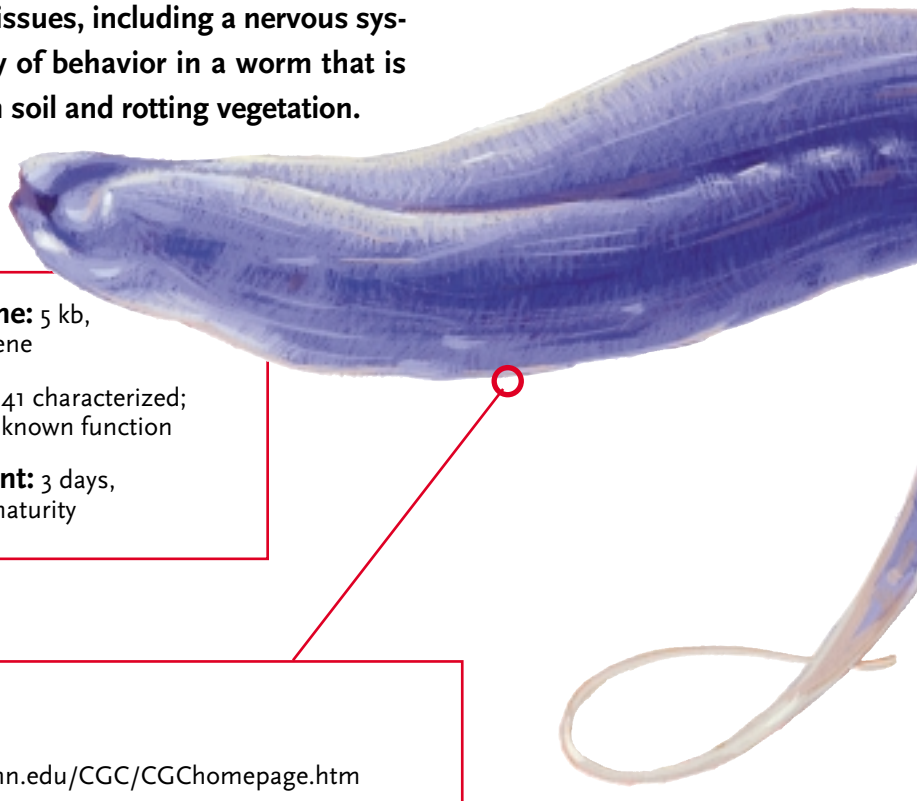
The Worm (*Caenorhabditis elegans*)

"You have

C. elegans **is a nematode, a smooth-skinned worm with a long, unsegmented, cylindrical body tapered at both ends. Comprising about 1,000 cells, it is the most primitive animal to exhibit characteristics that are important in the study of human biology and disease. Though tiny and transparent, *C. elegans* contains a full set of differentiated tissues, including a nervous system with a "brain," which allows the study of behavior in a worm that is capable of learning. It is found worldwide in soil and rotting vegetation.**



'Omics

Genome size: 97 Mb (96,893,008 bp)

Chromosomes: 5 autosomes, plus X

Number of genes: 20,000 predicted

Average gene: 5 kb, 5 exons per gene

Proteins: 1,341 characterized; 8,012 have unknown function

Development: 3 days, from egg to maturity

Web Sites

WormBase: www.wormbase.org

Worm Atlas: www.wormatlas.org

***Caenorhabditis* Genetics Center:** biosci.umn.edu/CGC/CGChomepage.htm

***C. elegans* Web Server:** elegans.swmed.edu

***elegans*Net:** members.tripod.com/C.elegans/index.htm

1963 Sydney Brenner formulates plan to study *C. elegans*

1976 John Sulston demonstrates cell death, cell fates

1982 Robert Horvitz, Hillary Ellis, Paul Sternberg describe first cell death mutation

1983 E.M. Hedgecock isolates first cell death mutant, *ced-1*

1983 Sulston completes first cell lineage map

1986 Ellis and Horvitz identify two "killer" genes, *ced-3* and *ced-4*

1988 David Vaux, Suzanne Corey, Jerry Adams isolate first mammalian apoptosis inhibitor

1989 Sulston, Horvitz, Alan Coulson, Robert Waterston launch plan to sequence genome

made your way from worm to man,
and much in you is still worm."

—Friedrich Nietzsche (1844–1900)

Stats

Size: 1 mm

Diet: Bacteria

Lifespan: 2–3 weeks

Reproduction: Male and self-fertilizing hermaphrodite

Cell lineage: Invariant between individuals

Feature Technology

RNAi: *C. elegans* is ideal for the study of functional genomics: The genome sequence is complete and well-annotated, and systematic gene function can be studied by RNA interference-mediated knockdown. RNA interference (RNAi) is a gene-silencing technique that uses double-stranded RNA to degrade the corresponding messenger RNA, leading to protein depletion and a loss-of-function phenotype.

Nobel Moment

The 2002 Nobel Prize in medicine was awarded for key discoveries concerning the genetic regulation of organ development and programmed cell death in *C. elegans*. Sydney Brenner established the nematode as a novel experimental model organism; John Sulston mapped a cell lineage in which every cell division and differentiation could be followed; and Robert Horvitz discovered and characterized key genes controlling cell death.

Illustration: Tammy Irvine, Rear View Illustration

1992 Vaux shows that human apoptosis inhibitor BCL-2 blocks cell death in nematodes

1992 Michael Hengartner discovers cell death regulator CED-9

1993 Horvitz discovers CED-3 is a caspase

1997 Xiaodong Wang isolates Apaf, a mammalian protein similar to CED-4

1998 Genome sequence completed and published

1998 Hiroaki Tabara and Craig Mello first use RNAi

1998 Marc Duval launches ORFeome project to identify open-reading frames

2000 Vaux and Wang independently isolate DIABLO/Smac, first mammalian IAP antagonists

2001 Horvitz demonstrates that engulfing dying cells actively promotes cell death

2002 Brenner, Sulston, Horvitz share Nobel Prize for *C. elegans* work