
Web resources for *C. elegans* studies*

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1. Introduction

This chapter describes a list of core Web resources that I think are most useful to someone who is either new to studying *C. elegans* or who has not been using the Web much as a research tool. It does not contain a

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comprehensive list of Web sites and services since links to other useful Web resources can usually be readily found at the sites discussed here.

Internet is the information super highway and the World Wide Web is the easiest way to access most of the information on the internet. Although one can always find some information about anything on the Web, it is not necessarily easy to find the most relevant quickly. The Web is vast. Since its debut for internal use at CERN in 1991, the Web has grown into a global network of 60 million sites as of March 2005 (<http://news.netcraft.com/archives/web_server_survey.html>). Furthermore, the format of Web resources and information pages is divergent, prevents highly efficient queries across all sites. Thus, Web search engines are billion-dollar industries and people are being paid for their Web surfing skills, researching the Web for answers of specific questions (<<http://answers.google.com/answers/>>).

Today, it is perhaps still possible to study *C. elegans* without using the Web, but likely with much reduced efficiency. One can use the Web to place an order for a deletion mutant, to read a summary of all that is known about one's favorite gene, to perform a sequence analysis or download a sequence for local analysis, or to look up a paper and read it online anywhere there is internet access. It is true that we cannot yet have worms delivered through fiber optics cables, but anything that can be reduced to a digital form is either available on the Web today or will be tomorrow. Via fast internet and hyperlinks, all digitized information around the world about the worm can be brought to one's computer terminal in an instance.

But one needs to know where to look. To most, it probably is an easier experience using the Web for the first time than to try to find something in a brick and mortar library—that's why the Web is popular. However, to efficiently take advantage of available Web resources, it is best to know exactly where the resources are and how to use them when one gets there. I try to write this chapter as an introductory guide for those who are just starting to tap into the Web for their worm research. It is by no means a complete guide but it should make it easier for people to get started.

2. Portal and knowledge environment

There are two types of Web services most suitable as one's starting points: portal and knowledge environment. A portal organizes Web links relevant to the domain of interest. From a portal, a user can quickly find sites and services of potential interest and via hyperlinks be brought there. In contrast, a knowledge environment is a Web site that directly offers many different types of information and services. A knowledge environment often emphasizes the interconnection among data types, which in a way is a web within the Web. In practice, most Web sites have portal pages.

2.1. WormBase

WormBase <<http://www.wormbase.org>> is a major repository for *C. elegans* information, including genomic, genetic, anatomy, people, and literature. WormBase is a knowledge environment. Access to information is via a set of Web pages, each of which specifically designed for a different type of biological knowledge. Further, different information types, when appropriate, are connected horizontally via hyperlinks. One can easily move from Web page of one type to another. For example, one can start by visiting a genome sequence, click a link to read about a gene that resides in this sequence on a gene page, click a link again to review an expression pattern description on an expression pattern page, click yet again to read about a cell on an anatomy page, and so on.

Some WormBase pages are complex. WormBase offers an online user guide. There is also a book chapter <<http://www.mrw.interscience.wiley.com/cp/cpbi/articles/bi0108/frame.html>>; although the access is restricted to subscribers of the journal. In this section I describe a few general purpose pages. In following sections, I discuss more specialized pages. Users are encouraged to visit the site and practice the most effective Web surfing technique—click and browse.

Basic Query <<http://www.wormbase.org>>

On the front page of WormBase, type a query term (e.g. glucos) in the query box, select an information type from the pull down menu to the left and hit the “Search” button.

The screenshot shows the WormBase Release WS138 homepage. At the top, there is a navigation bar with links: Home, Genome, Blast / Blat, Batch Genes, Batch Sequences, Markers, Genetic Maps, Submit, Search, and Site Map. The 'Site Map' link is highlighted with a red circle. Below the navigation bar is the WormBase logo with the tagline "The Biology and Genome of *C. elegans*". The main search bar has "glucos" entered. To the left is a sidebar titled "Web Site Directory" containing links for Release Notes, General Searches, Sequences, Cells and Gene Expression, Genetics, Strains, and Phenotypes, Downloads, Linking and Data Mining, About WormBase, and RSS News Feeds. The main content area features a "Find" dropdown set to "Anything" and a search term "glucos". It also includes a "Search" button, an "as XML" checkbox, and a "Literature Search" checkbox. A "Find Notes" section contains several news items with dates from January 11, 2005, to December 24, 2004. The news items include updates about new releases, meetings, and database features like "Gene Class" displays.

The information type “Anything” gives the broadest search option and should be selected unless one wishes to restrict the search to a specific type. The search term “glucos” is deliberately left in the ‘root’ form of related words so that the search includes all terms that start with “glucos”, such as glucose, glucosamin, glucosyl, etc.).

