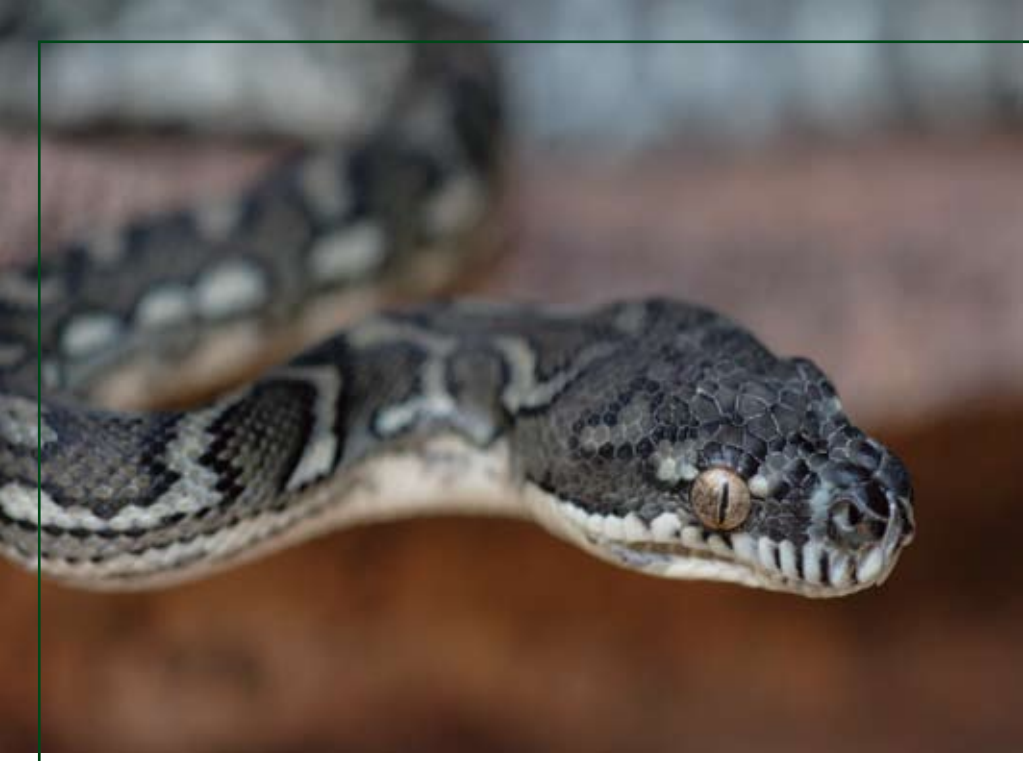

The sex chromosomes of snakes work in the opposite way from those of humans and other mammals: the male has two copies of a large Z chromosome and the female a single Z and a small, gene-poor W chromosome. Comparing the sex chromosomes of different snakes with those of birds will provide us with clues to how sex chromosomes evolved in all vertebrates including humans.

COMPARATIVE GENOMICS

Group Leader: Prof. Jenny Graves

Our research interests focus on mammalian genes and genomes. We compare the genomes of distantly related mammals and other vertebrates to understand how the genomes have changed in evolution. We specialise in Australian mammals (kangaroos and platypus) and reptiles (snakes and lizards). These distantly related species give us information about the function of genes in all mammals, including humans.

This comparative strategy is now widely accepted, and huge genome projects are under way to sequence the genomes of the platypus, the opossum and the tammar wallaby. The availability of this sequence is enormously widening our horizons, providing the means to look in depth into the organization, function and evolution of genome regions. Of special interest to us are the genes that control sex and regulate the activity of chromosomes.

HIGHLIGHTS

- The ARC Centre for Kangaroo Genomics has its gene mapping node in our lab. We have developed new mapping technologies and have produced detailed maps of our target chromosomes. This shows how human sex chromosomes evolved.
- We isolated the kangaroo and platypus versions of disease-causing human 'imprinted' genes that are expressed from only one of the two gene copies. This showed how the imprinted human region was put together only recently from non-imprinted components.
- We discovered that the gene that controls X chromosome inactivation in humans and mice has no homologue in kangaroos, completely changing the interpretation of how this important genetic silencing mechanism works and how it evolved in mammals.
- With our University of Canberra colleagues, we discovered that the two major ways of determining sex – chromosomes and temperature – are not mutually exclusive. We proposed a new model explaining how the two systems interact and interconvert in vertebrate evolution.

We use comparisons between kangaroo genes and chromosomes to discover new human genes and the sequences that turn them on and off, as well as to deduce how the human genome evolved.