which bear on biological studies, New Zealand stands out prominently in all discussions on the subject of geographical biology. It stands as a lone zoölogical area, minute in area, but on equal terms, as far as regards the antiquity and peculiar features of its fauna, with nearly all the larger continents in the aggregate. In consequence of this, many philosophical essays — such, for instance, as Hooker's introductory essay to the early folio edition of the "Flora;" the essays by Hutton, Travers, and others; and also the New Zealand references in Wallace's works — have all contributed essentially to the vital question of the causes which have brought about the distribution and geographical affinities of plants and animals, and have thus been of use in hastening the adoption of the doctrine of evolution.

Much still remains to be done. Both as regards its fauna and its flora, New Zealand has always been treated too much as a whole quantity; and in consequence percentage schedules, prepared for comparing with the fauna and flora of other areas, fail from this cause. It is absolutely necessary not only to discriminate localities, but also to study more carefully the relative abundance of individuals as well as of species before instituting comparisons. The facility and rapidity with which change is effected at the present time should put us against rashly accepting species which may have been accidental intruders, though wafted by natural causes, as belonging to the original endemic fauna or flora. Further close and extended study, especially of our marine fauna, is urgently required. We have little knowledge beyond the littoral zone, except when a great storm heaves up a gathering of nondescript or rare treasure from the deep. Of dredging we have had but little done, and only in shallow waters, with the exception of a few casts of the deep-sea trawl from the "Challenger." When funds permit, a zoölogical station for the study of the habits of our sea-fishes, and for the propagation of such introductions as the lobster and crab, would be advantageous. I observe that lately such an establishment has been placed on the Island of Mull, in Scotland, at a cost of £400, and that it is expected to be nearly self-supporting. With respect to food-fishes, and still more with respect to some terrestrial forms of life, we, in common with all the Australasian colonies, require a more scientific and a less casual system of acclimatization than we have had in the past.

One must talk with bated breath of the injuries that have been inflicted on these colonies by the rash disturbance of the balance of nature. Had our enthusiasm been properly controlled by foresight, our settlers would probably not have to grieve over the losses they now suffer through many insect-pests, through small birds and rabbits, and which they will in the future suffer through the vermin that are now being spread in all directions.

HEALTH MATTERS.

Why the Stomach does not digest Itself.

FROM a new study of this subject Dr. E. Sehrwald announces the following conclusions (*Medical Record*, March 7, 1891): 1. The balance between the alkali of the blood and the acid of the gastric juice does not follow, during life, the law of diffusion, but moves in narrower limits; 2. The self-digestion of the stomach is partly prevented by the alkalinity of the blood, and partly by cell-action; 3. The living epithelium interposed between the blood and the gastric juice prevents their mutual neutralization, and preserves the alkalinity of the blood and the acidity of the gastric juice; 4. By this protection the stomach is spared a great deal of work of secretion and absorption; 5. The protection furnished by the flowing blood is partly due to its alkalinity, and partly to its properties as a nutritive liquid; 6. All influences which arrest the nutrition of the cells of the walls of the stomach may lead to self-digestion and ulceration. The conditions which may be mentioned in this connection are, first, disturbances in the circulation; second, direct injury to the epithelium; and, third, injuries of the trophic nerves.

Cremation and its Safeguards.

The *Lancet*, Jan. 31, 1891, says, "Unfortunate circumstances connected with the death of the late Duke of Bedford have brought into prominence an important question respecting the procedure of the Cremation Society, of which the late duke was a prominent member, in cases of death from other than purely natural causes. It is clear that in the case of the society absolute certainty as to the cause of death, when other than natural, can alone justify the preferential application of its method. It will therefore be interesting to examine the practical value of the safeguards adopted by the society to prevent the chances of fallacy in a matter so important. These are three: namely, (1) the certificate of the medical practitioner in attendance on the deceased during his last illness; (2) a second independent certificate by another practitioner after careful inquiry into the circumstances attending the illness; and (3), should any doubt remain, the evidence afforded by necropsy.

