SCIENCE

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Light Waves in Astronomy: PROFESSOR A. A. MICHELSON ... 703

Twenty-seven Kinds of Men: PROFESSOR H. E. WALTER ... 707

Scientific Events:
The Rockefeller Buildings at University College, London; "University City" at Paris; Awards of the Royal Geographical Society; An Out-of-doors Museum for the University of Michigan ... 708

Scientific Notes and News ... 711

University and Educational Notes ... 716

Discussion and Correspondence:
Note on Preparing Color Standards: DR. ARTHUR P. HARRISON. *A Factor causing the Assimilation of Calcium:* CHARLES H. HUNT, A. R. WINTER. *Trabeculæ of Sanio in Angiosperms:* J. D. HALE. *A Course in Physical Measurements for Students in Other Sciences:* WINTHROP R. WRIGHT. *Biological Record Cards:* PROFESSOR E. L. MARK. *Aerobic:* DR. ARTHUR W. DOX ... 716

Quotations:
The Zoological Record ... 720

Scientific Books:
The New Volumes of the Encyclopædia Britannica: PROFESSOR R. D. CARMICHAEL ... 721

Special Articles:
The Electrical Resistance of Phenol Water Systems and of Protoplasm: PROFESSOR MARTIN H. FISCHER. *The Origin of Columnar Holes in Wandering Dunes:* PROFESSOR JOHN W. HARSHBERGER ... 724

Science News ... viii

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LIGHT WAVES IN ASTRONOMY[1]

WHEN any object is viewed in a telescope the image formed at the focus results from the concurrence of the light waves which reach the focus from all parts of the object glass.

In the simplest case—that of a star which is so far away that it may be regarded as a point of light the image will not be a point, but a disc of appreciable size surrounded by a series of concentric circles as shown in Figure 1*a*.

In the case of a double star each component will present such a figure readily separable in a telescope of adequate size as in Figure 1*b*.

But if the stars form a very close double, the two figures overlap as in Figure 1*c* and in this case the system is not to be distinguished as a double.[2]

It can readily be shown that the limit of resolution is reached when the relation between the angular separative α_0 is given when this is equal to the ratio of the length λ of the light wave to the diameter d of the objective multiplied by the constant factor 1.22.

Thus in case of the 100-inch telescope at Mt. Wilson the angle would be $1.22 \times 1/50000$ x $1/100$ or one in four million, corresponding to an angle of about one twentieth of a second of arc; which may be visualized as the appearance of a dime thirty miles away.

Next consider the appearance of an object presenting an actual disc such as a small planetoid. Each point of the disc would form an image like that in Figure 1*a*, the integrated effect corresponding to the appearance in Figure 1*d*.

Here again the appearance of d will not be distinguishable from Figure 1*a* if the angular diameter of the disc is less than $\alpha_0 = 1.22\lambda/d$. This then corresponds to the utmost attainable

[1] Abstract of a lecture given under the auspices of the Carnegie Institution of Washington on April 26, 1923.

[2] At least not accurately measurable though there may be indications of doubling.

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