50 & 100 YEARS AGO

50 YEARS AGO

It has been observed in this laboratory that when aqueous mixtures of dicarboxylic or monocarboxylic acids and certain ammonium salts are irradiated with ultra-violet light, certain amino-acids are obtained.

A cold quartz ultra-violet lamp giving 86 per cent of its output at about 2537 A. was used for irradiated mixtures of succinic, maleic, propionic and acetic acid with a number of ammonium salts ... The irradiation was continued in each case for 24 hr ...

Of all the ammonium compounds investigated only ammonia and ammonium carbonate were active, and of the acids only succinic, maleic and propionic acid gave rise to amino-acids ...

The amino-acids are aspartic acid, alanine and glycine, that is to say, amino-acids with 4, 3 and 2 carbon atoms respectively.

From *Nature* 23 August 1958

100 YEARS AGO

The Rev. J. W. Hayes, of West Thurrock Vicarage, Grays, has directed attention to some old underground workings for chalk at Hemel Hempstead, which in his opinion throw much light on the origin and use of dene-holes generally. It appears that in order to obtain chalk suitable for lime-making it was until recently the practice ... to work the chalk in subterranean chambers reached by deep shafts ... A vertical shaft, of circular section, about 5 feet in diameter, was sunk through superficial deposits until the hard chalk was reached, and from the bottom of the shaft three so-called "arches" were struck out. These arches were chambers, which in some cases were more than 12 feet high. The chalk was mined in these drifts for a length of twenty to twenty-five yards, and when the distance of the working face from the bottom of the shaft became inconveniently great, or when the roof proved unsound, a new pit would be sunk.

From *Nature* 20 August 1908

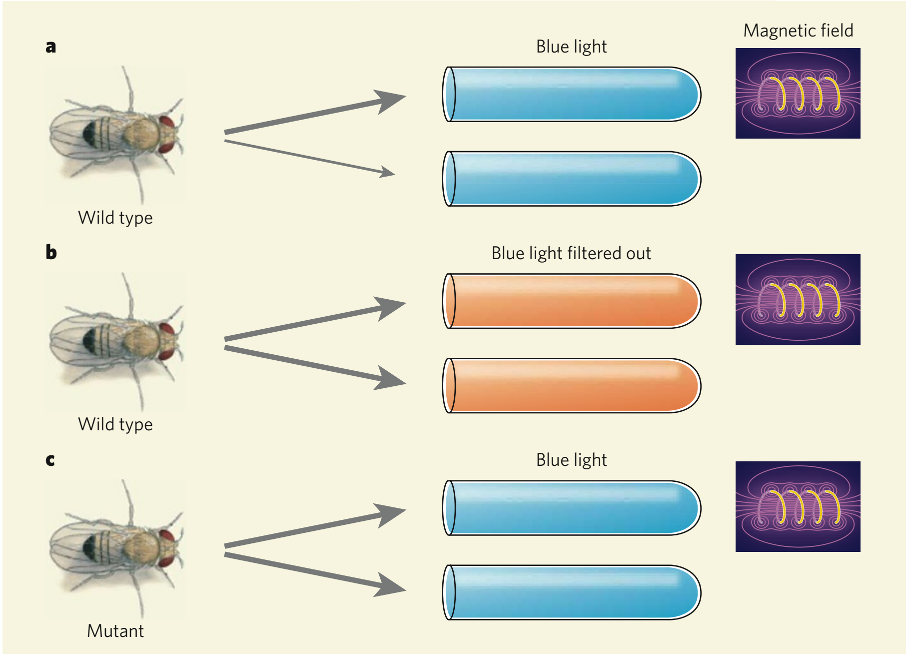

Figure 1 | Magnetoreception in fruitflies. **Gegear *et al.*[2] studied the ability of fruitflies to detect a magnetic field. a, When trained to associate a magnetic field with a reward of sugar, wild-type flies preferentially choose to enter a tube that is bathed in a magnetic field, rather than one that is not, so long as blue light illuminates the experiment. b, The trained flies demonstrate no preference for the tubes if blue light is filtered out of the illumination. c, Genetically modified flies that lack the photoreceptor cryptochrome (which responds to blue light) do not recognize the magnetic field, even in the presence of blue light, showing that cryptochrome is essential for magnetoreception in fruitflies.**

Previous studies[6] have shown that fruitflies respond differently to magnetic fields depending on the wavelength of light that they are exposed to. Gegear *et al.* therefore investigated the influence of different light colours on the behaviour of their trained flies, concentrating on the blue end of the spectrum for the reasons mentioned earlier. Their results indicate that light is indeed required for fruitfly magnetosensitivity — the flies were unable to detect magnetic fields in the absence of light of short wavelength (less than 420 nanometres; Fig. 1). This is close to the region of the spectrum that is absorbed by cryptochrome, suggesting that the photoreceptor might be involved in this behaviour.

To confirm the role of cryptochrome in magnetoreception, the authors tested mutant cry^0 flies, which lack the photoreceptor, in their behavioural assay. They found that untrained wild-type flies that have the same genetic background as cry^0 flies are attracted to magnetic fields. But the cry^0 mutants showed no response to the magnetic field, even if they had been through the training protocol. Moreover, flies that carried a different cryptochrome mutation — one that disrupts most of the photoreceptor's function without deleting the protein completely — were also unresponsive to the magnetic field. This strongly bolsters the idea that cryptochrome is a vital component of light-dependent magnetoreception in fruitflies.

Because cryptochrome is involved in setting the circadian clock in flies' brains, and could also have a clock-gene function in other tissues[1], Gegear *et al.* checked to see whether the flies' magnetoreceptive response depended on having a functional circadian clock. The answer was no. Even in conditions that caused the flies to be circadianly arrhythmic, wild-type flies retained their ability to detect a magnetic field, supporting the idea that magnetoreception in fruitflies is independent of their body clocks.

Clearly, cryptochrome is required for magnetoreception in fruitflies, but more sophisticated behavioural assays will be needed to understand the type of information that flies glean from magnetic fields. It also remains to be seen whether the receptor itself is the magnetosensitive molecule.

It has been proposed[4] that, in birds, Earth's magnetic field causes variations in signals from precisely oriented photoreceptors, thus providing a three-dimensional map of the field to the bird's brain. This raises the question of where cryptochrome localizes in the body. In fruitflies, the precisely organized compound eye seems a likely candidate. But fruitfly larvae also seem to sense magnetic fields[7], yet they don't have compound eyes. The finding of cryptochrome in the nerve fibres of some circadian-clock neurons[12] in fruitflies suggests that sites might exist in the brain for oriented placement of these receptors. Further studies with genetically engineered fruitflies will certainly provide us with some answers to these questions.

It is not clear why fruitflies, which do not migrate and usually spend their summers flying around rotten fruit, should care about Earth's magnetic field. The magnetoreceptive function