HALF-HOURS WITH THE W.E.A. WELLINGTON.

One Star May Break Up Another

Though the Stars Themselves May Be Miles Apart—Direct Hits Among the Millions of Stars are Most Unusual—The Formation of the Earth.

BEFORE we can make any steps toward a scientific appreciation of the beginnings of earth history we must first have a clear understanding of the shape or form of the earth, of its motions, and of its relation to the other heavenly bodies.

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FIRST of all the earth is round; we can prove that by sailing round it. Secondly, it is spinning on an imaginary line called its axis; we know this because the stars, the sun and all the other heavenly bodies move across the sky in definite periods. Thirdly, once in 365¼ days, that is once a year, the earth travels round the sun in an elliptical path whose average distance from the sun is 93 million miles. Any theory of earth origin must therefore account for its globular shape, its daily rotation on its axis and its annual revolution round the sun. The easiest way of obtaining an earth which will move in this way is to derive the earth from the sun and so we find that all recent theories adopt this sun birth as a fundamental source of the material of which the earth is built.

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THEORIES of earth origin received a fresh impetus from Newton's formulation, in 1687, of the laws of gravitation. One of these laws states that every body, everything which has mass, exerts an attraction upon every other body, everything else which has mass. When we let go of an article it is the gravitation or attraction of the earth which causes it to fall to the ground. It is the same attraction which prevents us flying off into space under the influence of the earth's rotation.

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THIS principle of gravitation was applied to the heavenly bodies by Kant, Sir George Darwin, Roche, and others who examined mathematically the stresses set up in the heavenly bodies by their close approach to one another. In particular it was found possible for one star to disrupt another smaller one when it approached within a certain distance. This essential principle that by close approach one star may break up another purely by virtue of its enormous gravitational attraction is the basis of most modern theories.

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THE theory which as present holds the field is the dynamical tidal theory which is sponsored by Sir James Jeans and H. Jeffreys. To understand it properly we must begin in the latter half of the last century, with the researches of Sir George Darwin, Roche, and others. These gentlemen studied mathematically the tidal stresses and distortions produced in a heavenly body on the close approach of another body, and they found that in certain cases it was possible for the gravitational pull of one body to disrupt the other.

MODERN authorities consider that the stars, moving endlessly as they do through space, must occasionally approach close to one another. At times actual impacts occur, and result in the formation of new stars. Such a direct hit is, however, most unusual, and close approaches are far more common. Such an approach is considered to have happened in the case of our ancestral sun. A star approached, and by virtue of its enormous gravitational pull, it drew towards itself from the sun, a filament of material. If the star had been stationary, it would have captured this material, but as it passed on, the material fell short, and took up a path round the sun.

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JEANS says that such a filament would be cigar-shaped. It would be thick in the middle and taper off to the ends, and, owing to its rotation it would split into a number of separate bodies, the largest in the middle; the smallest at the ends. These bodies he suggests condensed from the gaseous state to the liquid, and finally becoming solid, formed the planets.

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THIS, then, is the modern conception of the origin of the earth. The primeval sun was a dark cold body very much larger than it is now. A large star passing within a short distance of the sun drew from it a filament of material which escaped capture by the star and split up into a number of smaller masses, the primeval planets. These in their turn approached the sun too closely and had material abstracted from them to form the satellites. The sun during all this assumed its present size and temperature by condensation from the formerly more diffuse material.

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MOST modern authorities consider that at one time the surface of the earth was molten, and that the oldest rocks are those solidified from this molten mass. The earliest surface therefore was hot, cooling only slowly from the lava state.

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THE primeval atmosphere was present even when the earth's surface was molten. It contained vast quantities of water vapour which was continually condensing in the upper levels of the atmosphere and falling as rain. Owing to the great heat of the earth, however, it never reached the surface, but was vaporised and ascended again. In those days, then, the earth was shrouded by a continuous pall of cloud from which rain was ceaselessly pouring but never reaching the earth. When the crust cooled it changed slowly from the liquid state to the solid, to hard rock. The rain, ever descending from the shield of cloud, at last splashed on the surface of the hot earth. And it rained without a stop for some thousands of years. As the surface cooled further, the water collected in hollows and so it formed the primitive oceans.

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AT the same time by the abstraction of all this water the cloud canopy became thin and broken, and for the first time sunlight attained the surface of the globe. Volcanic activity was continually adding gases to the atmosphere and changing the face of the earth, but gradually all these manifestations died down or became sporadic in distribution, and we find a gradual but none the less sure change toward more even and homely conditions.

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THE MELBOURNE SYMPHONY ORCHESTRA

WITH TOSSY SPIVAKOVSKY

An orchestral concert by the Melbourne Symphony Orchestra; conductor, Professor Bernard Heinze, F.R.C.M.; assisting artist, Tossy Spivakovsky. The orchestra will present Mendelssohn's overture to "A Midsummer Night's Dream;" the Symphony No. 6 in F Major by Beethoven, and "La Grand Paque Russe" (Rimsky-Korsakov). Tschaikowsky's "Concerto in D Major" Op. 35 for violin and orchestra will also be presented, with Tossy Spivakovsky as violin soloist.

SATURDAY, NOVEMBER 18.