

grasses cover the soil between the trees. This difference in the types of plant covering on the windward and leeward sides is the most striking feature of the distribution of the vegetation of these mountains. A comparison of the vegetation of a valley bottom with that of its own higher bounding slopes, even on the beclouded windward side, shows a difference of the same sort as that just mentioned, though somewhat less marked.

Detailed instrumental measurements of the physical characteristics of several selected habitats were made by Shreve, between October, 1905, and June, 1906. These studies of the climate, in the valleys and on the ridges and at the top of the forest canopy as well as on its floor, together with his inquiry into the transpiration capacity of typical rain-forest plants, are perhaps the most unique features of his contribution. The habitat in which the climatic peculiarities of the rain-forest are most accentuated, as was demonstrated by the aid of the air and soil thermographs, the hygrometer and atmometer, is the floor of the windward ravines. Here soil moisture is abundant, the leaves are dripping wet with rain or fog for weeks together. The humidity is constantly high; the rate of transpiration is very low and the light filtering through the screen of foliage and of cloud is faint even at midday. On the slopes, and especially on the ridges, of both windward and leeward sides of the mountains, where air currents and sunlight have freer access, the soil is still moist, but the leaves are less often covered with water drops, and measurement shows that the humidity of the air is less, the rate of transpiration is higher and there is a somewhat greater daily range of temperature. These climatic differences, taken together with the characteristic differences in the vegetation of the two sides of the range, make it clear that the general distribution of the vegetation here is controlled primarily by the moisture content of the air rather than by that of the soil. The latter is probably adequate in all but a few restricted locations.

One very interesting feature of the seasonal activity of the rain-forest trees is that while

certain of them vegetate actively throughout the year, others growing right beside them show a well-marked winter rest. Most of the former species are allied with the lowland tropical forms, while the latter are allied rather with north temperate genera.

Most plants of this montane region grow quite slowly, probably in consequence of the moderate temperatures, a low transpiration rate and the often weak light. The uncoiling leaves of certain ferns show the most rapid growth observed.

The rate of transpiration was studied in 8 or 10 species. One rather unlooked for result was that the rate of transpiration for these plants, *under the conditions prevailing in the rain-forest*, is not *very* unlike that found for many Arizona plants *when growing under desert conditions*. As a matter of fact the desert plant, in spite of its highly protected surface, loses more water per square centimeter of surface, in its native habitat, than the plant of the rain-forest when growing in its home.

One other interesting conclusion of the author from this comparison of rain-forest plants and desert plants is that the continuous extreme humidity, the low temperature and weak illumination give conditions approximately as unfavorable to plant growth as are the opposite extreme conditions of arid regions. The tropical lowlands and the moist temperate regions are regarded as the homes of the most luxuriant and most varied floras of the earth, and the places of origin of new structures and new species.

DUNCAN S. JOHNSON

*Engineering Geology.* By HEINRICH RIES and THOMAS L. WATSON. New York, John Wiley & Sons. Octavo, bound in cloth. 672 pages.

This volume fills a special field in which it has no rival. It is arranged particularly for the use of the student of civil engineering, but the full treatment of many subjects and the extensive lists of standard papers will make it also a valuable reference work for engineering libraries. In many engineering

schools the curricula of the students of civil engineering provide one term only for geology. The student is expected to master the principles of geology and to find the applications in that brief time without any previous training in physiography, mineralogy, petrology or paleontology. It is obviously a difficult task to arrange the material so that the groundwork of principles is made clear in the short time allotted for the study, and applications emphasized sufficiently to make the study of much practical value. This difficulty is happily met in this volume by brief and concise statements of principles followed by ample and well-chosen illustrations.

The book is well arranged for the mature and serious-minded beginner who wishes to get the maximum of material in a short time. The more advanced student will find also many applications of geology brought from widely scattered sources and some which are not treated elsewhere. Separate chapters are devoted to rock minerals, rocks, structural geology and metamorphism, rock weathering and soils, rivers, lakes, wave action, underground waters, landslides, glacial deposits, cements, clays, coal, petroleum and gas, road material, and ore deposits. The mechanical features of the work are excellent; particularly noteworthy are the clearly executed photographs and line drawings.

W. H. EMMONS

MINNEAPOLIS

*Die Umwelt des Lebens. Eine physikalisch-chemische Untersuchung über die Eignung des Anorganischen für die Bedürfnisse des Organischen.* Von LAWRENCE J. HENDERSON; übersetzt von R. BERNSTEIN. Wiesbaden, J. F. Bergmann. 1914.

This volume is the German translation of the author's book, "The Fitness of the Environment," recently reviewed in these columns.<sup>1</sup> There are a few additional features; the table of contents contains a very complete and convenient summary of the whole book, important sentences or paragraphs are italicized,

<sup>1</sup> SCIENCE, N. S., 1913, p. 337.

and a brief final chapter has been added; there is also an interesting and apposite quotation from du Bois-Reymond in a footnote on page 161; and the subject-index has been omitted. Otherwise the book remains unchanged.

In his final chapter the author calls attention to the existence of "a hitherto unrecognized order among the properties of the chemical elements,"—referring to the remarkable manner in which certain fundamental properties, which have largely conditioned the course taken by the evolutionary process, are distributed among the elements. These properties, far from being distributed with approximate uniformity—as the periodic system might lead us to expect—attain strongly marked maxima, or are, so to speak, concentrated, in relatively few elements, which at the same time are among the most abundant and widespread, namely: carbon, hydrogen and oxygen. "As a result of this fact there arise certain characteristics of the cosmic process which could not otherwise occur:" the implication is that at the outset of cosmic evolution there were present in advance all of the conditions needed for the development of physico-chemical systems having *vital* peculiarities, *i. e.*, possessing the complexity, activity and stability in a changing environment which are essential to living organisms. The properties of these three elements—and of no others—show a most detailed "fitness" for the production of just such systems. If, therefore, the main outcome of evolution be regarded as the development of living organisms, "the biologist may rightly regard the universe in its very essence as biocentric."

The volume is attractively printed and is dedicated to Karl Spiro.

R. S. L.

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THE OXIDATION OF NITROGEN AND HOW  
CHEAP NITRATES WOULD REVOLU-  
TIONIZE OUR ECONOMIC LIFE

*How is Atmospheric Nitrogen Oxidized?*

It is not many years ago (1898) that Sir William Crookes sounded the note of alarm