100 YEARS AGO
On the shore of the island of Hadod, latitude 68° 40’ about, in Vesteraaln, north of Lofoten, there was found, probably in the autumn of 1897, a wooden ball, 4½ centimetres in diameter, covered by a thin layer of gum. The ball is of fine workmanship, and just able to float in the water. Circles are engraved upon four parts, and form small rhumbs over the whole surface; and on two places there is engraved with Latin Majuscules the name Melfort. Perhaps some of your readers can say from whence this ball has come. I am writing to the man who has the ball now, to ask him to send it to me.

From Nature 9 November 1899.

50 YEARS AGO
The speed of the meteors is so great that as they rush into the atmosphere of the earth they burn away at heights of about sixty miles. Until recently, the streaks of light produced by the burning meteors provided the only method by which astronomers could study this phenomenon. Such observations are hindered or prevented by cloud and moonlight, and are impossible in daylight.

On the other hand, the burning meteor leaves behind it a dense trail of electrons which can reflect radio waves ... An important consequence of the radio observations has been the discovery of great meteoric activity in summer day-time. The well-known visual meteor showers ... usually last for a few nights. The summer daytime showers detected by the radio method are far more extensive and attain higher rates. The daylight activity, which in May comes from the direction of Pisces, develops rapidly, extending over a wide belt stretching behind it a dense trail of electrons which can reflect radio waves ... An important consequence of the radio observations has been the discovery of great meteoric activity in summer day-time. The well-known visual meteor showers ... usually last for a few nights. The summer daytime showers detected by the radio method are far more extensive and attain higher rates. The daylight activity, which in May comes from the direction of Pisces, develops rapidly, extending over a wide belt stretching behind it a dense trail of electrons which can reflect radio waves ...

From Nature 12 November 1949.

Distorting sex ratios
Keith R. Willison

During sperm production in mammals, the process of meiosis generates spermatozoa that are genetically different but functionally equivalent. So, with respect to the sex chromosomes, for example, equal numbers of sperm are produced carrying either an X or a Y chromosome. Because X and Y sperm are equally capable of fertilizing an egg, equal numbers of male and female embryos are produced, and the mammalian sex ratio at birth is 50%.

All other pairs of chromosomes show this 50% transmission ratio, but there are rare exceptions. For example, some mice contain naturally occurring variants of chromosome 17 — the so-called t-haplotypes — that do not obey this rule. Remarkably, sperm carrying these unusual chromosomes can propagate themselves with transmission ratios as great as 99% in their own favour. It was not known how this process, known as transmission ratio distortion (TRD), is achieved at a molecular level. But on page 141 of this issue, Herrmann and colleagues describe a unique protein kinase encoded by the t-haplotype. This kinase affects a signal-transduction cascade that probably controls the speed and directionality of sperm as they make their long journey up the female reproductive tract.

Within a mouse t-haplotype, several hundred functionally unrelated genes have been locked together by a series of chromosomal inversions that prevent recombination with wild-type chromosomes. All t-haplotypes derive from a single common ancestor, and wild mice carrying these chromosomes can be found all over the world. Thet-haplotype variants (known as t11, t12 and so on) differ in the functionally unrelated genes, but not in the TRD system. Presumably, it is the common TRD system that allowed the successful propagation of t-haplotypes.

Over 40 years ago, Mary Lyon began a genetic study of TRD in the t6 haplotype of laboratory mice. She eventually developed a model for TRD, involving interactions between three or more genetic loci. According to this model, several loci — the t-complex distorters, Tcd — act on the single t-complex responder locus, Tcr, to distort transmission ratios (Fig. 1a). Normally, of course, all the component genes of the TRD system are encoded in the t-region of chromosome 17, and are locked together by the chromosomal inversions. But experiments have shown that the distorters (Tcds) can act in trans on the cis-acting Tcr responder. Put more simply, this means that the

Figure 1 Genetic models of transmission ratio distortion. a. Naturally occurring configuration of genetic elements required for 99% transmission of a t-haplotype chromosome (17t) compared with a wild-type chromosome (17+). Two or more distorters (Tcd-1 and Tcd-2) act on the responder (Tcr) (simplified model from refs 3,4). b. Experimental configuration of genetic elements created by Herrmann and colleagues, which produce twice as many male mice as females. The natural distorters are carried by a modified t-haplotype lacking Tcr (17t*), and they act in trans on a transgenic Tcr DNA construct carried on the mouse Y chromosome.

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This is possible because developing sperm grow together in a syncytium, in which groups of cells remain connected to each other through large junctions, allowing macromolecules to diffuse freely. The action of Tcr, on the other hand, could be to prevent those sperm cells that contain the t-haplotype from the harmful action of its own distorters — that is, t-haplotypes encode both the poison and the antidote. But it is not clear how the antidote might function in only half the cells in the syncytium, even with the knowledge that Tcr is a protein kinase and that it is expressed in the right cells at the right time. It is to be hoped that cell-biological analysis of the system will tell us how Tcr can act in cis, and how it interacts with the newly discovered kinase cascade that regulates the sperm flagellar apparatus.

Keith R. Willison is at the Institute of Cancer Research, Chester Beatty Laboratories, 237 Fulham Road, London SW3 6JB, U.K.