

FIG. 2

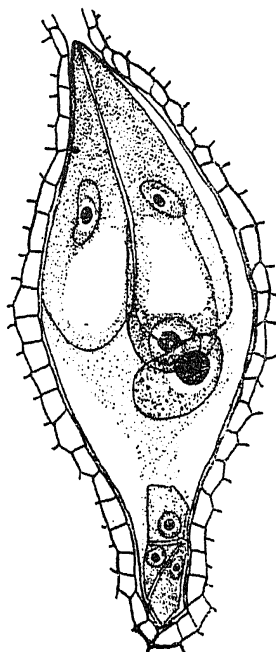


FIG. 3

cover cells, although he himself states in an earlier part of his note that the single hypodermal archesporial cell functions directly as the megaspore mother-cell. When a cover cell is not cut off primarily there could be no further development of cover cells to make either the megaspore or any structure resulting from it deep-seated. The extensive literature cited by Schnarf⁴ in his book in connection with the embryology of compositæ and the observations made more recently by Bhargava on *Eclipta erecta* and Banerji on *Carthamus tinctorius* are in complete accord with my observations.

A detailed account of the development of flower, pollen, ovule, embryo-sac and embryo will be published elsewhere in due course.

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Andhra University,
Waltair,
November 1, 1939.

¹ Bhargava, H. R., *Proc. Ind. Acad. Sci.*, Series B, 1935, 1, No. 7.

² Banerji, I., *Proc. Ind. Sci. Cong.*, Part III, 1938.

³ Sunil Datta, *Curr. Sci.*, 1939, 8, 472.

⁴ Schnarf, K., *Vergleichende Embryologie Der Angiospermen*, 1931.

The Age of the Earth

(According to the Hindu 'Shastras')

VERY little reference has been made to the views expressed in the religious books ('Shastras') of the Hindus when tracing the evolution of ideas about the age of the earth. Shand¹ does not refer to them at all; whereas Holmes only says, "Opposed to these limited ideas of a definite beginning, the old Brahmins of India regarded time and the earth as eternal".²

Both in the *Sankhya* and in the *Vedanta* philosophy of the Hindus, the Creation and Destruction of the World have been regarded as Cyclic in nature, like day and night. The total time of the Creation has been termed a "Kalpa" or a day of 'Brahma', the Creator. According to the ancient books of the Hindus—both socio-religious and astronomical, like the *Manu Smriti* (Chap. 1, stanzas 63-73) and the *Surya Siddhanta* (Chap. 1, stanzas 15-20)—a "Kalpa" is composed of 14 'Manvantaras' together with 13 time-intervals between them, each interval being of 1,728,000 years. Each 'Manvantara' itself is composed of 71 cycles of 'Chaturyugas'. A 'Chaturyuga' is the sum of four 'yugas' or eras, including the time-intervals between each of them. The four eras are 'Satya-yuga', 'Treta-yuga', 'Dwapur-yuga' and 'Kali-yuga'. Kali-yuga is of 432,000 years' duration, and Dwapur, Treta and Satya yugas are respectively double, treble and four-times the Kali-yuga. The figures for the various eras include also the time-interval which precedes and follows each era. From these figures, the duration for which this World is supposed to last is estimated to be 4,320 million years.

The age of the Earth from its beginning to the present time is termed in Hindu astronomical Calendars as 'Shrishti-Samvat' (year of Creation), and is often recited by the Hindus in the 'Sankalpa Mantra' during their religious rites. In this recitation of a few lines, the Hindu is reminded that since the beginning of the Creation of this world, six 'Manvantaras' and 27 'Chaturyugas' have already passed away, and we are at this time in the 5040th year (in

A.D. 1939) of the 'Kali-yuga', the last era of the 28th 'Chaturyuga'.¹ The total time through which the earth has already endured thus works out to be 1,972,949,040 years in the Hindu Calendar. It is wonderful how this "Srishti-Samvat" of the Hindus agrees so well with the recent geo-physical estimates of the age of the earth (about 2,000 million years).

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Indian School of Mines,
Dhanbad,
November 21, 1939.

¹ Shand, S. J., *Earthlore*, 1927, 42.

² Holmes, A., *The Age of the Earth* (Benn's Library Series), 1928, 5.

³ Tilak, B. G., *Shrimad Bhagwat Gita Rahasya*, Hindi Edition, 1919, 193.

The Constitution of Rottlerin

McGookin, Robertson and Tittensor¹ have advanced a new structure for rottlerin still retaining the CH_3CO group. We shall publish our detailed criticism of this formula as soon as our experiments in progress are completed. In the meanwhile we wish to point out that a solution of 0.5 gr. of rottlerin methyl ether² described by us, dissolved in 25 c.c. of chloroform when taken in a 2 dcm. tube showed a rotation of $+0.23$ whence the specific rotation is $+5.75$. Therefore, rottlerin has an asymmetric carbon atom which we do not find in Robertson's latest formula.

With regard to Robertson's criticism³ that 'Ray and co-workers maintain that this compound contains a lactone group and also state that in the conversion of tetrahydrorottlerin into octahydrorottlerone by hot alcoholic hydrochloric acid, an acidic substance is formed which apparently is an intermediate product in the rottlerone change. We have repeated the experiments described by the Indian workers and it may be stated that if the experiment is stopped after 8 hours, as these authors describe, the insoluble product appears to consist

only of octahydrorottlerone along with unchanged tetrahydrorottlerin, which in a finely divided state we have observed to be soluble in aqueous sodium bicarbonate.' They draw the conclusion that no acidic products are formed and sodium bicarbonate only dissolves the precipitate to a colloidal solution. We wish to state that we have definitely stated that the product is a mixture and did not claim it to be a pure product. We know there is some unchanged tetrahydrorottlerin and a little tetrahydrorottlerone in it but when the mixture is treated with bicarbonate, a good portion remains insoluble. The portion soluble in the bicarbonate solution has now been repeatedly extracted with ether and then on acidification with hydrochloric acid has deposited this acidic substance. The acidic substance so precipitated is freely soluble in ether. The ethereal extract has now been washed nine times with water and tested for the absence of chlorine ion. A few drops of this ethereal solution readily liberates iodine from an aqueous solution of potassium iodide and iodate thus establishing the presence of an acidic substance in the ethereal solution. We are also determining the pH of this ethereal solution. From the above it will be evident that the solution of a portion of the mixture in bicarbonate solution is due to salt formation and not to colloidalisation as Robertson supposes.

We thank Professor Mahan Singh of the Government College, Lahore, for taking the optical rotation for us.

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December 16, 1939.

¹ *J.C.S.*, 1939, 1582.

² *Ibid.*, 1937, 1864.

³ *Ibid.*, 1939, 1583.