

Chromosomes in space and time

The genetic material that makes up each chromosome of a higher organism is not haphazardly distributed throughout the cell nucleus, but is neatly packed into spatially distinct chromosome territories. Whether chromosome territories are arranged in particular patterns within the nucleus, and if so, whether such patterns are functionally relevant, has been controversial. A new evolutionary study of the nuclear arrangement of chromosome territories now provides strong support for non-random chromosome organization and its functional importance in mammals [1].

A striking example of a non-random arrangement of chromosomes is that of human chromosomes 18 and 19. Chromosome 18 is one of the gene-poorest human chromosomes, but chromosome 19 is one of the gene richest. Strikingly, chromosome 18 is preferentially found at the periphery of the nucleus, whereas chromosome 19 is preferentially found towards the nuclear center. The correlation between gene density and preferential internal

positioning not only holds for these two chromosomes but for the entire set of human chromosomes. From this observation, one might predict that, if positioning of chromosomes is of functional importance for an organism, chromosome arrangements might be maintained during evolution.

Cremer and colleagues [1] tested this prediction by comparing the nuclear position of chromosomes 18 and 19 in higher primates ranging from humans to the squirrel monkey, which is evolutionarily separated from humans by ~30 million years. In all species, the genetic material from chromosome 18 was at the periphery and chromosome 19 material was more centrally located. These results are all the more remarkable because chromosomes undergo rearrangements during evolution. For example, the genetic material corresponding to human chromosome 19 is found on three separate chromosomes in gibbons. Nevertheless, these regions behaved like human chromosome 19

material and they clustered in a central position in the interior of the nucleus.

Evolutionary conservation of chromosome arrangements strongly supports a functional role for chromosome positioning. One possibility is the silencing of genes by association with heterochromatin, which is often more prevalent in the nuclear periphery. Another possibility is that groups of genes cluster within the nucleus to form nuclear neighborhoods, which are optimized for their gene expression and regulatory needs. Whatever the function of non-random chromosome arrangements, clearly the most intriguing open question is how these patterns are established and maintained and what happens when they are disrupted.

1 Tanabe, H. *et al.* (2002) Evolutionary conservation of chromosome territory arrangements in cell nuclei from higher primates. *Proc. Natl. Acad. Sci. U. S. A.* 99, 4424–3329

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Arboreal antics

The canopies of tropical lowland rainforests host some of the most diverse arthropod communities on Earth. But whereas the crowns of boreal trees usually teem with free-feeding and slow-moving lepidopteran caterpillars, such creatures are all but lacking from many canopies in the lowland tropics. In their absence, the quick-moving nymphs of Hemiptera (bugs) or Orthoptera (katydids, crickets and grasshoppers) dominate the youth scene. Why this difference? Some studies have emphasized the fact that fogging samples from lowland rainforest canopies often abound with ants. If these animals all had a taste for insect flesh, they would certainly exert a high predation pressure on any caterpillars slow enough for them to catch.

In a recent study, Andreas Floren *et al.* [1] make the move from hypothetical connection to empirical observation by measuring ant predation in a Malaysian lowland rainforest. Floren's group presented moth caterpillars to 54 ant species roaming around in the tree crowns. As expected, most of the ants (85%) readily devoured any caterpillar that was offered to them. Floren *et al.* then fogged ten tree canopies. Among the vast number of ants collected, >80% belonged to the 46 species

that had eaten caterpillars in the tests.

These results clearly demonstrate how strong the predation pressure could be that ants exert on their fellow arthropods. And, by eating any slow and unprotected animal that they come across, ants might mould the whole structure of tropical canopy communities. From a conservation perspective, this implies that any disturbance to the ants will have profound repercussions throughout the arboreal insect community. Such effects have already been revealed by the work of Floren *et al.* – by comparing primary forest with disturbed sites, they showed that the proportion of predacious ants decreased with human disturbance, resulting in a higher abundance of caterpillars. Thus, Floren *et al.* assign a key role to the ants in the Malaysian rainforest drama – the voracious but sensitive architects of the canopy ecosystem. Whether they will take on the same part in other tropical areas is something that remains to be seen.

1 Floren, A. *et al.* (2002) Arboreal ants as key predators in tropical lowland rainforest trees. *Oecologia* 131, 137–144

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In Brief

Eco-crimes to be punished in Mexico



The punishment metered out to criminals tells us a lot about a society's values and priorities.

Although most

nations have laws that attempt to prevent environmentally destructive activities, rarely do we see 'environmental crimes' go to trial. In the first such prosecution in Mexico, a man charged with breaking an environmental law faces the possibility of facing three to eight years in jail if found guilty. This precedent-setting case involves the charge of tampering with an automobile emissions measuring device so that it falsely recorded 'passing scores' even though emissions did not satisfy government regulations.