"A further, though possibly less permanent, security exists in the resolution of the society to refuse cremation in any case where the least doubt exists respecting the cause of death. Such doubt, as observed by Sir Henry Thompson, could remain after necropsy only in an extremely small number of cases, and would, in fact, be virtually abolished. Not actually so, however. There still remains a minimum uncertainty; and this, it is apparent, is much greater where certification, even on the very careful system employed by the society, is alone relied upon. The practitioner in attendance might, in spite of diligence and skill, be misled; for example, in a case where the signs of poison were obscurely blended with those of real or supposed disease. In this connection the case of the late Mr. Maybrick is suggestive. Is it, then, to be believed that a second medical testimony, which would be independent of the former, could be relied on to guarantee the difference of opinion which would necessitate an appeal to the coroner? We should rather expect that this latter evidence, divested as it must be of various technical premises which guided the statements in the first certificate, would be at best a carefully weighed and usually confirmatory assertion of moral certainty.

"After all, it is probable that the most reliable safeguard against a too precipitate practice of cremation which we possess is to be found in the resolutions of the society above mentioned. Cremation, therefore, under its present rules, is certainly a valuable means of promoting accuracy in certification. As affording an absolute guaranty of such accuracy, it cannot be depended on, while it must in all cases destroy every trace of morbid or mischievous agency contained in the tissues. While, therefore, we freely admit its practical security against any miscarriage of justice in the vast majority of cases, we cannot admit that it stands in this respect on a level exactly so high as the practice of burial. Moreover, while we also recognize its more absolute and destructive purity in the disposal of infectious dead, we do not see that it possesses any such advantage in comparison with burial in other cases, provided that burial be conducted, as it increasingly is conducted, on a rational or 'earth to earth' system."

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

The Motion of Storms and High Areas.

THERE was presented in this journal Feb. 27 a short discussion of the origin and motion of waves of heat and cold. I desire to still further discuss this question under an analogous heading. In the previous note it is possible that too much prominence was given to the occurrence of temperature falls in the rear of storms when there were no high areas near. These falls seem to be accompaniments of storms, but are of very limited extent and slight intensity. They seem to be due largely to radiation from the air and earth to the clear sky.

It may conduce to clearness if several propositions are advanced and discussed.

1. *Storms and High Areas have the Same Velocity.* — If this were not so, the one would overtake the other when they were moving along the same line. Of course, there may be such conditions, on any map, in different lines, which have widely different velocities.

2. *These Conditions extend far above our Highest Mountains.*— We find the fluctuations of air-pressure on the advance of these conditions the same at mountain stations as at the base, except that the changes occur later at the summit, for reasons which have been fully set forth in the "Report of the Chief Signal Officer for 1882." The temperature changes, both the rise on the advance of a storm and the fall in its rear, after the diurnal range has been eliminated, are greater on a mountain than at the base, and they occur several hours earlier at the summit. The form which a storm or high area assumes is that of a disk with a height of five to ten miles, and a diameter of one thousand, and it may extend to the limits of the atmosphere.

3. *There is no Marked Movement of Air or Moisture-Particles by Heated Currents from the Earth upward.*— The best proof of this, perhaps, is in the fact that the velocity of the horizontal currents is markedly increased as we rise in the atmosphere, and hence such a movement would be rapidly disintegrated and brought to nought.

4. *There is no Whirl in Either of These Conditions a Few Thousand Feet above the Earth.*— Observations on Mount Washington (6,300 feet) have shown this fact. Unfortunately we have not the data to show just how high the gyratory circulation which we observe at the earth's surface extends, but the limit is probably 3,000 feet. This fact is a most important one to determine, and there is no better region to establish it on the whole earth than the isolated mountain-peaks of New England. Greylock, Ascutney, Killington, Mount Washington, Green Mountain, and a score of others, are all situated right in the path of our storms and high areas, and, it is believed, are destined to aid most materially in solving the riddles which now confront us on all sides.

5. *Their Motion is Independent of the Wind.* — To those familiar with weather science this will be self-evident, but it may be well to simplify this proposition slightly. Let us consider the case of a storm condition moving at thirty miles per hour between two points (*A* and *B*) six hundred miles apart. Let the wind have a velocity of fifteen miles per hour. In twenty hours the exact changes of the wind, pressure, temperature, etc., which took place at *A* will take place at *B*, provided the storm remains constant; but if we had put in the wind at *A* a bit of cotton, or some substance which would go exactly with the wind, at the moment the storm-centre was at *A*, we would have found it just half way between *A* and *B* at the moment the storm-centre crossed *B*. This shows plainly that all the conditions which accompany a storm are practically independent of the wind. The wind blows cold, but it is because a cold wave has passed that way. This may be made still clearer by considering an enormous sphere a thousand or two thousand feet in diameter, and highly heated, at a few thousand feet above the earth. If this were stationary, our thermometers, if delicate enough, would show its pressure, and the wind would transport the heat at its velocity; though it is evident that there would be an exceedingly rapid dissipation of this heat if there were no method of renewal. Suppose this sphere were transported horizontally at thirty miles per hour, and its heat could affect our thermometers instantly: it is evident that there would be a miniature warm wave travelling across the country at thirty miles per hour; but this would be independent of the wind, though it would have a tendency to modify that.