Site Map <http://www.wormbase.org/db/misc/site_map>

This page is like a portal which links to pages of major searches, data viewers and resources within WormBase, providing users a general idea of what's available.

FTP Download <<ftp://ftp.wormbase.org/pub/wormbase/>>

Both the data and software of WormBase can be downloaded and worked with locally. This feature is not for the casual users but particularly useful for those who routinely perform large-scale data analysis. A README file <<ftp://ftp.wormbase.org/pub/wormbase/README>> indicates which data are available for download.

WormMart <<http://dev.wormbase.org/BioMart/martview>>

Presently still under development, WormMart is an advanced query tool which allows users customize complex queries. It is also designed to run fast, expediting results returned from complex and large-scale queries. WormMart focuses on sequence-related data types.

2.2. *Caenorhabditis elegans* WWW Server <<http://elegans.swmed.edu>>

This site is a well-organized portal of many different types of information useful to *C. elegans* researchers. It is organized in two layers. The front page lists major topics or interests. Each topic has a hyperlink to a page that either offers a service (e.g. Literature Search) or is a list of links to other Web sites that offer services. Each page and link of this portal is generally self-explanatory; thus no user guide is necessary. Users can easily drill down the links to find out what is available at this site in a few minutes.



Caenorhabditis elegans WWW Server

WormBase

Recent papers	Literature Search	Meetings
CGC	Labs	Researchers
Wormatlas	Announcements (Saturday, January 22, 2005)	Bionet.celegans
Software		Nematodes
The Genome	Movies	Protocols

Caenorhabditis elegans is a small (about 1 mm long) soil nematode found in temperate regions. In the 1960's [Sydney Brenner](#) began using it to study the genetics of development and neurobiology. Since then the community of *C elegans* researchers has expanded to over a thousand. [The Riddle Lab](#) has written [an introduction to *C elegans* for non-specialists](#). Biologists unfamiliar with *C elegans* may find Mark Blaxter's [The Genetics of *Caenorhabditis elegans*, An Introduction](#) useful.

Users in Europe may find access to [the Greek mirror](#) of the *C elegans* WWW Server more convenient.

3. Literature search

3.1. Textpresso

Textpresso <<http://www.textpresso.org>> allows text searches on primarily *C. elegans* literature, including published papers, personal communications and meeting reports. Two major features distinguish Textpresso from other literature search tools: that it searches full-text contents of publications, and in addition to text strings, that it can search for groups of terms (categories).

The simplest way to search using Textpresso is to start with the default settings and type into the query box a text string. For example, if one wants to learn about regulation of kinases, one can search for "regulat kinase".

Textpresso treats the words independently. The default setting automatically appends a wild card to the end of each word thus expanding the search to include any word that begins with “regulat” or “kinase”. Further, the default setting is to search for sentences that simultaneously have both groups of words. Textpresso also offers category search and many other more advanced features. Users can read the user guide to learn how to use advanced features.

3.2. NCBI PubMed

NCBI PubMed allows queries on articles in a large collection of biomedical journals. Coverage of PubMed is broad and usually up to date but some literature relevant to *C. elegans* studies is not covered. Also, Pubmed searches are limited to citations and abstracts.

The screenshot shows the NCBI PubMed homepage. At the top, there's a navigation bar with links for All Databases, PubMed, Nucleotide, Protein, Genome, Structure, OMIM, PMC, Journals, and Books. The PubMed link is highlighted. On the right side of the header, there's a "My NCBI" section with "Sign In" and "Register" buttons. Below the header, a search bar contains the query "PubMed" followed by a dropdown arrow, then "for" and the search terms "elegans aging". To the right of the search bar are "Go" and "Clear" buttons. Underneath the search bar, there are tabs for "Limits", "Preview/Index", "History", "Clipboard", and "Details". A list of search tips follows:

- Enter one or more search terms, or click [Preview/Index](#) for advanced searching.
- Enter [author names](#) as smith jc. Initials are optional.
- Enter [journal titles](#) in full or as MEDLINE abbreviations. Use the [Journals Database](#) to find journal titles.

A yellow-highlighted text block below the tips states: "PubMed, a service of the National Library of Medicine, includes over 15 million citations for biomedical articles back to the 1950's. These citations are from MEDLINE and additional life science journals. PubMed includes links to many sites providing full text articles and other related resources."

