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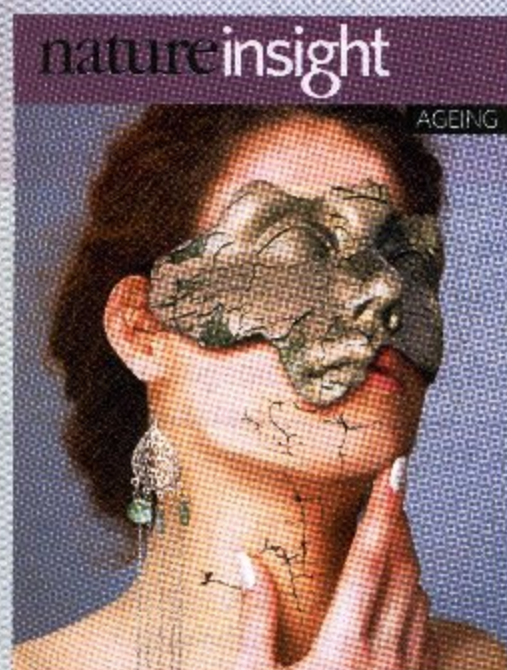
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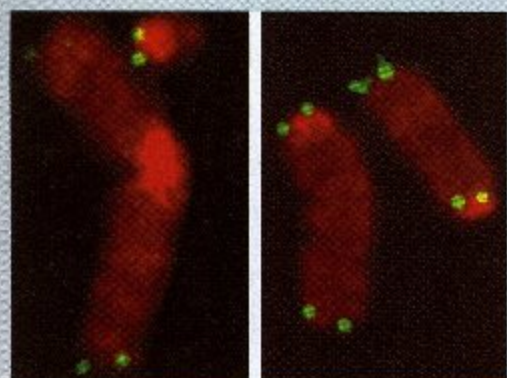
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Worldwide, the number of old people is increasing rapidly, so finding ways to keep age-related diseases at bay is an urgent task. Owing to a growing understanding of the processes that underlie ageing, there is hope that, at some time in the future, elderly people will be kept healthy by suppressing the ageing process itself.



Abnormally fused chromosomes (left) in prematurely ageing mice, p. 520. (Courtesy of A. Protopopov and E. V. Ivanova, Dana-Farber Cancer Institute)

AGEING

REVIEWS

504 The genetics of ageing

C. J. Kenyon

Ageing is not a passive, disorganized process of deterioration, as biologists once thought. Like many biological processes, it is controlled by signalling pathways and transcription factors. Mutations in certain genes can slow down ageing and lengthen lifespan in model organisms, such as yeast, flies and the nematode *Caenorhabditis elegans*. Biologists are now unravelling the pathways that are involved in this process, improving our understanding of what causes ageing and, importantly, how to postpone it. As many such genes and pathways function similarly in mammals, there is hope that, in the future, the results might help to defer ageing in humans as well.

513 Lessons on longevity from budding yeast

M. Kaeberlein

The budding yeast *Saccharomyces cerevisiae* is one of the most important models in ageing research. Its short lifespan and the ease by which both dividing and non-dividing cells can be studied has led to much progress in defining the molecular mechanisms of ageing and the factors that affect longevity in yeast. Many of these — including dietary restriction, the protein kinase TOR (target of rapamycin) and sirtuins — have now been shown to be evolutionarily conserved across species and are some of the most promising targets for anti-ageing drugs.

520 Linking functional decline of telomeres, mitochondria and stem cells during ageing

E. Sahin & R. A. DePinho

Ageing-related pathways have been characterized in various organisms, but it is unclear how they interact during the ageing process. Now, studies of mutant mice and people with genetic disorders seem to indicate that three pathways — genome maintenance, DNA damage signalling and metabolic regulation — connect during ageing. One possible model is that damage to telomeres (which protect chromosomes from degradation) and impaired DNA repair activate the tumour-suppressor protein p53, leading to cell death, cell senescence, or arrest of the cell division cycle, together with impaired mitochondrial function. This leads to further DNA damage, feeding into a cycle of decline. Overall, the pools of tissue stem cells become smaller, making it difficult to maintain the proper function of the body's organs.

