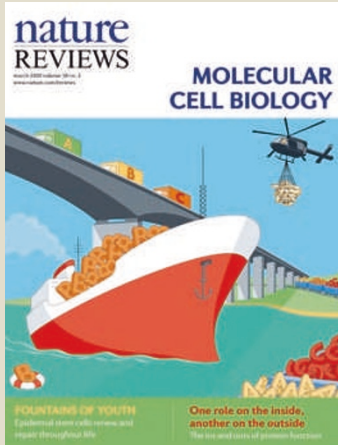




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► **COVER:** 'ABC transporters' by Vicky Summersby, inspired by the Review on p218



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The field of epigenetics has exploded in recent years and is the focus of some of the most exciting studies of nuclear processes, such as transcription, DNA replication and DNA repair. But what is epigenetics?

First coined by Conrad Waddington in 1942, epigenetics defined how the genes of a genotype bring about a phenotype. However, the term is now rarely used in this sense. Over the years, the word has been used in other ways. Adrian Bird, for example, recently defined epigenetics as the structural adaptation of chromosomal regions so as to register, signal or perpetuate altered activity states. Notably, this definition includes both transient epigenetic marks (such as the phosphorylation of histone variant H2AX after a double-strand break) and epigenetic marks that are inherited through cell division. Epigenetics has also been defined more stringently as the heritable changes in genome function that occur without alterations in DNA sequence. This definition implies that whether, when and how particular genetic information is read is determined by epigenetic marks — key candidates include DNA and histone modifications, histone variants, non-histone chromatin proteins, nuclear RNA and higher-order chromatin organization. On page 192, Aline V. Probst, Elaine Dunleavy and Geneviève Almouzni discuss how epigenetic marks are inherited and maintained throughout the cell cycle. With their Review, we launch a new Article Series on Chromatin dynamics (<http://www.nature.com/nrm/series/chromatin>). The articles in this Series, which will run throughout 2009, will discuss recent breakthroughs in our understanding of the mechanisms that govern the dynamic structural and spatial organization of chromatin, thereby providing important insights into gene regulation, DNA repair, development and epigenetic inheritance.

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