does, as he supposes, interest psychologists, but mainly because his results fall within the range of details which have been pretty thoroughly worked out by psychologists. Burrow's monograph[2] contains the best historical account of the investigations up to 1909, and very little has been done on the problem since the publication of my own articles in 1910.[3]

Although the causal factors have not yet been precisely determined, certain points are clearly settled. First, the "personal equation" is not a matter of [illegible] at all, but a matter of the [illegible] of reactions and anticipated stimuli. Simple reactions to visual stimuli are seldom shorter than 100σ (0.1 sec.), whereas the errors in synchronization are usually much smaller and frequently negative. The errors fall within the limits of the imperceptible time interval for the conditions of observation. Second, the usual error, without practice, is negative, and practice tends to change it towards the positive. Third, the same phenomena appear under conditions in which no overt reaction is required, but in which, as in the astronomer's eye-and-ear method and Wundt's complication experiment, the subject is required merely to note the apparent position of a moving object with reference to a series of auditory stimulations. And we are now safe in saying that this is because the latter cases are of the same type as the former, that is, that a discriminative perception is really a reaction: and this in a literal, not a figurative sense.

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QUOTATIONS

COPERNICUS

THE whole world should observe along with the Poles the birthday of Copernicus, and should continue to celebrate the 19th of February in his memory so long as the earth swings in its orbit; for what this boy, born 450 years ago, and christened Nichola Koppernigk, son of a native of Cracow, conceived as the order of the universe is "the capital event of modern thought." By it mankind's outlook on the universe has been fundamentally changed. The young Koppernigk was a student in the University of Cracow the year in which Columbus discovered America, giving himself to mathematical science and painting. He afterward studied law and attended mathematical lectures in Bologna and still later studied music in Padua and took his degree in canon law in Ferrara. He then devoted his medical skill to the service of the poor, his economic knowledge to the reform of the currency in the Prussian provinces of Poland, and his astronomical genius to the development of a new cosmic theory which has come to bear his name.

It was while he was in the midst of such studies and ministries that the name "America" was first given by others to the fringe of this continent and graven on a map published at St. Dié, at the foot of the Vosges Mountains, in southeastern France. Our continent was thus christened under the Ptolemaic geocentric system. But our national life made its beginnings under the Copernican system and had from the first a "shuddering sense" of physical immensity. It is inconceivable that this new physical conception has not mightily affected man's social and religious conceptions, and especially those of Americans. With the enlargement of the universe under it, and the accompanying diminution of the relative size of the earth—made still smaller by man's improved means of communication—we no longer picture our planet as a flat area divided into exclusive, provincial or national strips spanned by a Ptolemaic sky. We find ourselves "in the same boat" on a sea of practically infinite space.

In observing the birthday of Copernicus the Polish astronomers have fitly gathered in their first congress and proudly remembered what their science has given to mankind; and the Polish people have with good reason held their celebrations all over Poland in honor of the son of the city of Thorn (now again in Polish territory) and the academic son of the

[2] Burrow: "The determination of the position of a momentary impression in the temporal course of a moving visual impression. *Psychol. Monographs*, XI, No. 4.

[3] Dunlap: "The complication experiment and related phenomena," *Psychol. Review*, XVII, pp. 157-191; "Reactions to rhythmic stimuli with attempts to synchronize," *Psychol. Review*, XVII, pp. 399-416.

University of Cracow (once more a Polish university). But it would be profitable for the whole world—scientists, statesmen, warriors, philosophers, teachers, pupils and the people in general—to pause and consider what was the real significance of the gift of Copernicus. The corollary of his theory is a world-wide solidarity of human interest. There is no escape from it. If an international holiday were to be added to the many holidays in the various calendars of the world, it should be one on which the birthday of Copernicus is solemnly observed—for he discovered the universe.—*New York Times.*

SCIENTIFIC BOOKS

The British Association for the Advancement of Science: a Retrospect, 1831-1921. By O. J. R. Howarth, O.B.E., M.A., Secretary. 14 x 22 cm., vii + 318 pages, numerous illustrations. Published by the Association, Burlington House, Piccadilly, London, W.1, 1922.

American men of science should find much to command their interest in the attractive volume here cited. The book, which is a very readable summary of the development and achievements of the British Association, is replete with information and suggestion for those who hold membership in our scientific societies and in the American Association for the Advancement of Science—especially for those whose hope for our future rests partly in efforts toward the strengthening of American scientific organization.

In these days when the human value of historical appreciation is so strongly and so rightly emphasized on every hand, when the development of the sciences seems almost on the point of becoming subject matter for a new branch of historical science, it is particularly fortunate that Mr. Howarth has been able to present us with this account, which is in some respects a résumé of the history of British science since 1831. The association was founded in that year. The war that finally ended with Waterloo had left the British people with new insight into possibilities for national improvement. Somewhat parallel to what is happening to-day, many minds became constructively critical and there was clamor for many kinds of reform. Among the reformers were leading men of science, who complained of the "decline of science in England" and advocated an association of scientific men as a means toward the attainment of the improvement that was sought.

The British Association was organized at York, on September 26, 1831. The Reverend William Vernon Harcourt, chairman of the organizing committee, proposed the foundation of an association "having for its objects, to give a stronger and more systematic direction to scientific inquiry, to obtain a greater degree of national attention to the objects of science, and a removal of those disadvantages which impede its progress, and to promote the intercourse of the cultivators of science with one another, and with foreign philosophers." So the association came into existence. It was largely modeled after the Deutscher Naturforscher Versammlung, which had held its first meeting at Leipzig in 1882. That organization is now the Gesellschaft Deutscher Naturforscher und Ärzte. We may note further that our American Association was principally modeled after the British, when the latter was seventeen years old.

In a chapter on "The Association and the Progress of Science" is, among others, an excellent account of the two famous controversies between science and religion through which the British Association passed, the first following the general appreciation of the meaning of Lyell's "Principles of Geology," the second following the appearance of Darwin's "Origin of Species." To American scientists these pages are now specially interesting, for history does seem to repeat itself in our midst.

Throughout its history the British Association has ever held strongly to its aim of bringing science to the non-scientific, to society at large, especially to the public of the cities in which the annual meetings are held. General addresses have frequently been given that "demonstrate to all men that science is thinking with and for them, about matters which must interest and most deeply concern them."

The association has met every year since its foundation, with the exception of the two years 1917 and 1918. It has met at thirty-four cities in the British Isles and has held meetings over-