miles from the sea at an elevation of between 1,500 and 2,000 feet. After winter rains set in the medusae disappeared but were again observed in the same pond in May, 1939; they were still present in September of this year, but disappeared about the middle of October.

Some specimens were sent to me for determination. The likeness of the Maui medusa to *Craspedacusta sowerbii* was at once suggested and later verified by comparison with specimens of that species received through the kindness of Dr. A. E. Woodhead, of Ann Arbor, Mich. The only apparent difference between the Michigan and Hawaiian specimens is a larger number of tentacles in the latter. This, however, is probably a difference in size of individuals. Maui specimens 17 mm in diameter of bell bear approximately 500 tentacles, arranged in several series, varying in length and in level of separation from the surface of the bell.

Difficulty is expressed by Miss Sylvester in keeping the medusae alive under laboratory conditions. In tap water they lived only a day and but four or five days when pond water was used.

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REAPPEARANCE OF AN ANCIENT ABSURDITY REGARDING MAGNETS

IN the *Science News Letter* for February 3, 1940, there appears in a prominent position[1] a story which reverts to a way of comparing magnets that became obsolete two hundred and ten years ago. The anonymous author of this story is only the latest of a long line of careless writers who make it hard to justify the popularization of science by its uncritical friends.

The mistake, repeated five times in a total of less than 150 words, consists in setting as a figure of merit for a magnet the ratio of the weight it can lift to its own weight. This was outmoded in 1730, when James Hamilton (Lord Paisley) put the facts in this connection into the following statement:[2]

> The principle upon which these tables are formed is this: That if two loadstones are perfectly homogeneous, that is if their matter be of the same specific parity, and of the same virtue in all parts of one stone, as in the other; and that like parts of their surfaces are cap'd or arm'd with iron; then the weights they sustain will be as the squares of the cube roots of the weights of the loadstones; that is, as their surfaces.

Hamilton's rule teaches that any ratio of weight lifted to weight of lifting magnet can be reached with any magnet material simply by making the magnet small enough, and this interpretation was very well and widely known fifty years ago.[3] It therefore is complete nonsense to say that one material or method of construction is superior to another because a certain little magnet of the newer sort can lift a more impressive multiple of its own weight than can some indefinitely larger magnet of the older sort.

This note is not intended to deny that new materials and new methods of using them have vastly increased the usefulness of permanent magnets wherever magnetic adhesion is wanted. All that is objected to is the fallacy of emphasizing weight ratios in this connection.

Those who should have known better, but didn't, may derive cold comfort from the fact that this particular absurdity has been repeated at frequent intervals ever since 1730, sometimes by reputable physicists, and even after Hamilton's rule had been rediscovered twice.[4] All but the simplest truths about static electricity and permanent magnets seem, indeed, to have been forgotten very generally during the century, 1820–1920, in which electromagnetic phenomena were so much more novel and interesting.

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Since the photograph caption to which Professor McKeehan refers was based on information supplied by the General Electric Company, when the editor of SCIENCE gave opportunity for adding an explanation to Professor McKeehan's comment, we referred the matter to that company with the result that the following explanation by Mr. W. E. Ruder, head of the metallurgical section of the General Electric Research Laboratory, was received with permission to quote:

> Professor McKeehan's note to SCIENCE borders on the redundant. No comparison or rating of *magnets* is made or intended. In the "500X", "1500X" and "4500X" holding powers mentioned the same magnet material, Alnico, of essentially the same size was used. The whole point to these experiments is to bring out the fact that the design of a magnet is of the utmost importance in its application. With the newer types of higher coercive force and lower residual magnet alloys it is most important to reduce leakage to a minimum if the maximum available energy of the magnet is to be utilized in *holding*. In this case we reduced leakage to a minimum with soft iron pole pieces and introduced multiple gaps so designed as to take the greatest advantage of the high coercive

[1] The upper right-hand corner of the page facing the front cover, or, more precisely: Vol. 37, p. 67.

[2] Royal Society of London, *Phil. Trans.*, 36: 245–250, 1730.

[3] For example, it was discussed at length by Silvanus P. Thompson in the second of his Cantor Lectures on the electromagnet, delivered in London on January 27, 1890: *Journal of the Society of Arts*, 38: 889–905, 909–926, 1890, especially pp. 895–896.

