ing revolution describes a vertical plane as shown in Fig. *D*.

If one wishes while the plant on the klinostat is freed from the tropic effect of gravitation to apply some stimulus for the study of a tropic reaction, the stimulus should be employed so as to cause curves in the plane of revolution; for as soon as the tip of stem or root deviates from the vertical plane, gravitation seizes upon it to turn it to the horizontal.

Neutralization of the Tropic Effect of Light.—Experiments in which plants are rotated to neutralize the tropic effects of gravitation have been mostly carried on in the dark-room with seedlings. Such conditions and material are easily obtained and managed. Sometimes, however, when the experiments are prolonged, and older plants are used, it is necessary to do the work in the light to avoid the appearance of pathological conditions. The requirements for such work are as manifold as the end sought and can not be considered here. It may be indicated that when the experimental plants are subjected to one-sided illumination as before a window, there are several adverse conditions that are not easily overcome. The common statement that the plants are to be rotated with the axis of the klinostat parallel with the window in order to neutralize the tropic effects of light leads to humiliation or self-deception. If the part of the plant sensitive to light is not at the center of rotation, it alternately as it revolves approaches and recedes from the light, receiving therefore more light on one side than on the other, and responding with phototropic curves. Or if so placed that it does not approach and recede from the window, it may on the horizontal klinostat, receive on one side its principal illumination from the sky and, on the opposite side of the plant, from the earth, thus again forming phototropic curves because of unequal stimuli. Several plants in a pot revolving on a klinostat with axis parallel with the window are likely to show curves because of the shadows which the plants cast on one another. Finally, the effort to neutralize the tropic effect of both light and gravitation on the same plants at the same time is so difficult as to require very special attention to the management of the light, unless the work is done in a plant-house with full exposure. A klinostat, such as has been devised, giving both vertical and horizontal revolution at the same time is not a guarantee against faulty results.

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QUOTATIONS.

THE PRESIDENTIAL ADDRESS BEFORE THE BRITISH ASSOCIATION.

MR. BALFOUR'S presidential address to the British Association naturally recalls another occasion in the history of that body when the chair was filled, not exactly by a prime minister, but by one who had been and very shortly again became prime minister. There is a marked resemblance between the address delivered at Oxford in 1894 by the late Lord Salisbury and that delivered yesterday in the seat of the sister University by his nephew and successor in office. It is entirely right and fitting that this should be the case, because on both occasions the British Association has listened, not to an expert in any one of the sciences, but to a student of the true *scientia scientiarum*. In a limited sense that proud title may be bestowed, as it was yesterday by Mr. Balfour, upon the science of physics. But the real *scientia scientiarum* consists in the assimilation by men of broad and sound general culture of the best and most assured results of the labors of specialists in many fields of research, and in the application of these results to life and conduct in domestic affairs, and to the solution of imperial problems in the wider arena of statesmanship. Of the countless millions who own allegiance to the king there is no man so deeply bound by duty and responsibility to master that difficult science as the prime minister of Great Britain. The obligation, it must be confessed, has sat very lightly upon many holders of that high office. We would fain hope that the appearance of two prime ministers in succession, showing incontestably that they possess a genuine appreciation of the vital necessity for knowledge in the direction of affairs, may be taken as a sign that a higher standard than that of political dexterity in appealing to ignorance

may by degrees be firmly established. We may anticipate the sneer that speculations on the nature of matter do not help much in dealing with what is called 'practical politics,' apparently because it consists chiefly of unpractical and impracticable verbiage. Perhaps not; but the intellectual habit and the intellectual capacity which impel and enable a man immersed in work to keep himself acquainted with the changing aspects of science upon which such speculations depend, do most potently help him in whatever business it may be his lot to transact. The precise color of his speculations is not very material, since it depends upon personal idiosyncracies of which the man himself could give none but the most inadequate account. In essence these speculations are as old as human thought, and all through the ages we find the most powerful intellects ranged on opposite sides. In form the speculations are constantly changing, and so are the names of the opposing parties. What we have to ask about a man is not on which side he stands, but what mastery he shows of the contemporary scientific achievement which gives to the secular controversy the form it wears for the men of his own time. That mastery, according to its degree, makes him an efficient intellectual force in whatever field he may choose to exert himself.—London *Times*.

AN ANCIENT FICTION.

The astonishing longevity of popular delusions in natural history is nowhere better illustrated than by the credence given even by educated folk at the present day to alleged discoveries of frogs, toads and other animals within hermetically sealed cavities, such as inside overgrown hollows of trees or closed interior spaces of rock.

Dr. Traquair, director of the Edinburgh Museum, mentions a letter published in the London *Times* a few years ago by the late Miss Amelia B. Edwards, the eminent Egyptologist, on the finding of a live toad deep down in boulder clay at Greenock, and refers to another accomplished author who took umbrage because some one ventured to question his assertion that live frogs occur in the Old Red Sandstone. Dr. Traquair is right in supposing beliefs of this nature to have considerable antiquity, although he professes ignorance as to how far back they can be traced into the past.

Probably not many will be surprised to learn that this popular delusion has a continuous history in literature of at least four hundred years; and if we include the so-called 'subterranean fish' of Narbonne, to which a special chapter is devoted in Rondelet's 'Ichthyology' (1554), a form of it is traceable as far back as the time of Aristotle. The occurrence of live fish underground, and the singular mode of taking them with the spade instead of the net, or hook and line, is mentioned repeatedly by classic authors, the most particular account being that of Polybius ('History,' xxxiv.). Older than these, though of scarcely germane nature, are the Biblical and secular legends of miraculous suspension of vital functions, of which the tale of the Seven Sleepers is an example.

References might be given to more than a score of sixteenth to eighteenth century writers who make more or less particular mention of the occurrence of live animals in cavities long closed to the air, the list including such prominent names as Conrad Gesner,* Agricola,† Francis Bacon,‡ Athanasius Kircher,§ Libavius|| and Astruc.¶ It is not, however, worth while to take further notice of these early accounts, unless it be one which is remarkable for its *naïveté* and evident truthfulness. This narrative is to be found in the surgical works (book xxv., cap. 18) of Ambroise Paré, court physician of Henry III.,

* 'De omni rerum fossilium, etc.,' Zurich, 1565.

† 'De Animantibus subterraneis,' Cap. XXXV., Wittenberg, 1614.

‡ 'Natural History,' opus posthumum, cent. vi., § 570. Bacon says here: 'The ancients have affirmed that there are some herbs that grow out of stone; which may be, for that it is certain that toads have been found in the middle of freestone.'

§ 'Mundus subterraneus,' lib. viii., Amsterdam, 1664 and 1678.

|| 'Singularium,' part i., de carne fossile; part iv., de Batrachiis, cap. 25.

¶ 'Mémoires pour l'Histoire naturelle de la Province de Languedoc,' part iii., chap. 10, Paris, 1737.