

alone. Evidence for this phenomenon, which resembles the interaction of the bios factors in promoting yeast growth, was given earlier¹. This action of the ether residue, we now find, may be imitated by means of a mixture of sugars and phosphate having approximately the same dry weight per cubic centimetre as the ether residue.

Secondly, some of the salts increase the apparent activity of others. In certain combinations this effect may be as large as that of the ether residue, that is, the activity is multiplied about four times. Although even *l*-malate, the most active so far found, shows little activity at the concentration at which it is present in hay infusion, nevertheless in combination with other salts the activity is considerable. A synthetic mixture of potassium salts of the various acids, each at the concentration present in hay infusion, possessed about one sixth the activity of the original infusion, but when in conjunction either with the ether-insoluble residue or with the mixture of sugars mentioned above, this figure is raised to two thirds. Several active fractions from hay infusion remain unidentified; but since the total activity of these is small compared to that of the acids already determined, it is clear that the excysting activity of hay infusion is largely explained on the above basis.

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¹ Thimann, K. V., and Barker, H. A., *J. Exp. Zool.*, **69**, 37-57 (1934).

Galileo and Mathematical Demonstration

IN support of his contention that Galileo regarded mathematical demonstration as an *a priori* method of reaching truth, G. J. Whitrow, in his contribution

to the supplement to NATURE of June 12¹, states that my uncle, the late Mr. J. J. Fahie, has shown that "to satisfy his [Galileo's] own mind alone he had never felt it necessary to make any [experiments]". This is a misquotation. In my uncle's book the words are²: "It was in reference to this controversy [on floating bodies] that Galileo declared that ignorance had been the best master he ever had, since, in order to be able to demonstrate to his adversaries the truth of his conclusions, he had been forced to prove them by such a variety of experiments as made himself doubly confident; though to satisfy his own mind alone he had never felt it necessary to make many".

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¹ NATURE, **139**, 1008 (1937).

² Fahie, J. J., "Galileo", p. 145 (1903).

The statement in my contribution to the supplement to NATURE of June 12 is inaccurate, and I apologize for misquoting the late Mr. J. J. Fahie. Actually I did not have access to his original article and quoted from E. A. Burt "Metaphysical Foundations of Modern Science" (2nd edition, Jan. 1932), p. 65, where, in referring to Mr. Fahie's article, the vital word 'any' is misquoted for 'many'. Until receiving Mr. Fahie's letter I was naturally unaware that Dr. Burt had misquoted.

The point I wished to emphasize (owing to the unfortunate misquotation it was over-emphasized) is that *a priori* mathematical reasoning played a much larger part in Galileo's work than is generally realized.

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Points from Foregoing Letters

X-RAY photographs indicating changes in the structure and molecular orientation of *p*-cresol mono-alcohol during the process of resinification on heating are submitted by N. J. L. Megson and W. A. Wood. A new crystalline compound (m.p. 99-100°) is first formed apparently by condensation of two molecules with elimination of water. The resin which results on further heating shows signs of a distorted crystal structure, and the authors suggest that it is formed by small irregular displacements of the molecules from the crystalline formation and not by radical rearrangement of a random nature.

B. A. Nikitin states that, as in the case of radon, other rare gases, namely, argon and neon, are taken up in definite proportions by sulphur dioxide hydrate (formed from sulphur dioxide and snow at -8° C.); he concludes that neon also forms a hydrate, as is known to be the case with argon, krypton, xenon and radon. Different stability of the rare gas hydrates makes it possible to separate chemically argon and radon from helium, and neon and radon from argon.

Photomicrographs showing the growth-stimulating effect upon yeast (*S. cerevisiae*) of substances produced in cells irradiated with ultra-violet light are submitted by G. S. Sperti, Prof. J. R. Loofbourrow and Sister

C. Marie Dwyer. The authors describe a new technique of testing proliferation-producing substances, and give a table showing comparative effect of irradiated cells, Kreke's 'bios' preparation and controls.

The infra-red absorption spectrum of tetradeuterioethylene has been investigated by Dr. G. B. B. M. Sutherland and G. K. T. Conn, who have thus identified four of the fundamental frequencies of vibration of the molecule.

D. G. Davey discusses certain aspects of the physiology of nematodes from the alimentary canal of sheep. Acidity and the toxicity of bile salts are factors which influence their specificity and also their distribution within their host. He has failed to discover their actual food requirements, but points out that simple immersion in blood or alimentary canal fluid is probably insufficient for their culture *in vitro*.

Emergence from the cyst of the protozoan *Colpoda cucullus*, which takes place in hay infusion, is found by K. V. Thimann and A. G. Haagen-Smit to be due to the presence of potassium salts of certain organic acids (oxalic, succinic, acetic, fumaric, etc.). They find that the ether-insoluble portion of the hay infusion, which by itself is inactive, increased the activity of the organic salt.