

primary process, and that this by conditioning the mass-change of the universe is the 'cause' of the world-geometry which predicts the nebular recession. The same confusion between perhaps diverse physical phenomena is seen in another paper of the series, where Prof. Tolman gives an actual formula for the luminosity of a nebula in terms of its distance

and red-shift. This appears to assume some common property in the nebulae, but it is obvious that nebulae (like stars) could have intrinsically different luminosities for the same distance. The whole discussion is, however, most stimulating, and will certainly help to provoke more accurate and extensive observations of the most distant nebulae.

### Thinning Operations in Forestry.

FOR a century or two it has probably been the desire and aim of the scientific forester to endeavour to bring the work of thinning a wood, at various ages in its development, within the circumscribed limits of a definition. There are many experienced foresters, and probably some of the most expert in this part of the forester's work, who maintain that any definition of the work involved or the laying down of any hard-and-fast rules is impracticable—if for no other reason than that in any wood the soil and other factors vary from place to place, with a consequent variability in growth. It follows from this state of affairs that the thinning operations must, if properly carried out, be based upon the condition of the individual trees and their crowns at any spot; and this condition will be a variable quantity. Greater regularity may be found in well-managed coniferous woods, and even in young well-grown broad-leaved crops; but so far as the forests of the British Empire are concerned, such conditions are only exceptionally present.

Some of these points are recognised in the brochure entitled "Classifications of Thinnings" (*Indian For. Records*, vol. 15, pt. 1, 1930. Govt. of India, Calcutta Press). One of the reasons for the persistent effort to evolve some method of classifying thinnings has been the desire to have some rules or rule-of-thumb methods of dealing with certain types of crops which would be simple enough in practice to enable their carrying out by the subordinate staff. In view of the enormous and increasing amount of this type of work which faces the numerically small staffs of the Empire Forestry Departments, it will prove almost a necessity

to place a portion of the thinning work in the hands of the non-gazetted grades. But it has long been accepted that the best amongst thinning experts are born with the gift; that such are to be found in the lower ranks as well as in the upper. In either case the young forester requires to be trained by the senior who is an expert in practice, and not by any rule of thumb such as the brochure here under review attempts to prescribe.

This is not to say that the attempted classification is not of use to those who have a first-hand practical acquaintance with thinning work, either in one type of crop (mixed or pure), or in varying crops managed under different sylvicultural systems. But a very considerable amount of experience would be required before this attempt at classifying thinnings could be translated into practice: even then a wide and varying meaning can be given by different performers to the definitions given under the subdivisions on "Intensity of Thinnings". These subdivisions speak for themselves (for the definitions the pamphlet must be consulted). I. Ordinary Thinning: (1) Light thinning (A grade); (2) moderate thinning (B grade); heavy thinning (C grade); very heavy thinning (D grade). II. Crown Thinnings: (1) Light crown thinning (L.C. grade); heavy crown thinning (H.C. grade). To make use of this brochure with intelligence, and without danger to the crops being treated, the forester requires to possess a clear knowledge of the relative significance of the words and phrases used in the definitions, combined with a very considerable previous practice in the carrying out of one of the most important and interesting of his duties.

### Curious Markings on Stones in Scotland.

THE *Glasgow Herald* of Sept. 17 contains an article by Mr. L. MacLellan Mann describing the markings on some stones at Langside and Cleuch, near Glasgow. The markings on the two stones are nearly alike, consisting of series of rings, arcs, and cup-like depressions. Mr. Mann claims that these have astronomical significance; some of the groups of cups are shown to resemble the Sickle in Leo and (more doubtfully) a star-group in Scorpio. He further claims that he can identify records of ancient eclipses; it would, however, need a fuller explanation of his method to induce astronomers to accept his claims in full. He states that he identified the date of a recorded eclipse as B.C. 2983 Mar. 28\* Gregorian reckoning from the stone itself, and afterwards found by consulting astronomers in Berlin that there was a total eclipse on that date, the track of totality passing over or near Glasgow. The writer of the present note has verified this latter fact independently, making use of the new-moon tables by the late C. Schoch that are contained in "The Venus Tablets of Ammizaduga" (Langdon and Fotheringham, 1928). These tables make use of the latest values of the solar and lunar accelerations; but there is of necessity a considerable margin of uncertainty in computing the tracks of very early eclipses.

This eclipse affords a good illustration of the use of M. Oppert's long eclipse cycle of 1805 years; the name

\* Mr. Mann gives Mar. 27, but 28 appears to be correct.

'megalosaros' has been suggested for it; it is about a hundred times as long as the 'saros', and shares with it the useful property that the parallaxes of sun and moon nearly repeat themselves. The following table gives the tracks of the three successors of this eclipse; they are from Oppolzer's "Canon" and Schrader's sequel to it:

Date.	Sunrise Point.	Noon Point.	Sunset Point.
- 2982 April 21-6	° °	47 W. °	° °
- 1177 April 16-43	41 W. 1 N.	20 E. 40 N.	99 E. 58 N.
628 April 10-03	99 E. 9 N.	161 E. 51 N.	104 W. 63 N.
2433 April 20-46	50 W. 6 N.	13 E. 48 N.	106 E. 56 N.

The first three dates are by the Julian calendar, the fourth by the Gregorian one.

It will be seen that the cycle enables us to make a close approximation to the latitude of the eclipse track; the longitude offers greater difficulty owing to the large effect of the secular acceleration in such a long period. Oppolzer's older eclipses themselves require a considerable shift in longitude to reduce to Schoch's values of the accelerations.

Mr. Mann claims to have found similar records of still older eclipses; thus he refers to one in New Mexico of the date B.C. 3457 Sept. 5. It would, however, be well for him to make the full case for the 2983 eclipse accessible to astronomers before asking them to consider these more remote ones.