In the center, there's a "Bookshelf Additions" section featuring thumbnail images of books: "THE CELL", "Molecular Biology of the Cell, 4th Ed.", and "The Genetic Landscape of Diabetes". To the right of this section, under "My NCBI", it says: "A new [default filter](#), Review, is now available for all PubMed searches. [My NCBI](#) has replaced the Cubby and includes automatic e-mailing of search updates and filters for search results."

At the bottom, a blue banner reads "New Global NCBI Search Engine". Below it, a green banner says "NCBI's growing number of Entrez databases can now be searched".

To search, one can start by typing a term of interest in the query box and click the “Go” button. Read the tutorial to learn how to perform more sophisticated queries.

3.3. *Caenorhabditis elegans* WWW Server Worm Literature Index

Caenorhabditis elegans WWW Server Worm Literature Index <<http://elegans.swmed.edu/wli/>> offers text searches on citations and abstracts of selected publications, Worm Breeder's Gazette articles, and Worm meeting abstracts. Coverage of publications is limited to those selected by CGC (*C. elegans* Genetic Center). Although the coverage of search space here is only a subset of that of Textpresso, the user interface is self-explanatory, easy to use, and one can search for phrases.

Worm Literature Index

Word(s) to search for:

- Partial word matches allowed
 Author Title Text

Find abstracts containing:

- Any word All words Phrase

Find abstracts from:

- All Sources.
 Published books and papers only.
 2004 Worm Meetings only.
 Last Worm Breeder's Gazette only.
 Any Worm Breeder's Gazette.
 Any Worm Meeting.



4. Gene function

Many different aspects of biological knowledge go into the description of gene functions, including mutant phenotype, site of action, interaction with other genes, and sequence similarity to other genes. A Web resource that has descriptions of gene function usually offers a type of pages that integrate these aspects so that a user can have a holistic view of gene function at a glance.

4.1. WormBase Gene Summary

<<http://www.wormbase.org/db/gene/gene>>

Each gene in WormBase has a summary page which collates together several different aspects of a gene, including identification, genetic and genomic location, function, reagents and bibliography.

Gene Summary

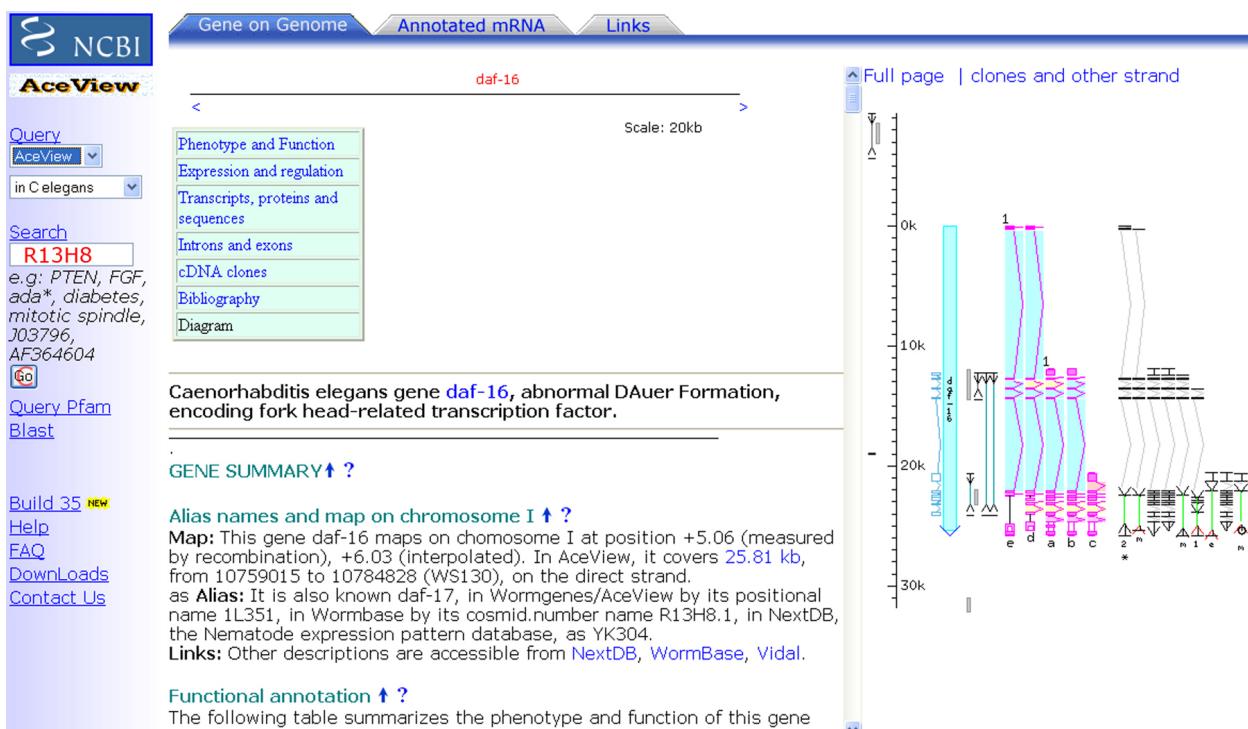
Specify a gene using a three letter locus-name ([unc-26](#)), a predicted gene id ([R13A5.9](#)), or a protein ID ([WP:CE02711](#)):

