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inactivated after fertilization in the absence of prior MSCI clearly shows that key aspects of imprinted X inactivation can take place without it.

One interesting outcome of these studies[2,6,7] is that the pre-inactivation and the *de novo* inactivation hypotheses can both be correct, as summarized in Fig. 1. X-linked genes in the sperm could arrive in the egg in an epigenetically inactive form. The egg cytoplasm could then exert an immediate response to reverse this state — perhaps as part of the genome-wide reprogramming events that affect the paternal genome in the newly fertilized egg[11]. It is likely, given the results of Okamoto *et al.*, that most genes on the paternal X, including the *Xist* gene, are activated at the two-cell stage. But it seems that over the next few cell divisions they become inactivated again through the action of *Xist*, without necessarily requiring prior MSCI.

The latest work illustrates the amazing plasticity and dynamic nature of epigenetic programming and reprogramming in germ cells and early embryos. Insight into these events will give us clues about how the genome functions in normal development and in disease. It may also eventually provide tools for treating diseases of genome malfunction. ■

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COMMUNICATIONS TECHNOLOGY

Chaos down the line

Rajarshi Roy

Chaos, goes conventional wisdom, can only be a malign influence in telecommunications. But a technique that uses chaotically varying signals to transmit information more privately may help it shed that bad-boy image.

Synchronization leads to communication — even when the signals used are chaotic. That is the lesson of a study by Argyris and colleagues on page 343 of this issue[1]. It reports the successful transfer of digital information at gigabit rates by chaotically fluctuating laser light travelling through more than 100 kilometres of a commercial fibre-optic link around Athens, Greece (Fig. 1). The transmitter and receiver become harmonized in chaotic synchrony, allowing information to be reliably extracted at the other end — a result that brings us closer to exploiting the inherent advantages of chaos, rather than trying to eliminate it whenever it appears.

The phenomenon of synchronization in periodic systems has been known since at least 1665, when Christiaan Huygens observed that pendulum clocks become synchronized when placed close to each other on a common support. Asian fireflies flashing together, flocks of geese flying in remarkable formations and pedestrians in lock-step on London's Millennium Bridge are illustrations of synchronization when large numbers of living creatures get together[2]. But synchrony also arises in inert matter: lasers and masers both exploit the ability of large ensembles of atoms and molecules to harmonize their oscillations and emit light in coherence. The key to synchrony in such systems is that the individual elements

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Figure 1 | Attic experiment. Argyris and colleagues[1] successfully used chaotic waveforms to transmit information over a distance of more than 100 kilometres in the telecommunications network of Athens (seen here from the Acropolis).

50 & 100 YEARS AGO

50 YEARS AGO

An Outline of the Cancer Problem. — It is almost as difficult to review a popular book on cancer as to write one, and for similar reasons. The subject ranges over such a vast canvas that one is always acutely aware of numerous important omissions and of the minor distortions which inevitably appear... One is compelled to stress those aspects most dominant in one's own experience, and Dr. I. Hieger naturally stresses the important role of the chemical carcinogens in etiology. He was in the team which first isolated from coal tar a pure chemical carcinogen, and he gives us the most interesting story of this pioneer discovery. Moreover, we have seen lately the firm linkage of exposure to tobacco and industrial smoke to the tremendously rising incidence of lung cancer... If it is shown that lung cancer is in fact due to exposure to chemical carcinogens in smoke, their practical significance in human cancer will become of greatly enhanced importance.
From *Nature* 19 November 1955.

100 YEARS AGO

American palaeontologists are becoming more and more strongly convinced of the decisive character of the evidence afforded by extinct faunas of a comparatively recent connection between South America, South Africa, and Australia. A short time ago, Dr. W. B. Scott...announced his opinion that the fossil Santa Cruz insectivore Necrolestes is closely allied to the South African Chrysochloris, and that this relationship indicated a connection between South Africa and South America. Now Mr. W. J. Sinclair... states unequivocally that Prothylacinus and the other marsupial-like carnivores of the Santa Cruz beds are true marsupials closely related to the Australian thylacine... Mr. Sinclair considers himself justified in stating that..."a land connection between Patagonia and the Australian region existed not later than the close of the Cretaceous or the beginning of the Tertiary".
From *Nature* 16 November 1905.