



**Figure 1 | How fly eyes differ from those of other arthropods.** **a, d,** Surface view of a single eye facet (ommatidium) of a compound eye. **b, c, e,** Ommatidia seen as though sliced through their long axis. **a,** In the ancestral fly eye and in modern-day insects such as bees and beetles, the light-capturing surfaces (rhabdomeres) are fused in the centre of the ommatidium. **b,** In 'apposition' eyes, pigment cells sheath each ommatidium, so light is received only down the central axis and image resolution is improved. **c,** Insects that need good night vision have 'superposition' eyes, which lack most of this pigment, so light is received from all angles. In this case more photons are received, but the resolution of the image is reduced. **d,** Modern flies and some mosquitoes have open rhabdoms, so that instead of one picture point per ommatidium, they can perceive seven. This requires some rewiring of the underlying neurons so that light received from different angles in one ommatidium can be resolved (neural superposition). **e,** Zelhof *et al.*<sup>1</sup> find that expression of the Spacemaker protein is responsible for the opening up of the rhabdomeres.

known protein, Chaoptin<sup>5</sup>, to divide the upper part of the photoreceptor cell membrane into rhabdomere and 'stalk' domains. These proteins also delicately regulate cell-cell contacts so that the rhabdoms stay intact, but the adjacent rhabdomeres don't stick to each other.

Zelhof *et al.* find that Spacemaker is absent from the eyes of insects with fused rhabdom systems (bees and beetles), but is present in other diptera with open rhabdoms (the house fly and a mosquito). Prominin and Chaoptin are present in all cases, and so it seems that Spacemaker is the crucial factor in making the inter-rhabdomeral space. In a most satisfying control experiment, they targeted the expression of Spacemaker to another type of fly eye: the ocelli (simple eyes on the top of the head). The three ocelli have many photoreceptor cells, but their rhabdomeres are normally fused. When Zelhof *et al.* expressed

Spacemaker in the ocelli, they found that an inter-rhabdomeral space opens up.

These experiments suggest that the diptera may have 'opened their eyes' (invented neural superposition) by a single change: reprogramming the expression of Spacemaker for novel expression in the ommatidia. It is not often that we get such a clear glimpse of the blind watchmaker at work. ■

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## 50 YEARS AGO

A new and rapid technique of characterizing the chemical properties of a protein in considerable detail has been devised; by its application a specific difference is found in the sequence of amino-acid residues of normal and sickle-cell haemoglobin. This difference appears to be confined to one small section of the polypeptide chains... The action of trypsin on proteins is at present the most reliable way of splitting a peptide chain at specific peptide bonds... Small differences in the two proteins will result in small changes in one or more of [the resulting] peptides. These should be detectable when the mixture is examined by a two-dimensional combination of paper electrophoresis and paper chromatography. It was decided to call the resulting chromatogram the 'finger print' of the protein. V. M. Ingram  
From *Nature* 13 October 1956.

## 100 YEARS AGO

In my address at York I urged biometricians to make sure that the problems they seek to elucidate are sound from a biological point of view. When asked by Prof. Pearson for an instance of failure in this respect I gave him, while away on my holiday, and in a private letter, Dr. Pearl's paper. He has now seen fit, although I twice asked him to wait for a full answer until my return to Cambridge, to challenge me to show in the pages of *NATURE* how my advice was applicable to that paper. I must leave your readers to judge how far I have succeeded in so doing.

The task has been far from an agreeable one. I should never have thought of singling Dr. Pearl's paper out for public criticism in this manner had I not been challenged to do so. I can only say that if he feels himself aggrieved at the result, he can be in no doubt whom he has to thank. J. J. Lister  
From *Nature* 11 October 1906.

50 & 100 YEARS AGO