[[Identification](#)] [[location](#)] [[function](#)] [[gene ontology](#)] [[reactome knowledgebase](#)] [[alleles](#)] [[similarities](#)] [[reagents](#)] [[bibliography](#)]

Identification	IDs:	CGC name	Sequence name	WB Gene ID	Version														
		cha-1 - (<i>abnormal Choline Acetyltransferase</i>)	ZC416.8	WBGene00000481	1														
Concise Description:	cha-1 is part of a gene complex, in which it shares a common promoter and first (noncoding) exon with unc-17 (and is thus coexpressed with unc-17), but in which the two genes encode mutationally separable functions; cha-1 encodes a choline acetyltransferase that synthesizes acetylcholine, is expressed in neurons, and is required for viability, normal growth, locomotion, and sensitivity to acetylcholinesterase inhibitors. [details]																		
NCBI KOGs*:	Carnitine O-acyltransferase CRAT [KOG3717]																		
Species:	<i>Caenorhabditis elegans</i>																		
Other sequence(s):	L08969 (Nematode choline acetyltransferase (cha-1) mRNA, exons 1-11 and complete cds.) L08970 (Nematode choline acetyltransferase (cha-1) gene, exons 1-11 and complete cds.)																		
ZC416																			
Gene model(s):	<table border="1"><thead><tr><th>Gene Model</th><th>Status</th><th>Remark</th><th>Nucleotides (coding/transcript)</th><th>Protein</th><th>Swissprot</th><th>Amino Acids</th></tr></thead><tbody><tr><td>ZC416.8b</td><td>confirmed by cDNA (s)</td><td>C. elegans CHA-1 protein; contains similarity to Pfam domain PF00755 (Choline/Carnitine o-acyltransferase)</td><td>1884/10766 bp</td><td>WP:CE17308</td><td>CLAT_CAEEL</td><td>627 aa</td></tr></tbody></table>					Gene Model	Status	Remark	Nucleotides (coding/transcript)	Protein	Swissprot	Amino Acids	ZC416.8b	confirmed by cDNA (s)	C. elegans CHA-1 protein; contains similarity to Pfam domain PF00755 (Choline/Carnitine o-acyltransferase)	1884/10766 bp	WP:CE17308	CLAT_CAEEL	627 aa
Gene Model	Status	Remark	Nucleotides (coding/transcript)	Protein	Swissprot	Amino Acids													
ZC416.8b	confirmed by cDNA (s)	C. elegans CHA-1 protein; contains similarity to Pfam domain PF00755 (Choline/Carnitine o-acyltransferase)	1884/10766 bp	WP:CE17308	CLAT_CAEEL	627 aa													
Putative ortholog(s):	<i>Caenorhabditis briggsae</i> : CBG08307 [syntenic alignment] (Stein LD et al. 2003 PubMed) : best reciprocal blastp match-seg-off)																		
Literature citations:	<i>Caenorhabditis briggsae</i> : CBG08305 [syntenic alignment] (Stein LD et al. 2003 PubMed) : best reciprocal blastp match-seg-off)																		
Notes:	108 citations																		
	Cha-1 only corresponds to ZC416.8b and not ZC416.8a which instead corresponds to the unc-17 gene. ZC416.8a and ZC416.8b are different alternatively spliced forms of the same gene that both share a common 5' untranslated exon (Alfonso et al., Journal of Molecular Biology 241: 627-630, 1994). SL1 trans-spliced; see yk1344c11.5.																		
Location	Genetic Position: IV:-3.31 +/- 0.003 cM [mapping data] Genomic Position: IV:3624692..3613927 bp																		

4.2. NCBI AceView

NCBI AceView <<http://www.ncbi.nlm.nih.gov/IEB/Research/Acembly/index.html?worm>> shows clustering of EST sequences, their alignments to the genome, and annotation of genes, including gene structure, biological function, and bibliography.

