

First Glances at New Books

CLIMATE THROUGH THE AGES—C. E. P. Brooks—*Coleman* (\$5).

The geologist and paleontologist, who have solid rocks and equally solid petrifications to go on, have a relatively easy time, and hence their sciences are already well developed. But climates do not fossilize, and the paleoclimatologist has had to lean on his colleagues. The science of the climates of the past, however, is now rounding into definite form, and will in its turn be of great assistance to its older sisters. The present work speaks well for the development so far, and augurs well for the future.

Science News-Letter, January 15, 1927

PRACTICAL COLLOID CHEMISTRY—Wolfgang Ostwald—*Dutton* (\$2.25). A pioneer in colloidal affairs gives directions for some beautiful experiments.

Science News-Letter, January 15, 1927

INDUSTRIAL PSYCHOLOGY—Charles S. Meyers—*People's Institute*. (\$2.50). If the industrial civilization of the Occident is to continue, it becomes increasingly obvious that the strains it imposes be kept within the limits of human tolerance. Well-digested knowledge of a book such as Dr. Meyer's should be a required part of the equipment of every industrial executive, from foreman up.

Science News-Letter, January 15, 1927

CORRESPONDENCE SCHOOLS, LYCEUMS, CHAUTAUQUAS—John S. Noffsinger—*Macmillan* (\$1.50).

The results of a survey of the institutions most popularly resorted to by the great mass of Americans who feel that their schooling has been incomplete but who are unable to resume or continue attendance at the usual types of school. The author believes that correspondence schools especially are entitled to recognition, and that the system would profit by closer legislative regulation.

Science News-Letter, January 15, 1927

A NATIONAL PROGRAM OF FOREST RESEARCH—Prepared by Earle H. Clapp—*American Tree Association*.

One of the foremost of our national agencies for the redemption of American forests takes stock of the present situation and recommends action for the future. A whole encyclopedia full of forest information has been boiled down into the 232 pages of this book.

Science News-Letter, January 15, 1927

PHYSICS

Our Dependence On Light

Quotation from introduction to Erwin Freundlich's *THE FOUNDATION OF EINSTEIN'S THEORY OF GRAVITATION* by H. H. Turner. Cambridge, England, The University Press. Dr. Turner is Savilian Professor of Astronomy at Oxford University.

The Universe is limited by the properties of light. Until half a century ago it was strictly true that we depended upon our eyes for all our knowledge of the universe, which extended no further than we could see. Even the invention of the telescope did not disturb this proposition, but it is otherwise with the invention of the photographic plate. It is now conceivable that a blind man, by taking photographs and rendering their records in some way decipherable by his fingers, could investigate the universe; but still it would remain true, that all his knowledge of anything outside the earth would be derived by the use of light and would therefore be limited by its properties. On this little earth there is indeed a tiny corner of the universe accessible to other senses; but feeling and taste act only at those minute distances which separate particles of matter when "in contact"; smell ranges over, at the utmost, a mile or two; and the greatest distance which sound is ever known to have traveled (when Krakatoa exploded in 1883) is but a few thousand miles—a mere fraction of the earth's girdle. The scale of phenomena manifested through agencies other than light is so small that we are unlikely to reach any noteworthy precision by their study.

Few people who are not astronomers have spent much thought on the limitations introduced by the news agency to which we are so profoundly indebted. Light comes speedily but has far to travel, and some of the news is thousands of years old before we get it. Hence our universe is not co-existent: the part close around us belongs to the peaceful present; but the nearest star is still in the midst of the late War, for our news of him is three years old; other stars are Elizabethan, others belong to the time of the Pharaohs; and we have alongside our modern civilization yet others of prehistoric date. The electric telegraph has accustomed us to a world in which the news is approximately of even date; but our forefathers must have been better able, from their daily experience of getting news many months old, to realize the unequal age of the universe we know. Nowadays the inequality is almost entirely the concern of the astronomer, and even he often neglects or

forgets it. But when fundamental issues are at stake, the time taken by the messenger is an essential part of the discussion, and we must be careful to take account of it, with the utmost precision.

Our knowledge that light had a finite velocity followed on the invention of the telescope and the discovery of Jupiter's satellites: the news of their eclipses came late at times and these times were identified as those when Jupiter was unusually far away from us. But the full consequences of the discovery were not realized at first. One such consequence is that the stars are not seen in their true places, that is in the places which they truly held when the light left them (for what may have happened to them since we do not know at all—they may have gone out or exploded). Our earth is only moving slowly compared with the great haste of light; but still she is moving, and consequently there is "aberration"—a displacement due to the ratio of the two velocities, easy enough to recognize now, but so difficult to apprehend for the first time that Bradley spent two years in worrying over the conundrum presented by his observations before he thought of the solution. It came to him unexpected, as often happens in such cases. In his own words—"at last when he despaired of being able to account for the phenomena which he had observed, a satisfactory explanation of them occurred to him all at once when he was not in search of it." He accompanied a pleasure party in a sail upon the River Thames. The boat in which they were was provided with a mast which had a vane at the top of it. It blew a moderate wind, and the party sailed up and down the river for a considerable time. Dr. Bradley remarked that every time the boat put about, the vane at the top of the boat's mast shifted a little, as if there had been a slight change in the direction of the wind. The sailors told him that this was due to a change in the boat, not the wind; and at once the solution of the problem was suggested. The earth running hither and thither around the sun resembles the boat sailing up and down the river: and the apparent changes of wind correspond to the apparent changes in direction of the light of a star.

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In the fourteenth century the standard for an inch measure was three barley-corns round and dry taken from the middle of the ear.