# In this issue

## Opioid peptides: Two decades on

Two decades have passed since Hughes, Kosterlitz and their colleagues reported the discovery of the enkephalins from porcine brain (*Nature*, 1975, **258**, 577). These pentapeptides were the first endogeneous opioids to be discovered providing a new class of ligands to explore the physiology and pharmacology of an ever-increasing number of opiate receptors in the brain. Classically, morphine – an opium alkaloid, was the best known of the opiate receptor ligands. In the early years of opioid peptide research, much attention was focused on the possibility of developing non-addictive analgesics, a goal which proved unreachable despite enormous scientific effort. The discovery of endogeneous opioids, however, proved to be extraordinarily influential in directing attention towards neuropeptides, their role in pain perception and modulation of behaviour. Close connections were established between the brain and the gut, a fact that is not generally appreciated. While initial discoveries were made in a variety of vertebrates, very soon opioid peptides were found to be widely distributed among invertebrates, providing comparative endocrinologists with a fertile area of research. In a comprehensive review (page 659), Nagabhushanam *et al.* survey the occurrence and biological role of peptide opioids in invertebrates. A vast body of literature implicates these molecules in a diverse range of biological phenomena, ranging from behaviour modulation and thermoregulation to reproduction. This spectacular range of molecules and functions could hardly have been anticipated when the first reports on enkephalins appeared twenty years ago.

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## Of remote sensing, GIS, and the mountain goat

Wildlife biology has been one of those subjects where even the simplest questions are maddeningly difficult to answer (e.g. how many tigers are there in Nagarhole?), and the considered opinion of an expert practitioner is much more valuable than the results obtained from the most sophisticated mathematical models. Recent years, however, have seen a welcome trend of a close co-operation between the two; the availability of satellite imagery at increasingly finer scale and of powerful GIS (Geographical Information System) hardware/software has improved the situation even more. The article on **page 685** of this issue illustrates a particularly attractive contribution – of estimating the proportion of the area of the Rajaji National Park, where a population of *Nemorhaedus goral*, an endangered species of the mountain goat, can thrive.

Situated in the Dhaulkhand range in the Shivalik mountains of Uttar Pradesh, the Rajaji National Park covers an area of about 150 square kilometers. Contrary to the imagined picture of vast stretches of thick forest, the park is a rich and complex mosaic of dry deciduous forest patches, roads, human habitation, plantations, water bodies and the like. Not all of these are equally conducive for maintaining the population of mountain goats, however – they prefer areas with steep, grassy slopes and near water bodies, and tend to avoid locations close to human habitation, and those with thick shrubs.

Starting with satellite imagery down to the resolution of 36 m × 36 m, the authors were able to prepare detailed maps (2 cm = 1 km) describing the different vegetation types in the national park. To this was added the information on the location of habitations, slopes, waterbodies, etc. GIS software was then used to assign a numerical value (of index of suitability to gorals, based on what the gorals like and dislike) to each point in the map. Further analysis then showed about 35% area to be highly suitable to gorals, and 20% unsuitable to them. Clearly, such quantitative estimates would be very valuable to foresters and administrators of national parks for efficient management of wildlife.

A particularly heartening aspect of this article is the close collaboration of the different institutions – Remote Sensing Institute, the Forest Department and WWF – and one can now look forward to more of such interdisciplinary contributions based on the study of various national parks and other endangered species.

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