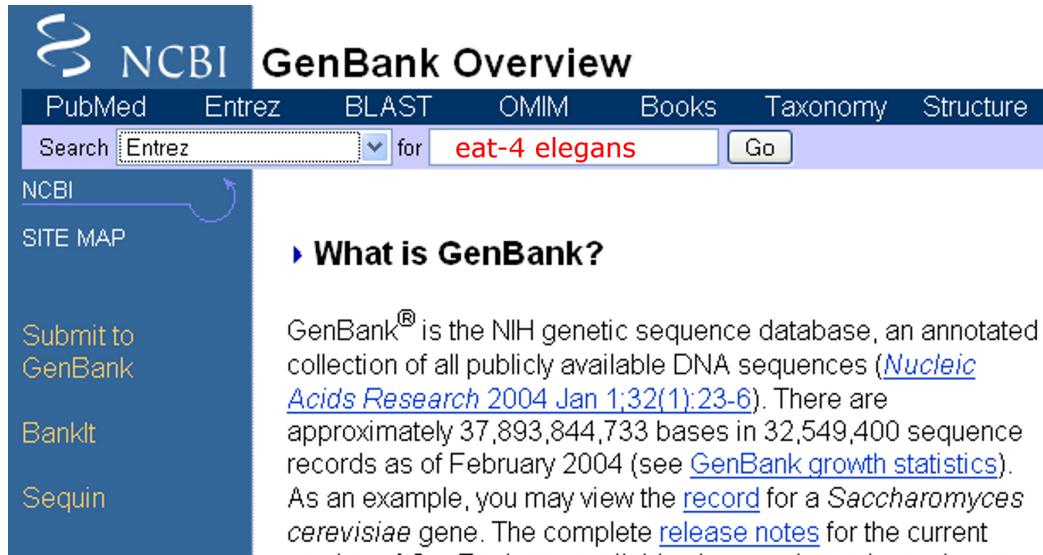


To perform a simple search, type into the query box a key word (such as **R13H8**, a genomic cosmid name), click the “Go” button. Many navigation links are there on the result page. To get at the most information, users should click and browse around.

5. Sequence analysis-retrieval

5.1. NCBI GenBank

NCBI GenBank <<http://www.ncbi.nlm.nih.gov/Genbank/index.html>> is a repository of sequences from many phylogenetically diverse organisms including the worm.



Search by a simple text string match; follow the appropriate links (Nucleotide or Protein) to download sequences.

The screenshot shows the NCBI Entrez search results for the query "eat-4 elegans". The top navigation bar includes links for HOME, SEARCH, SITE MAP, PubMed, Entrez, Human Genome, GenBank, Map Viewer, and BLAST. A search bar contains the query "eat-4 elegans" with buttons for GO, CLEAR, and Help. Below the search bar, a summary table provides links to various NCBI databases:

10 PubMed: biomedical literature citations and abstracts	none Books: online books
5 PubMed Central: free, full text journal articles	1 OMIM: online Mendelian Inheritance in Man
	none Site Search: NCBI web and FTP sites
4 Nucleotide: sequence database (GenBank)	1 UniGene: gene-oriented clusters of transcript sequences
3 Protein: sequence database	71 CDD: conserved protein domain database
1 Genome: whole genome sequences	none 3D Domains: domains from Entrez Structure
none Structure: three-dimensional macromolecular structures	2085 UniSTS: markers and mapping data
none Taxonomy: organisms in GenBank	none PopSet: population study data sets

Notice the extensive links to other types of information here. Browse and click to explore.

5.2. WormBase Genome Browser

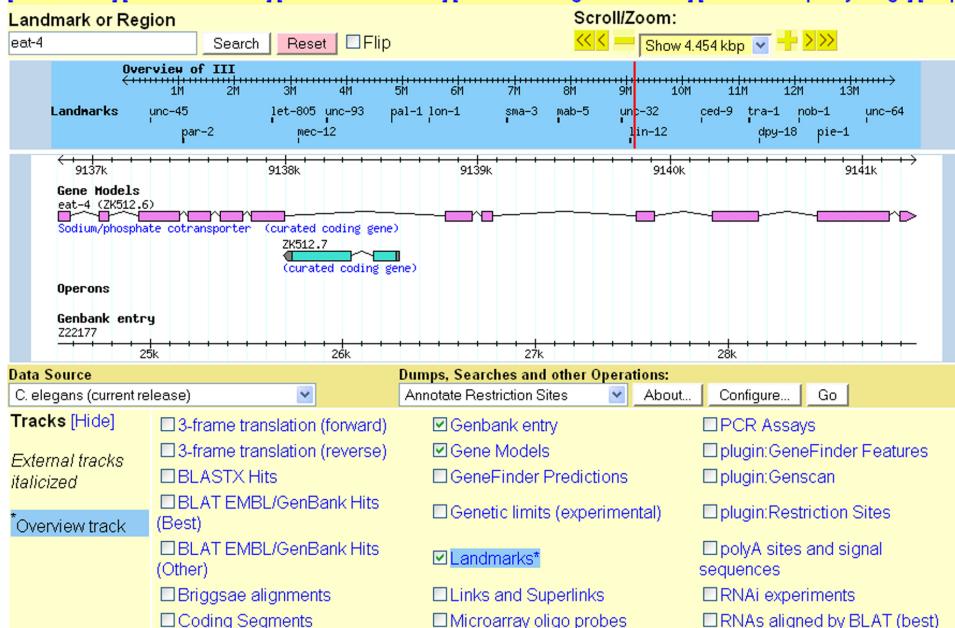
WormBase Genome Browser <<http://www.wormbase.org/db/seq/gbrowse/wormbase>> is a physical map browser. Using Genome Browser, one can search and display sequences and sequence-related features; one can also zoom in or out and move along on a chromosome.

