

however, that he may, in the near future, be tested genetically.

In the meantime the correlation between blue eyes and deafness is certainly not a perfect one. If the two characters are due to a similar physiological or genetic agent, it seems certain that its effects are sufficiently variable to enable them to operate in either the eyes or the ears, to the exclusion of the other location.

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¹ Bamber, R. C., *J. Genetics*, 27, 407-413; 1933.

Spawning Date of the Common Frog

In a former communication¹ I announced certain conclusions on the effect of the weather upon the spawning date of the common frog, *Rana temporaria*. Since then, a number of new facts have come to light.

Although wet days and spawn days are not associated, rainfall affects the date of spawning. The effect, parallel to the temperature effect previously reported, is due mainly to the total rainfall of the month prior to spawning.

These conclusions are confirmed by the relation which exists between the altitude of a pond and its spawn date. In south-west England, spawning is, on the average, earlier the higher the pond observed. In the Midlands and in south-east England, the same is true but the effect is much less. This distribution, both altitudinal and geographical, is the same as that of orographical rainfall.

The view that the weather is acting directly on the frogs themselves conflicts with my observations on migration. Although frogs hibernate in a variety of situations, they arrive at a particular breeding pond from different directions simultaneously, although this pond may differ considerably in its spawn date from another close by. There is, moreover, a difficulty in accepting a long period rainfall effect acting directly on frogs hibernating under water. The pond seems to be the unit for both spawning and migration, probably two aspects of one problem.

The observations suggest that spawning is dependent on pond periodicity. It is known that the periodicity of pond plants is affected by temperature and especially rainfall, which acts by the washing of phosphates from the soil into the pond². Atkins, in the paper cited, found that ponds with streams running into them developed their algal maxima earlier than the others, due to the increased phosphate supplies, and I found, from the results of a postal questionnaire, that ponds without streams tended to be without frogs.

The link between algal (or other plant) periodicity and spawning is being sought in the production of odour by the water plants. The smell of standing water is a problem of water-works technology, with a large literature, which has received little attention from workers on the migration of terrestrial animals breeding in the water. The odours are, in general, not those of decay, but are due to essential oils secreted by the water plants, plankton, etc., and are markedly periodic in their occurrence.

An endeavour was made last season to see whether plankton was responsible by asking a number of

observers to send me samples of the water of their ponds, from which I concluded that planktonic organisms are not concerned. An attempt is being made this spring to correlate phosphate changes in the water with spawning.

The form of the generalised curve showing the progressive changes in the number of ponds in an area having spawn is deducible from some simple assumptions on the mechanism, and the reasoning shows that the date on which the maximum number of ponds develop the postulated effect will not be coincident with the date on which the maximum number of spawn reports occur, but will be later.

A detailed account will be published later.

I wish to thank those phenological observers who took so much trouble in the postal scheme, and the Royal Meteorological Society for data courteously supplied.

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¹ Savage, *NATURE*, 131, 587, April 22, 1933.

² Atkins, *J. Marine Biol. Assoc. U.K.*, 13, 119.

A Recent Sedimentary Volcanic Tuff

ON November 3, 1931, during a trawling survey of Falkland Island waters, the R.R.S. *William Scoresby* made a haul with a commercial trawl in 98 m. of water on a position 45° 56' S., 66° 24' W. situated in the Gulf of San Jorge, off the Patagonian coast.

The contents of the trawl consisted mainly of several bushels of slabs, 5-10 cm. thick, of a compact clay-like rock. Its colour was greenish-grey changing to olive-buff when dry. Under the microscope, the rock is seen to consist of some very finely divided 'clay' substance, too finely divided to be identified by means of the polarising microscope, but a much more abundant constituent is colourless volcanic glass in flakes varying in size from 0.15 mm. downwards. With this are birefringent grains of feldspar (varying in size from 0.06 mm. in diameter downwards) and a very few green grains resembling glauconite. The colourless glass and the feldspar are similar to the material which forms the dust clouds emitted by volcanic eruptions in the Andes and has on occasions travelled the whole breadth of the Argentine Republic. In dust collected at Buenos Aires after the eruptions in the Andes in 1932, the particles ranged from 0.2 mm. downwards for the colourless glass, and from 0.1 mm. downwards for the chips of feldspar and other minerals. There seems no doubt that the rock has been formed by the deposition in the sea of volcanic dust wind-borne from the Andes. If so, it is an excellent example of the mode of deposition of some of those sedimentary volcanic tuffs which have long been known among deposits of volcanic origin.

The associated fauna was very meagre, consisting almost entirely of an alcyonarian of the genus *Renilla* together with a few polychaetes.

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