Female infidelity—may the best sperm win

Georgia Mason

WHY ARE so many females unfaithful to their partners? Two-timing would not seem to have the advantages for them that it has males. A pair of British zoologists think they know why it has evolved.

Mark Bellis and Robin Baker of the University of Manchester say females mate with several males because this allows them to pit the sperm of different males against each other in their reproductive tracts. In this way, they ensure that they are fertilised by the best-quality sperm.

Male infidelity has always been easy to explain. Fertilising a female takes relatively little time and energy, so a male can father a lot of children quickly and easily. The more females a male mates with, the more descendants he will have. His genes—including any that promote such "promiscuity"—will become widespread.

Females, on the other hand, must devote a lot of time and energy to each of their young, from producing the original egg, through nurturing the fetus, to looking after the offspring until it becomes independent. This means that the number of young a female can produce is limited. She does not need to mate very often in order to reproduce at her maximum possible rate.

More important to a female than the number of times she copulates is the quality of the males. She will increase the number of her descendants if she chooses a male who can increase the success of her offspring—by helping to rear them, or by passing on to them genes that make them big, strong or attractive. Females are, therefore, choosy when it comes to selecting a mate.

But if quality rather than quantity of partners is important to a female, why does she not seek out the best male she can, and stick with him? Some biologists have claimed that a female is unfaithful so that she can persuade a second male to help rear her offspring. Others have claimed that if a female bears children by a range of fathers, she increases their genetic variability, maximising the chance that at least some will succeed.

However, Bellis and Baker have another idea for the evolution of female infidelity, in the human species at least. In a world in which no individual is strictly monogamous, they say, there is one particular characteristic that is very advantageous to pass on to one's sons: good-quality sperm capable of beating any opposition.

But sperm quality is not something a female is likely to be able to assess from the physical or behavioural attributes of a potential mate. There is only one way to test the competitive ability of a male's sperm, say Bellis and Baker. She must mate with other males so that the sperm of more than one has a chance of fertilising her egg.

This does not, of course, imply conscious scheming on the part of the female, say the biologists. Any female who mates with several males will automatically be fertilised by the most able sperm. If this trait is heritable, then she will have more successful sons than other females, and the behaviour will spread throughout the species.

To test their theory, Bellis and Baker compiled a questionnaire to quiz women on their infidelity and had it published in the magazine *Company*. The researchers received replies from more than 3000 women. Out of these, 162 had last copulated with someone other than their regular partner.

If the reason a female mates outside the normal pair bond is to gain extra help with the young, it is important that the second male believes that he has a genetic stake in the offspring. But, say Bellis and Baker, whether or not he fertilises her is not important to the female. This means that she would copulate with other males even during infertile stages of her menstrual cycle.

When they studied the results of their questionnaire, Bellis and Baker found that this was not the case. They found that women were most unfaithful during their most fertile period, just before ovulation.

According to the biologists, this suggests that the evolutionary advantage of this behaviour depends on the female conceiving offspring by the second male. It could be that the "genetic variability" idea is the correct one, or that he looks as though he has particularly "good genes".

Bellis and Baker looked at the copulations that occurred within five days of the last mating with a regular partner. Significantly, this type of copulation was also more closely associated with peak fertility than any other.

Human sperm can last for at least five days in the female reproductive tract. So if the female is to be fertilised by the most able sperm, she can only pit them against each other if she mates with her second male within five days of mating with her regular partner. According to the biologists, females act in a way that encourages competition between the sperm of different males.

Bellis and Baker conclude that in the face of natural selection, infidelity is as advantageous to females as it is to males, and that females time their sexual behaviour in order to maximise the competitive abilities inherited by their offspring. It may take two to tango—but in evolutionary terms it is the females who call the tune (*Animal Behaviour*, vol 40, p 997). □

Supernova leaves X-ray afterglow

A BRITISH telescope on board the X-ray satellite ROSAT has produced the first ever image of a supernova remnant in the extreme ultraviolet (XUV) band of the spectrum. The XUV has so far remained a relatively unexplored spectral region in astronomy because the Earth's atmosphere blocks light in this range of wavelengths (*New Scientist*, Science, 8 December 1990).

British astronomers in Garching, near Munich, constructed the images of the Vela supernova remnant from data gathered by ROSAT's Wide Field Camera. ROSAT, launched in June, is a joint project involving Germany, the United States and Britain.

The images show extended regions that are emitting XUV radiation. These areas mark the arc of interstellar gas that was left over after a star exploded about 15 000 years ago. The cross in the picture marks the position of the Vela pulsar, thought to be a spinning neutron star. This would have been created when the core of the original star collapsed as the supernova exploded.

The exploding supernova produced a blast wave which heated the gas to a temperature of a few million degrees. It is this gas which is emitting the XUV radiation. This suggests that the gas around the original material was spread unevenly, so that some of the exploding material escaped into space.

By combining the XUV data with data from X-ray, optical and radio observations, astronomers hope to build up a clearer picture of how temperature and density are distributed in the gas of the Vela remnant. This will provide more clues about how expanding supernova envelopes interact with the interstellar medium surrounding them.

Theorists believe that collisions between supernova ejecta and interstellar gas clouds can, in some cases, cause the clouds to collapse to form "protostellar" objects which evolve into new stars. The birth of the Sun itself may have been triggered by such an event.

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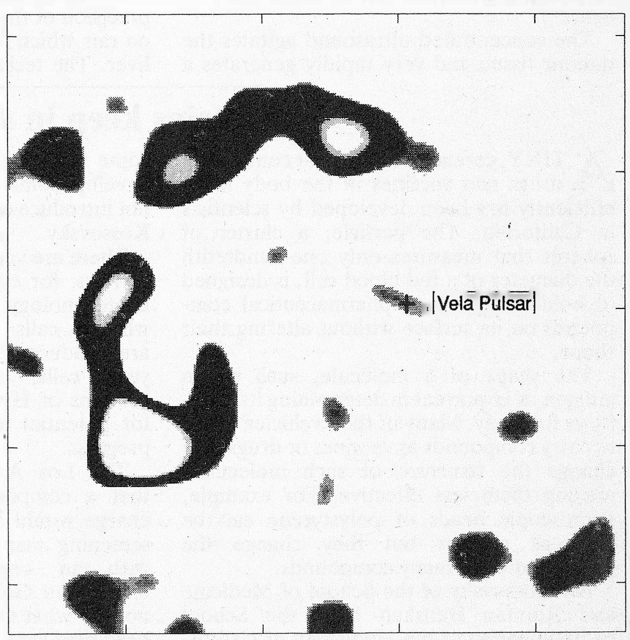

Hot gas expands from the Vela pulsar, the site of a supernova