their mates laid fertile clutches[8].

A less intrusive technique has recently provided surprisingly good correlative evidence for successful cuckoldry in the pied flycatcher (*Ficedula hypoleuca*)[9]. This species is one of a growing number that is recognized as being polyterritorial. A male defends a small territory around a nest hole, a female mates with him and starts to lay a brood, and the male then dupes a second female into mating with him at a second nesting territory (often some distance from the first) before leaving her, to return and feed his first mate's young. The primary female succeeds in fledging considerably more young than does the second[10]. While the male is away from the nest, the primary female sometimes copulates with a secondary male from an adjacent territory. To see if these copulations result in paternity, Alatalo *et al.*[9] measured tarsus lengths of the primary female, the primary male and the offspring in several hundred pied flycatcher nests. The correlation between mothers and offspring is considerably better than between fathers and offspring. Not surprisingly, perhaps, there is a significant positive correlation between the tarsus lengths of offspring and the adult males in the nearest territory. This correlation is unlikely to be caused by common environmental factors since there is no correlation between the tarsus lengths of adult males from neighbouring territories. Instead, it seems that about a quarter of the hatchlings in the study were not sired by the resident male. A less exhaustive study produced similar results with the congeneric collared flycatcher (*Ficedula albicollis*)[9].

One clear implication of these studies is that the genetic structure of a population will seldom be quite what one would expect from the idealized picture of its breeding system derived from casual observation. If conspecifics are being fooled, it is likely that human observers are too. The social behaviour of a species, including its breeding system, necessarily evolves in the context of its actual genetic structure. To understand the functional significance of differences in social organization among birds and mammals, we will need yet more detailed accounts of the actual patterns of relatedness in species with different kinds of mating systems and ecologies. □

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Supernova remnants

Defining the Crab nebula

from Virginia Trimble

NO TWO remnants of the stellar explosions we call supernovae are alike. But the Crab nebula (SN 1054) — complete with 33 msec pulsar and lots of helium, yet lacking the usual rapidly-moving, shock-edged supernova remnant shell — is even less alike than most. New observations, presented at a recent symposium*, serve to emphasize its uniqueness. Among the highlights were: dynamical information on the jet that protrudes from the main nebula; the probable demise of earlier evidence for an extended halo; identification of an exceedingly similar, though not identical, remnant in the Large Magellanic Cloud; and discovery of a new class of nonthermal galactic radio and X-ray sources that are neither Crab-like nor shell-type supernova remnants (for more on which see pages 113, 115 and 118 of this issue).

Sydney van den Bergh (*Astrophys. J.* **160**, L27; 1970) first reported a luminous jet extending from the north-east nebular boundary of the Crab nebula. Later work established that it emits both line (thermal) and continuum (synchrotron) radiation, and prompted countless models, which were invariably a bit contorted as the axis of the jet has never pointed back to the pulsar position, either now or in AD 1054. These models will have to be rethought in light of four new observations. First, the jet is moving outward along its own axis at about 4,000 kilometres per second (R.A. Fesen and T.R. Gull, University of Colorado and Goddard Space Flight Centre). Second, the local magnetic field is aligned with the jet (A.S. Wilson, University of Maryland; T. Velusamy, Tata Institute). Third, while moving outwards, the jet is simultaneously expanding cylindrically and perpendicularly to its axis at 360 kilometres per second (Peter Shull, Oklahoma State University). And, fourth, composition of the jet is quite close to that of the adjacent nebular filaments, including a lower-than-average ratio of helium to hydrogen (R.C.B. Henry, University of Oklahoma). The length divided by the axial velocity and the width divided by the trans-

*'The Crab Nebula and Related Remnants', George Mason University, Virginia, 11-12 October 1984.

Milan Hašek 1925–1984

THE death on 14 November 1984 of Milan Hašek has deprived Czechoslovakia of one of its most distinguished scientists and one of the pioneers of transplantation biology. At the time of his death he was a leading scientist in the Czechoslovak Academy of Sciences' Institute of Molecular Genetics.

Hašek's great and enduring achievement was to have discovered the phenomenon of immunological tolerance, independently of all others, by the ingenious expedient of making a vascular bridge — a parabiosis — between two embryonated hens' eggs. The chorioallantoic membranes of the two eggs were laid bare over an area of about 0.5 cm^2 and these two windows were apposed to each other using a fragment of embryonic tissue to make a vascular bridge between the two membranes. Hašek showed that the two chickens hatched from these eggs had a greatly diminished ability to make red cell agglutinins against each other's erythrocytes, and later it became clear that the chickens were mutually tolerant of skin grafts that were exchanged between them.

When Hašek began his work, he was a dedicated communist. This was evident from his early papers, in which the results were interpreted in terms of 'negative hybridization', a phenomenon that he believed to cast doubt on 'the absurd theory of the genes'. Hašek was far too intelligent to persist in these doctrinal delusions. Once he became aware of immunogenetic developments in the West — especially the discovery of immunological tolerance in inbred mice — he quickly mastered modern transplantation theory and, with some able colleagues, made many important contributions to it. Indeed, some of his papers have taken their place among the classics of immunology.

Hašek happened to be abroad at the time of the Russian occupation of Czechoslovakia in 1968 but, despite his protest against this tragic event, decided to return. Sadly he was subsequently deprived of his influential post as director of the prestigious and, under his leadership, vigorous Institute for Experimental Biology of the Czech Academy of Sciences. This, together with a recurrent illness, kept him in the wilderness for a long time. In recent years he re-established himself in the Institute of Molecular Genetics and, together with a group of bright collaborators, made numerous and substantial further contributions to transplantation immunology.

Milan Hašek was a giant in more ways than one. He was a man of great physical stature and his enthusiasm and zest for life was legendary and infectious. He will be greatly mourned and missed by friends in the scientific community throughout the world.

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