529 Neural mechanisms of ageing and cognitive decline

N. A. Bishop, T. Lu & B. A. Yankner

During ageing in humans, the brain undergoes structural and physiological changes, and cognitive capacity declines. The technological advances of DNA microarray analysis and functional imaging of the brain have enabled researchers to study ageing at a deeper level, by characterizing the changes that occur in brain gene expression and large-scale cognitive networks as a person ages. In addition, many of the pathways that have been identified to control ageing in various organisms have also been found to modulate the pathology and cognitive decline in animal models of neurodegenerative disorders. Together, these lines of research are improving our understanding of normal and pathological ageing of the brain and how this leads to cognitive decline, providing the first steps to treating and, perhaps, preventing such conditions.

536 Biodemography of human ageing

J. W. Vaupel

Over the past couple of centuries, the lifespan of humans has been extended considerably and is still increasing by hours each day. Remarkably, people are reaching old age in better health. This progress is largely a result of better medical care, rising standards of living and healthier lifestyles. Research by demographers, epidemiologists and biomedical researchers suggests that humans can live to even greater ages, and in good health. It is clear that further improvement of health among elderly people will be aided by a better understanding of the root causes of ageing and by targeting these for intervention.

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NATURE ONLINE

ADVANCE ONLINE PUBLICATION

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Molecular mechanism of multivesicular body biogenesis by ESCRT complexesT Wollert & J H Hurley [doi:10.1038/nature08849](https://doi.org/10.1038/nature08849)**Bone progenitor dysfunction induces myelodysplasia and secondary leukaemia**M H G P Raaijmakers *et al.* [doi:10.1038/nature08851](https://doi.org/10.1038/nature08851)**Identification of two evolutionarily conserved genes regulating processing of engulfed apoptotic cells**J M Kinchen & K S Ravichandran [doi:10.1038/nature08853](https://doi.org/10.1038/nature08853)**Intense star formation within resolved compact regions in a galaxy at $z = 2.3$** A M Swinbank *et al.* [doi:10.1038/nature08880](https://doi.org/10.1038/nature08880)**Evidence of RNAi in humans from systemically administered siRNA via targeted nanoparticles**M E Davis *et al.* [doi:10.1038/nature08956](https://doi.org/10.1038/nature08956)

PUBLISHED ON 24 MARCH 2010

The complete mitochondrial DNA genome of an unknown hominin from southern SiberiaJ Krause *et al.* [doi:10.1038/nature08976](https://doi.org/10.1038/nature08976)**NEWS & VIEWS Human evolution: Stranger from Siberia**Terence A Brown [doi:10.1038/nature09006](https://doi.org/10.1038/nature09006)**Genome-wide association study of 107 phenotypes in *Arabidopsis thaliana* inbred lines**S Atwell *et al.* [doi:10.1038/nature08800](https://doi.org/10.1038/nature08800)**Human memory strength is predicted by theta-frequency phase-locking of single neurons**

U Rutishauser, I B Ross, A N Mamelak & E M Schuman

[doi:10.1038/nature08860](https://doi.org/10.1038/nature08860)**Chromatin signature of embryonic pluripotency is established during genome activation**N L Vastenhouw *et al.* [doi:10.1038/nature08866](https://doi.org/10.1038/nature08866)***Zscan4* regulates telomere elongation and genomic stability in ES cells**M Zalzman *et al.* [doi:10.1038/nature08882](https://doi.org/10.1038/nature08882)

NEW ONLINE THIS WEEK

On the latest video release, Nature's Henry Gee discusses the report (AOP this week) that pregnant male pipefish can selectively abort developing embryos, depending on who the mother is.

<http://www.youtube.com/NatureVideoChannel>

On the podcast, an interview with Ian McEwan on his new novel *Solar*. And more on the claimed anti-ageing action of sirtuin activators and the 'third human' who may have lived at the same time as modern humans and Neanderthals.

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