Showing 4.454 kbp from III, positions 9,136,822 to 9,141,275

Instructions: Search using a sequence name, gene name, locus, oligonucleotide (15 bp minimum), or other landmark. The wildcard character * is allowed. To center on a location, click the ruler. Use the Scroll/Zoom buttons to change magnification and position.

Examples: IV, rhodopsin, IV:120,000..130,000, unc-9, him-*, B0019, PCR_product sjj_B0019.1, ttatcaaacaattaa.

[Hide banner] [Hide instructions] [Bookmark this view] [Link to an image of this view] [Publication quality image] [Help]



With Genome Browser, one can search for sequences by name or sequence (restricted to oligo size pieces) match, display and explore selected tracks of sequence and sequence features, and export sequences, features and images. Interested users can either explore around the page or read the user guides (<<http://www.its.caltech.edu/~wormbase/userguide/Menu/Sequence/index.html>>; <<http://www.mrw.interscience.wiley.com/cp/cpbi/articles/bi0108/frame.html>>).

6. Sequence analysis-search for homologous sequences

6.1. NCBI Blast

NCBI Blast <<http://www.ncbi.nlm.nih.gov/BLAST/>> offers a very extensive set of blast services. Here, different types of blast searches can be performed against all available sequences in GenBank database. One can even download programs to install and run locally.

The screenshot shows the NCBI BLAST homepage. At the top right is a large blue 'BLAST' logo. To its left is a sidebar with links to various NCBI databases and services. The main content area is organized into several sections: 'About BLAST' (News, Mailing list, References, NCBI Contributors, FAQs, Program selection guide, Web service interface, Databases, Documentation, Errata, Executables, Source code, Support); 'BLAST Services' (Nucleotide, Protein, Translated, Genomes, Special, Meta); and 'BLAST Software' (Databases, Documentation, Errata, Executables, Source code). A yellow banner at the top center reads 'NEW 15 Nov 2004 Download the BLAST poster from SC2004!'. The 'About BLAST' section also includes a link to the 'BLAST poster'.