[4] First by Daniel Bernoulli: *Acta helvetica, physico-mathematico-botanico-medica*, 3: 233–249, 1758; again by P. W. Haecker: *Annalen der Physik . . . Poggendorff*, 57: 321–345, 1842.

force of the magnet material used. We made no attempt to reestablish or disprove the Hamilton Rule as quoted by Professor McKeehan, as it has no bearing whatever on this magnet design. If we cared to be critical, we would ourselves object to the "160 man—72,000 pound weight" statement, as lifting and holding are obviously not the same thing.

We have no objection to Professor McKeehan's academic statements as such, but to title them as he has, or to refer to our design of magnet assembly in that connection implies a lack of fundamental knowledge on our part that is hardly justified. With the interested lay reader the terms coercive force, residual, and maximum available energy may be assumed to have little concrete meaning, but to say that a magnet of a certain size and design will hold 100 pounds conveys something quite real even though only comparative. It was never intended as an absolute measure of magnetic quality.

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ROGER BACON WAS MISTAKEN

IN a recently published, and in general commendable, book I find the following:

> These ancient volumes said that hot water would freeze more quickly than cold water; . . . These are just samples of some of the drivel that was accepted by "learned" men. . . . But Bacon had little regard for authority. He was an experimenter. So he took two vessels exactly alike and filled one with cold water and one with hot. It was a bitter cold day. He set the vessels out of doors. When the cold water froze first Bacon decided that the ancient author was a liar.

But if Bacon had taken a pint of drinking water from his kitchen and a pint of boiling water from his teakettle, had put each pint in similar open tin dishes, and had set them outdoors in zero weather he would have found that the hot water was the first to freeze. The hot water would have cooled very rapidly, partly on account of the rapid evaporation and partly on account of the rapid loss of heat by radiation. The cold water would have evaporated slowly and cooled slowly. Consequently, the hot water would have reached the temperature of the cold water several degrees above the freezing point, and, since a large amount had evaporated, the smaller of the two masses of water was the first to freeze.

Those despised ancients knew a thing or two.

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SCIENTIFIC BOOKS

POLITICAL GEOGRAPHY

The Earth and the State, A Study in Political Geography. By DERWENT WHITTLESEY. xvii + 618 pp. New York: Henry Holt and Company, 1939. $3.75.

GEOGRAPHERS investigate the characteristics that differentiate areas of the earth, whereas historians deal with the differentiation of periods in the time sequence of human events. Space and time, whether in physics or in the study of man, can not in the final synthesis be separated; but because of the widely different techniques, geography and history have developed as separate disciplines. Inevitably they must remain distinct; yet all the more is it essential that scholars in both these fields constantly attempt to reunite them in practice.

Professor Whittlesey's book on political geography is highly successful in maintaining its essentially geographic objectives while making use of historical balance. The book deals with the processes and characteristics which differentiate political areas; and these are traced over a sufficient background of history to provide an adequate interpretation of present conditions.

This new geographical approach to the study of political areas endows such areas with new meaning. The territory of every state or nation includes organic parts that are characteristic of all states. Each state, for example, may be differentiated into such parts as a nuclear core, constituent or administrative regions, problem areas, vulnerable zones, capitals, strategic spots and boundaries.

Professor Whittlesey's discussion of the inherent differentiation of political areas is far from academic. In the chapters on certain specific modern states, an important and readable contribution has been made to an understanding of the problems which trouble the present-day world. New light is thrown on the chaos of Europe—on the relations of Great Britain, France, Germany, Italy and other political units whose struggles are affecting the whole world. It is imperative that the free citizens of our own country should attempt to understand and formulate a policy regarding conditions in Europe, and to this end Professor Whittlesey's book makes a notable contribution.

The thesis is presented that the success, perhaps even the chance for survival, of a state is affected by the pattern of arrangement of the various parts of the political area and of the relations of these parts to the underlying qualities of the land. That the territory which is now Italy has been unified in one state only for 70 years in the modern period, and only for 500 years under Roman rule, whereas this territory was subdivided during the rest of the 2,500 years of Italian history, suggests, "a serious weakness of geopolitical structure not apparent from the map." Pro-