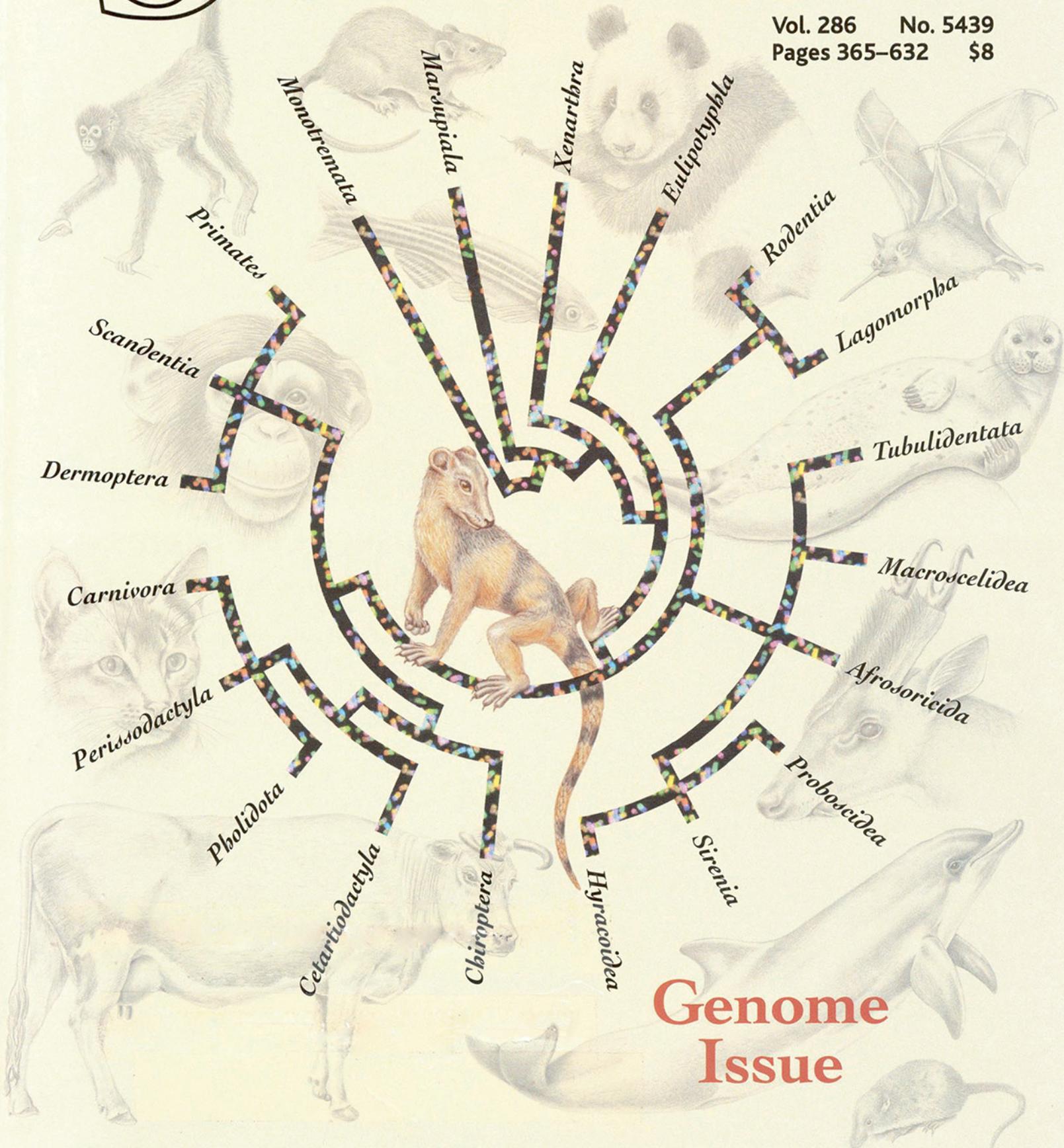


15 October 1999

Science

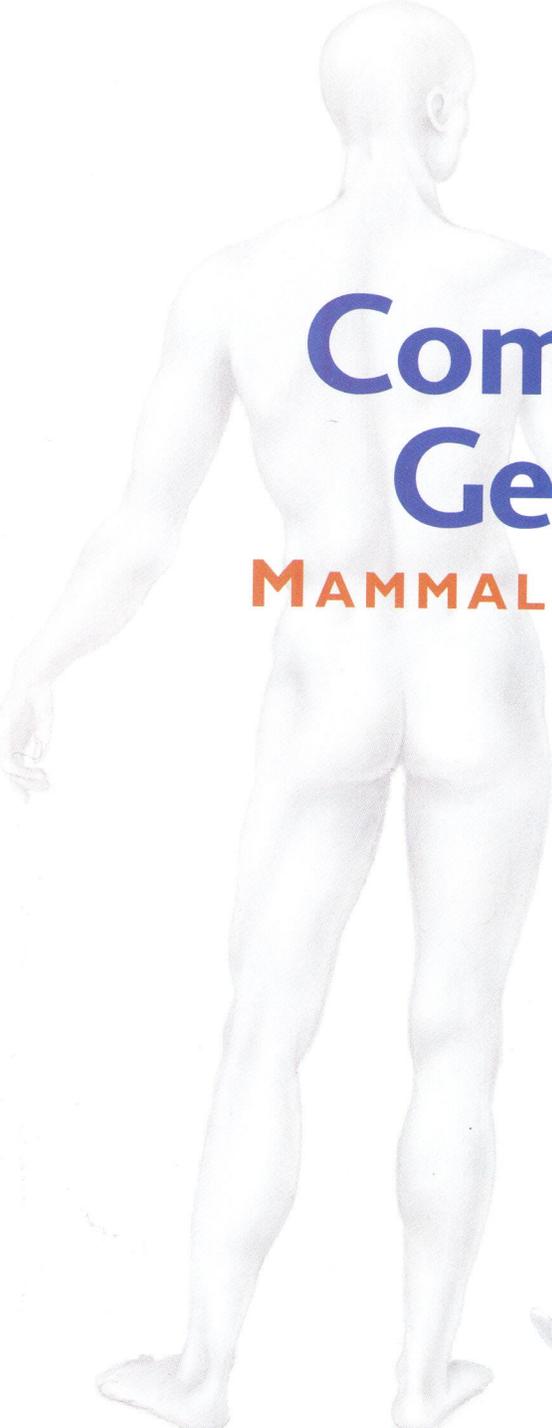
Vol. 286 No. 5439
Pages 365-632 \$8



**Genome
Issue**



AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE



Comparative Genomics

MAMMALIAN RADIATIONS

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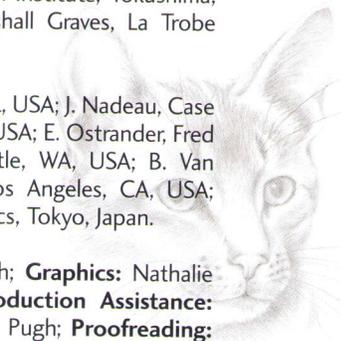
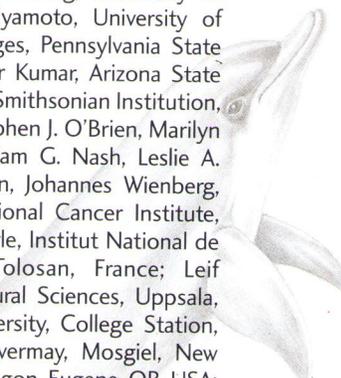
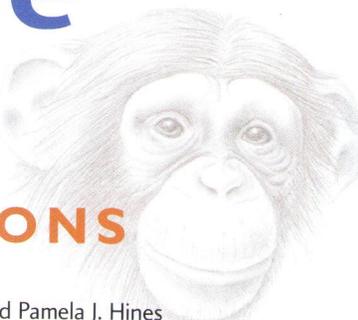
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SCIENCE VOL 286 15 OCTOBER 1999



Comparative Genomics

MAMMALIAN RADIATIONS

Genome Maps Ten

Traces of evolutionary history appear in functional morphology and DNA sequences of living and extinct species. These remnants of the past can lead to insights into the relationships among extant groups of animals, the forces driving evolution, and the utility of animal models for studying human disease. We present below one evolutionary interpretation for the still-disputed hierarchy of surviving placental mammalian orders (excluding monotremes and marsupials), which is a synthesis of accumulated molecular and morphological inferences. The time scale is derived largely from molecular data; indicated fossil remains are much

younger, raising controversies around the precise age of mammal ancestors. The tips of the phylogenetic tree depict genomes for 21 representative species from 11 orders, which are labeled on the vertical lines. These examples show genome-wide homology alignments assessed by comparative gene mapping or direct visualization of chromosome painting, in which fluorescently labeled, individual chromosomes are hybridized to chromosomes from distantly related species. Species were selected to maximize the number of orders represented and to illustrate patterns of genome conservation. The 24 human chromosomes are distinguished by 24 colors,

and regions of human chromosome homology in other species are indicated by color and human chromosome number (for example, cat chromosome A1 contains gene stretches homologous to human chromosomes 5 and 15). Selected gene homologs in each species represent a subset of extensive comparative gene mapping data; thus genes listed may not reflect the extreme borders of the conserved segments. Gene orders have been determined in human, cat, pig, sheep, rat, mouse, and zebrafish; in other species the genes are listed in the order in which they appear in humans. The zebrafish map, including 25 linkage groups not yet assigned to the 25 chromosomes, is presented to illustrate the array of gene segments conserved for 450 million years. Further information and discussion of dissenting views of mammalian evolution can be found in the 15 October 1999 issue of *Science* and the associated web site at <http://www.sciencemag.org/feature/data/1044631.shl>

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HUMAN CHROMOSOME COLOR KEY

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	X	Y

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