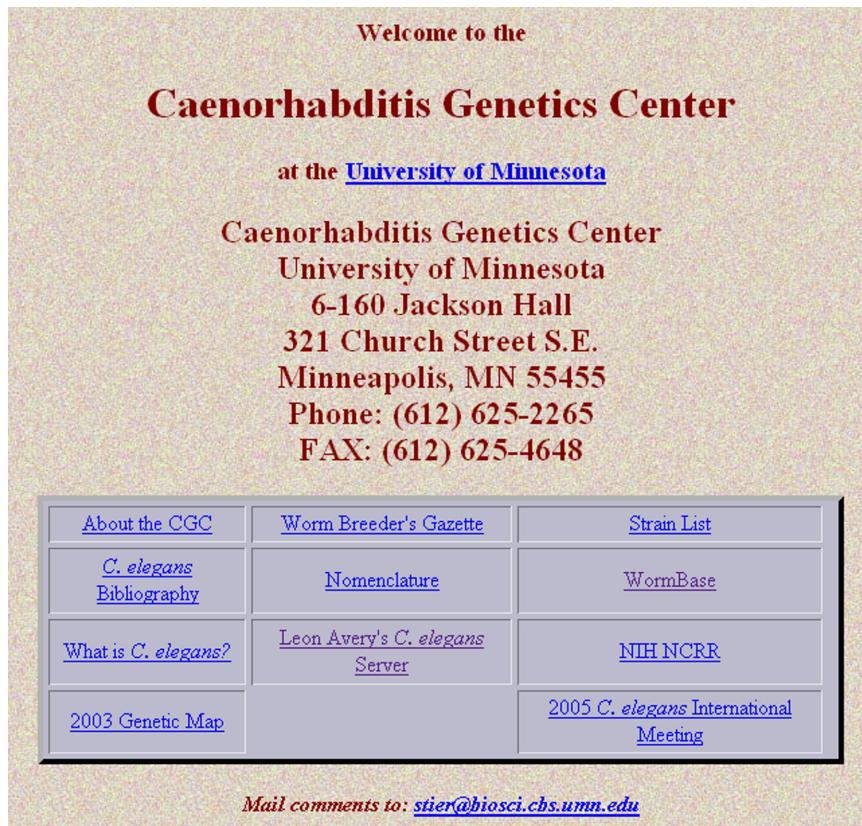
6.2. WormBase Blat Server

WormBase Blat Server <<http://www.wormbase.org/db/searches/blat>> is limited to basic Blast or Blat searches against *C. elegans* and *C. briggsae* sequences. However, WormBase already stores information of homologous sequences from other species in its database. Such sequences may be displayed in Genome Browser under feature tracks.

7. Genetics

7.1. Caenorhabditis Genetics Center (CGC)

Caenorhabditis Genetics Center (CGC) <<http://biosci.umn.edu/CGC/CGChomepage.htm>> is a resource center for *C. elegans* genetics. It is responsible for gene nomenclature, strain collection and distribution, and genetic map construction. CGC homepage is a portal that has links to these and some other related services useful to *C. elegans* geneticists.



7.2. Genetic mapping analysis

WormBase integrates genetic map information with that of physical map. Two search tools are particular useful for genetic mapping analysis.

Genetic Interval Search

- This page will list genes inside a genetically-defined interval.
- Specify a genetic interval using the names of two genes (for example *evl-7* to *sup-23*).
- Alternatively, define the endpoints using the notation *chromosome:position*, as in II:-4.3 to II:-4.0.
- Entering a single value into the start position will center the search on a window 0.3 cM wide
- Interval size is currently limited to 2 cM. Longer intervals may take some time to collate.

From position/landmark: To:

Displaying genetic interval II:-4.3 to II:-4.0

Name	Map	Pos	Type	Description
B0304.3 / cyp-23A1	II	-4.2541	named gene	The B0304.3 gene encodes a homolog of the human gene CYP7B1, which when mutated leads to giant cell hepatitis (OMIM:231100). RNAi: WT [WBRNAi00009688]
B0304.1 / hh-1	II	-4.2322	named gene	hh-1 is orthologous to the human gene MYOGENIC FACTOR 6 (HERCULIN) (MYF6; OMIM:159991), which when mutated leads to disease. [C.elegansII] cc450am : recessive lethal, arrest at varying stages as lumpy dumpy with some muscle differentiation, disorganized myofilaments. Encodes member of MyoD family. Transcripts present transiently in MS descendants, stably in D daughters and C and MS lineages leading to body wall muscle. Antibody staining similar (nuclear staining, persists through development of body wall muscle cells). [Krause et al. 1990, 1994; Chen et al. 1992; KM; PD] RNAi: WT [WBRNAi00009686]; Unc [WBRNAi00024379]; Unc [WBRNAi00027142]
B0304.4	II	-4.2233	predicted	No molecular description available. DNA: WT [WBRNAi00009688]

Genetic Interval Search <<http://wormbase.org/db/searches/interval>> can return a list of genes that have the potential to map within a specified genetic interval.

It should be noted that the genetic and physical map correlation is often solely based on statistical inferences thus should not be taken literally as factual.

7.3. Small interval genetic mapping

SNP, Visible Marker, And Strain Search <<http://wormbase.org/db/searches/strains>> is particularly useful for finding markers for genetic mapping experiments in a small interval.

SNP, Visible Marker, And Strain Search

This page is designed to assist in the selection of SNPs and visible genetic markers for mapping experiments. Provided with a genetic interval, it will display all visible markers and SNPs within that interval, as well as strains carrying those SNPs. The severity of markers can be restricted to avoid conflicts with the mutation of interest. To simplify in the acquisition of strains, strains can be restricted to those directly available from the CGC.

- Specify the interval using the names of two genetically defined loci (*unc-70*), or predicted genes (JC8.10a).
- Alternatively, you may provide genetic map positions using *chromosome:position* notation (III:-0.685).
- Please note: intervals are restricted to 2 cM.
- Entering a single value into the start position will center the search on a window 0.3 cM wide.
- [Learn more](#) about how this script works.

