these were not as well preserved as those at Alder and Florissant. The plants include species of *Chamaecyparis, Picea, Pinus, Sequoia, Alnus, Betula, Tilia, Zelkova,* and others. Except for the conifers, there is no close tie with the Florissant flora, but most of the dicotyledons are the same as those at Alder. Although these three floras are thus linked together by substantial agreement in composition, they may not have been exactly contemporaneous and the strata containing them may occupy somewhat different positions in the Oligocene series.

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[1] MacGinitie, Harry D. Carnegie Inst. Wash. Pub. 599 (1953).

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Scribing as a Substitute for Drafting in the Preparation of Maps for Reproduction

A NEW technique of drafting with special tools on coated plastic, known as *scribing,* is rapidly supplanting pen-and-ink drafting in the final stages of map production. An adaptation and refinement of negative engraving used in photolithography, the new method produces a more legible map with neater and sharper line-work in a shorter time and at less cost.

In the older method the printer's copy, the drawings from which printing plates are made, is the product of skilled freehand inking. The map detail is reproduced photographically on metal-mounted paper and traced in ink by the draftsman. A separate drawing is required for each color, the line-weight and registrations must be very precise, and the appearance of the printed map depends largely on the talent and patience of the draftsman. Because of the shortage of competent draftsmen, the operation is frequently a bottleneck in the production line.

With scribing, more dependence is placed on mechanical aids; therefore the result is more uniform. A