6. *Their Motion is Independent of Air-Currents at any Elevation.* — This proposition will be the most difficult of all to accept, and yet it seems to be abundantly borne out by the facts. During the passage of a storm, the air-current gradually increases in velocity as we rise in the atmosphere. After a certain height is reached, the velocity of this current is diminished. Again, during the passage of a high area the velocity of the current itself is markedly diminished, and, as I have shown, it is half that of the high area at the height of Mount Washington, while during the passage of a storm it is nearly double the storm velocity. Now, it is plain that any condition having any height in the atmosphere would be entirely disintegrated by the varying velocity of the different strata of the atmosphere; and also its motion cannot be due to that of the strata, since this velocity is far greater than that of the storm, and is only half that of a high area. It has also been shown that the direction of motion of storms and high areas is very different from that of the strata far above the earth. One other consideration may be presented. It frequently occurs that storm conditions seem to be transferred through the air without a corresponding depression at the earth's surface, and at a velocity which appears to be far higher than the air strata can have.

This whole subject is exceedingly complicated; and it must be confessed that we must continue to grope rather in the dark until we can obtain the facts which shall enable us to lay the first stone of a consistent theory of these conditions, which are so familiar to us, but of which we know next to nothing. I cannot do better than to close this discussion, without further comment, with the remarkable views of two specialists eminent in this line of research. These views are entirely at variance with the facts observed in this country, and cannot possibly be accepted as an explanation of the phenomena in question. I have already shown, that, owing to the peculiar position of European mountains far to the south-east of the path of storms, we can hope for but little assistance from observation at their summits in elucidating these complex problems.

Dr. J. Hann of Vienna, in a recent publication, has said, "The forces which are in activity in the winter in the air circulation of the higher latitudes arise from the heat of the tropics; that is, from the heat difference between the polar regions and the equatorial zone. Storms and high areas are merely secondary phenomena in the general atmospheric circulation."

Dr. W. Siemens of Berlin has written as follows: "Minima and maxima of air-pressure (storms and high areas) are consequences of the temperature and velocity of air currents in the higher atmospheric strata."

H. A. HAZEN.

Washington, March 9.

BOOK-REVIEWS.

Constructive Steam-Engineering. By J. M. WHITHAM. New York, Wiley. 8°. $10.

THIS descriptive treatise covers pretty thoroughly a rather extensive field, embracing as it does engines, pumps, and boilers, with all their accessories and appendages. The scope of the work is limited, as indicated by the title, to constructive features, design not being discussed. But this does not lessen the value of the book, as nearly every form of engine or boiler that has won recognition in modern steam-engine practice is fully described, illustrated, and discussed. Steam-engine design, as a separate subject, was ably treated in a previous work by the same author, noticed in these columns a year or more ago.

In the preparation of this work the author has had ample resources to draw upon; and he has exercised notable discretion in sifting out essentials from non-essentials in dealing with the mass of material placed at his disposal by the current literature of the subject.

The plan of the work is as follows. A brief classification of the various types of engines comes first. This classification may be summed up as (1) condensing and non-condensing; (2) non-expansive and expansive; (3) simple, compound, triple-expansion, and quadruple-expansion; (4) single-acting, double-acting, and rotary; (5) rotative and reciprocating; (6) stationary, portable, locomotive, and marine. Less important is the further classification into (7) horizontal, vertical, inclined, and oscillating; and (8) erect vertical, inverted vertical, direct-acting, indirect-acting, and beam engines. Exception may be taken to the author's statement, in this introductory chapter, that compound, triple, and quadruple expansion engines have respectively two, three, and four cylinders. Some of them have, as shown in a subsequent chapter, at least one extra cylinder; that is, two low-pressure cylinders instead of one larger one. This, of course, is a small matter; but it would be well to classify the engine in this respect by the number of expansions instead of the number of cylinders.

The second chapter, a very important one, is devoted to heat and steam, embracing a discussion of thermometers and calorimeters. Then comes a chapter in which the constructive details of an engine are illustrated and discussed; after which comes a lucid presentation of the indicator and its uses, and a chapter on the