



50 YEARS AGO

What Man May Be: The Human Side of Science by George Russell Harrison

— It has been estimated that each year sees the discovery of at least one million new scientific facts. Very few of us who are scientists have the capacity to digest more than a minute fraction of this feast, and to see the pattern to which it contributes. Yet we are vastly better off than the non-scientists, whose main contact with science is “through its slums, the half-world of such things as flying saucers and water dowsing”... This is an excellent book to give to almost anyone who wants to understand that science has changed both the things we do, and the way we think. There is not a dull moment in it, and probably most of those who do read it will catch something of the infectious optimism that underlies each page. Onward and upward in the best of all possible worlds.

From *Nature* 4 January 1958.

100 YEARS AGO

“The inheritance of ‘acquired’ characters” (*Sur la Transmissibilité de Caractères acquis*) by Eugene Rignano — A man of science to command general attention and interest must do two things; first, he must make interesting discoveries or profound generalisations; and secondly, he must do things at the right time. Darwin made his name because he fulfilled both conditions. Mendel died an unknown man because he did not fulfil the second. He was forty years too soon... If it is possibly fatal to make discoveries too soon, it is certainly fatal to make them too late. It is therefore with a certain sense of weariness, mingled with surprise, that we note the appearance of a work on the transmission of acquired characters... The author of the book before us, who is an engineer interested in sociology, believes in the transmission of acquirements, and has invented a theory of centro-epigenesis to account for the phenomenon.

From *Nature* 2 January 1908.

within organs — for efficient tumour growth^{6,7}. It seems, therefore, that *Ets2* has context-dependent functions: in the *Apc^{Min}* mice with intestinal cancer it is a tumour repressor and in the PyMT mice with breast cancer it functions as a tumour promoter within the non-cancerous stromal cells. Such a non-cell-autonomous function of *Ets2* as a tumour promoter is consistent with observations⁸ that *Ets2* regulates the expression of genes within stromal cells to produce the extracellular matrix that is known to be essential for tumour growth and metastasis.

Taken together, the tumour-promoting and tumour-repressive activities of *Ets2* may provide an intriguing explanation for the inverse correlation between *Ets2* copy number and intestinal tumour number in *Apc^{Min}* mice (Fig. 1). Previous studies have suggested that, in *Apc^{Min}* mice, early tumour cells have an inductive activity on nearby cells, which leads to polyclonality — tumours originating from more than one cell population⁹. The activity of *Ets2*, which can regulate stromal function as well as tumour growth, may contribute to this polyclonality and subsequent tumour survival. Although speculative, this hypothesis can be tested with animal models such as those used by Sussan and colleagues².

These authors’ results undoubtedly provide insight into the contextual function of *Ets2*, but also reveal a paradox that will require further

study. The contradictory activities of *Ets2* predict a crucial point — individuals with Down’s syndrome are at a lower risk of developing solid tumours, probably owing to the high *Ets2* levels in their epithelial cells, but they might be at a greater risk of cancer metastasis. So therapeutic use of potential drugs with *Ets2*-like activity to reduce tumour incidence may have limited value, because a side effect of such drugs could be increased efficiency of metastasis¹⁰. Nonetheless, the findings of Sussan *et al.*² strongly warrant further investigation into whether natural variation in *Ets2* expression levels is associated with differential susceptibility to solid tumours. ■

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MAGNETISM

Freedom for the poles

Oleg Tchernyshyov

Magnetic poles always come in twos, a north and a south. That received wisdom has not stopped physicists from searching for ‘monopoles’ in accelerators and cosmic rays. Theory now indicates a better place to look.

Despite some tantalizing clues for their existence from the realms of quantum physics, magnetic monopoles — single magnetic poles without a partner — remain elusive after decades of searching. Do they exist at all in the real world? On page 42 of this issue¹, Castelnovo, Moessner and Sondhi argue yes: monopoles are alive and well in an exotic class of magnetic material known as spin ice².

An iron magnet has two poles, north and south: Earth’s iron core makes it an extremely large example of the genre. These poles are positive and negative magnetic charges, acting as sources and sinks of the magnetic field. In general, magnetic interactions are very similar to electrical interactions: like poles repel and unlike attract, with a force inversely proportional to the square of their separation. But whereas positive and negative electric charges can exist independently, magnetic poles always seem to occur in pairs. Rather as

the sorcerer’s apprentice hacks his enchanted broom into pieces only for each to spring to life as a new whole broom, breaking a bar magnet in two yields smaller magnets, each with a north and a south pole, and an overall magnetic charge of zero.

This asymmetry extends to the subatomic level. Elementary particles can carry a positive or negative electric charge, but the magnetic charge is zero without exception. Yet theory offers some hints that single magnetic poles might exist in nature. In the 1930s, Paul Dirac showed that magnetic monopoles could explain the observed quantization of electric charge. Extensions of the standard model of particle physics include particles with magnetic charge.

One environment in which monopoles might pop up is crystalline solids. In a crystal at a low temperature, excitations above the ground state often behave like elementary particles: they