

to the time since the earth was born out of the sun. By a more detailed but similar calculation Prof. H. N. Russell has estimated this upper limit at 3×10^{10} years (Proc. Roy. Soc., 99 A (1921), p. 86).

Our hypotheses doubtless suffer from over-precision, and a more general discussion might permit of a greater age for the earth. It does not seem to me that the presence of uranium and thorium discloses any insoluble difficulties, although it would obviously have been more gratifying if the earth's age had come out a larger fraction of the estimated age of the sun.

J. H. JEANS.

February 16.

Robert Browning as an Exponent of Research.

THE comment in NATURE of January 10, p. 58, on poets who have touched the field of science may fitly be supplemented by some reference to Robert Browning, whose utterances in this field are often overlooked, although he has shown a deeper insight into the spirit of research than any other poet known to me, and has expressed it many times in glowing words. This trait is the more remarkable since Browning evidently knew little and cared little about the particulars of science, and probably found them somewhat repellent; being in this respect widely different from Tennyson, who was well versed in the scientific literature of his day, and used his knowledge of it freely. Yet Tennyson's attitude remained always that of the orthodox cultured "naturalist" of Victorian times, skilful in observation, but recoiling in alarm from the outlook to which observation led. Browning on the other hand took little heed of the path, but pressed on boldly toward the outlook and gauged the qualities required to reach it. Even in his conception of a poet, as expressed in "How it Strikes a Contemporary," he sees an investigator pure and simple, with an aptitude for understanding and recording: vividly pictured in the person of the elderly man of Valladolid, the true "Corregidor" of the city, whose

"—very serviceable suit of black
Was courtly once and conscientious still";

who

"—walked and tapped the pavement with his cane,
Scenting the world, looking it full in face";

everywhere taking such keen "cognisance of men and things" that you might even

"—surprise the ferrel of his stick
Trying the mortar's temper 'tween the chinks
Of some new shop a-building—."

The most frequently quoted though scarcely the most cogent expression by Browning of the spirit of research is contained in that noble threnody "A Grammarian's Funeral," which ought by now to have drawn from some great composer a stately "Searcher's Funeral March." It is unnecessary to recall the many familiar passages—the whole poem is an emotional rendering of delight in the pursuit of knowledge, and pride in its acquisition, whether the apparent gain be great or small:

"He settled *Hoti's* business—let it be!—

Properly based *Oum*—

Gave us the doctrine of the enclitic *De*"

—achievement enough for a Hymn of Triumph.

Browning's power in the field of psychology has always been recognised, though his psychology is, of course, tinged deeply with emotion, as in that celebrated and much-discussed example "The Ring and the Book." His grip of the scientific mentality is perhaps nowhere better displayed than in his subtle analysis of the mind of an investigator confronted with a supernormal phenomenon, given under the

guise of "An Epistle," from Karshish, the vagrant Arab physician—

"—the picker-up of learning's crumbs,
The not-incurious in God's handiwork,"

to his Sage at home—

"To Abib, all-sagacious in our art,
Breeder in me of what poor skill I boast."

Antique in form but modern in application, the "Epistle" reveals the imagined writer as the possessor of exactly the mental qualities which would do credit to a young travelling medical man of the present day.

This appreciation of research is not, however, noticeable in Browning's earlier poems; one searches vainly for any clear expression of it in "Paracelsus," where one might expect to find it; but it crops up again and again, with increasing intensity, in his later work, and often in unexpected places. Take this, for example, from "Apollo and the Fates":—

"—'Tis Man's to explore

Up and down, inch by inch, with the taper his reason:

No torch, it suffices—held deftly and straight.

Eyes, purblind at first, feel their way in due season,

Accept good with bad, till unseemly debate

Turns concord— . . ."

Or this, again, from "Fust and his Friends":—

"—Man Ignores—thanks to Thee

Who madest him know, but—in knowing—begin

To know still new vastness of knowledge must be

Outside him—to enter, to traverse, in fee

Have and hold! 'Oh, Man's ignorance!' hear the fool whine!

How were it, for better or worse, didst thou grunt
Contented with sapience—the lot of the swine

Who knows he was born for just truffles to hunt?—
Monk's Paradise—' *Semper sint res uti sunt!*'

No, Man's the prerogative—knowledge once gained—

To ignore,—find new knowledge to press for, to swerve

In pursuit of, no, not for a moment: attained—

Why, onward through ignorance! Dare and deserve!

As still to its asymptote speedeth the curve,

So approximates Man—Thee, who, reachable not . . ."

Is it not by glowing rhapsody of this kind, rather than by the rendering in verse of specific results in science, be it ever so skilfully and accurately, that the poet can best touch the imagination with a sense of what science is, and may be? G. W. LAMPLUGH.

St. Albans, January 31.

The Origin of Sponge-Spicules.

IN the preliminary account by my friend Prof. Dendy (NATURE, February 7, p. 190) it is difficult to see evidence for the independent organic life of his "scleroplastids." There is nothing to prove this hypothesis in the observation that the first rudiment of the spicule in *Stelletta* is a skeleton-crystal on the tetrahedral system, afterwards overlaid (as we have long known in the tetracrepid desma of *Lithistida*) with siliceous deposit in amorphous aggregation. Obviously twinning and repetition of branches (also long known) are not arguments against the crystalline character of form in spicules. In 1898 I pointed out certain resemblances to the relations between a symbiotic organism and its host in the relations between a crystal, utilised as a spicule, and the sponge which has secreted it (Proc. Roy. Soc., vol. 64, p. 71). These resemblances seem to have misled Prof. Dendy to his new theory, but he adduces no facts which give evidence for separate organic life in the spicule, or impeach the evidence for its crystalline structure.

I advocated crystallographic explanation of their