The alleged crime was detected at one of Mexico City's 162 auto-inspection centers, which are responsible for enforcing regulations aimed at reducing the city's well-known air pollution problems. It is believed that eliminating corruption at emissions-testing centers could markedly improve air quality in the capital

city. Environmentalists are applauding this case, and are calling for more such prosecution of environmental criminals. *PK*

US EPA seeks major new funding to address water pollution

The EPA has requested US\$21 million to target 20 polluted watersheds throughout the USA. The initiative is intended to elicit community-based action that focuses on watersheds that are noteworthy for their economic or biological value. This new program is one of many recommendations from a recent report on the status of watersheds throughout North America (<http://www.epa.gov/owow/forum/report.html>). In spite of worldwide efforts at improving water quality, many watersheds suffer from sedimentation, metals, pathogens, excessive nutrients, habitat loss and invasive species. Top-down government regulations have certainly improved water quality, but sources of watershed degradation are so numerous, insidious and widespread, that here is little hope of achieving desired improvements without strong local community support.

This new program is only a start, but it is hoped that the pilot will be so successful that it will spread to watersheds throughout the USA. The fact that a federal regulatory agency is turning to community-based action is evidence of a general strategic shift in government institutions throughout the world; this shift reflects an appreciation for the limitations of top-down environmental regulation. *PK*

The battle to halt illegal logging

Several governments and international organizations are increasing the amount of attention paid to the environmental threats posed by illegal logging. In numerous tropical and temperate nations, illegal loggers are stealing valuable timber, flaunting environmental laws, invading national parks, and engaging in bribery and corruption.

The alarming scope of illegal logging is highlighted in a recent newsletter published by the International Tropical Timber Organization (<http://www.itto.or.jp>), which shows that illegal logging accounts for a large proportion of all the wood products sold worldwide. In countries such as Ghana and Russia, 20–50% of all timber is harvested illegally, with estimates reaching 80–90% for nations such as Cambodia and Brazil. Even

in British Columbia, Canada, timber worth US\$200–320 million is stolen annually.

Fortunately, efforts to halt forest crimes are increasing. Last year, illegal logging was condemned in key ministerial conferences in Bali and Rome. The Indonesian Navy seized a large shipment of stolen timber from Borneo, and Brazil is cracking down on the illegal mahogany trade. But all parties agree that illegal logging remains an enormous challenge that can only be reduced by increased vigilance, international cooperation and pressure from nongovernmental organizations. *WFL*

China Government seeks advice on how to pursue conservation planning



In April 2002, the Chinese Environmental Protection Agency (SEPA) sent representatives from every province in China to participate in a workshop on methods for broadscale conservation planning.

The workshop, which SEPA co-sponsored with The Nature Conservancy, reflects a countrywide mandate to pursue conservation planning to allow for the protection of biodiversity. Development of infrastructure (e.g. dams, factories and roads), expanding cities, conversion of land to agricultural uses, and population growth are all threats to biodiversity in China.

Because China contains an estimated 10% of the world's biodiversity, protecting biodiversity in this country should be a concern for all conservation biologists. The fact that conservation planning is a state-sanctioned priority offers some hope; many wealthy western nations do not have a strong national commitment to conservation planning. One reason why China might be receptive to conservation efforts are the demonstrations of damaged ecosystems leading to huge economic losses, such as the recent dust storms in Beijing, or the Yangtze River floods of 1998. *PK*

Environmental litigation at the center of controversy in Chile

A US\$1.4 billion dollar timber project planned for central Chile has been halted by a federal court for failing to file an adequate

environmental impact statement. The halted project, which includes a huge sawmill and pulp mill, is opposed by several local citizen groups, which are worried about impacts on wineries, fisheries and farms. The mills would use chlorine and produce dioxins, which could severely damage the region aquatic resources according to the plaintiffs. The case is, however, not settled, because it is being appealed before Chile's Supreme Court.

What makes this story so interesting is that, previously, litigation has not played a prominent role in Chilean conservation. Many are applauding the possibility that environmental litigation could become a forceful tool for insuring that conservation and environmental values are respected more broadly in Latin America. *PK*

Disingenuous attack on the US Endangered Species Act

The US Congress is yet again considering several modifications of the Endangered Species Act (ESA) that conservation and ecological leaders feel would dangerously weaken the act. Attacks on the ESA are almost an annual ritual in congress, even though public opinion polls repeatedly find strong support for the protection of threatened species. But this year's attempts to revamp the ESA are something of a 'sheep in wolves clothing'.

The most notable is the 'Sound Science for Endangered Species Act Planning Act' proposed by an Oregon Republican congressman (<http://www.walden.house.gov/issues/esa/index.html>). This proposed new law claims to want to strengthen the role of science in endangered species management by requiring peer reviews by panels of external scientists, and by establishing so-called standards for data. Environmentalists and several prominent ecologists have noted that there already are peer reviews and that, in fact, this proposed law seeks to retard implementation of the act, motivated in part by a congressman's advocacy for farm irrigation at the expense of preserving water for endangered Northwest salmon (<http://www.stopextinction.org/action/KlamathCP.html>). Perhaps we should take heart that 'sound science' is seen as a banner under which to float any cause. *PK*

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