Search Parameters	
From position/landmark:	<input type="text" value="bli-6"/> to <input type="text" value="unc-24"/>
Loci	<input checked="" type="radio"/> All <input type="radio"/> Cloned Only <input type="radio"/> None
SNPs	<input checked="" type="radio"/> All <input type="radio"/> Snip-SNPs <input type="radio"/> SNPs <input type="radio"/> All <input checked="" type="radio"/> Verified <input type="radio"/> Predicted
Ease Of Scoring	<input type="text" value="3"/> <input type="button" value="▼"/> <input type="checkbox"/> Exclude loci with no Ease of Scoring data?
Mating Efficiency	<input type="text" value="3"/> <input type="button" value="▼"/> <input type="checkbox"/> Exclude loci with no mating efficiency data?
Exclude Lethals?	<input type="checkbox"/> Yes
Strains	<input type="radio"/> CGC Strains Only <input checked="" type="radio"/> All Strains
<input type="button" value="Reset"/> <input type="button" value="Search"/>	

8. Cell and anatomy

8.1. WormAtlas

WormAtlas <<http://www.wormatlas.org/>> provides anatomical information of *C. elegans*. The front page lists several useful entry points.

One can use the simple text search tool to search the site for information that relates to anatomical terms (e.g. PVT, name of a neuron). Another good way to use this site is to read sections of the “handbook”.

ATLAS OF *C. elegans* ANATOMY - an illustrated handbook

HERMAPHRODITE ANATOMY

Edited by: Z. F. Altun & D. H. Hall

[Chapter 1](#): Overall description of body shape

[Chapter 2](#): Adult organs and tissues

1. Epithelial System
 - ◊ [Hypodermis](#)
 - ◊ Specialized epith. cells Part I-[Seam Cells](#)
 - ◊ Specialized epith. cells Part II-[Neuronal Support Cells](#)
 - [Introduction](#)
 - [Glia table](#)
 - [Amphid sensilla](#)
 - [CEP sensilla](#)
 - [Phasmid sensilla](#)
 - [IL & OL sensilla](#)
 - [Deirid sensilla](#)
 - ◊ Specialized epith. cells Part III-[Other interfacial cells](#)
2. Nervous System
 - ◊ General Description

MALE ANATOMY

Edited by: R. Lints & D. H. Hall

[Chapter 1](#): Introduction to the male

- ◆ Part I - [Body shape, behavior and propagation](#)
- ◆ Part II - [Anatomical differences between the sexes](#)

[Chapter 2](#): Adult organs and tissues

1. Epithelial System
 - ◊ Hypodermis
 - ◊ Part I-Seam Cells
 - ◊ Part II-Neuronal Support Cells
 - ◊ Part III-Other interfacial cells
2. Nervous System
 - ◊ General Description
 - ◊ Male sensory organs
 - ◊ [Individual Neurons](#)
 - ◊ Commissures
 - ◊ Synapses

ADDENDUM

[Chapter 1](#): *C. elegans* behaviors and processes

[Chapter 2](#): [Phylogeny](#) by David H. A. Fitch

APPENDIX:

[References](#)

[A crawling C. elegans](#) - from Goldstein lab

[A bird's eye view of C. elegans](#) -quicktime movie.

by Adam Hartley and Carolyn Marks



8.2. Gene Expression Pattern

Summary of published gene expression data can be found at WormBase, or *C. elegans* AceView. Two Web sites offer primary, sometimes unpublished expression data.

The Nematode Expression Pattern Database (NEXTDB) <<http://nematode.lab.nig.ac.jp/db2/>> provides access to *C. elegans* EST sequences obtained by Yuji Kohara's laboratory and some other experimental results derived from them, such as expression patterns determined by *in situ* hybridization, which can be searched via a text query tool.

Advanced search by keywords

[help](#)

key	value	example
YK clone	<input type="text"/>	yk48g3, YK48G3, yk48g3.3, 48g3
cosmid	<input type="text" value="K04H4"/>	K04H4, k04h4
gene name	<input type="text"/>	pos-1, POS-1
product name	<input type="text"/>	K04H4.2a, k04h4.2a
CELK group	<input type="text"/>	CELK02199, 2199
homologous protein	<input type="text"/>	kinase, homeobox
motif or domain	<input type="text"/>	transmembrane receptor
chromosome	<input type="text" value="all"/> <input type="button" value="▼"/>	
clone size	<input type="text"/> to <input type="text"/>	

As an example, let's query for cosmid **K04H4**. On the result page, one can either click on a group, such as CELK02617, to go to the summary page for this EST cluster group (roughly equivalent to a gene) directly, or one can select the cosmid **K04H4** link to jump to a map view to begin browsing along the chromosome, gene-by-gene, for *in situ* data.

Result of keyword search

clone	group	chromosome	cosmid	CDS No.	product	gene	size
1029f07	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.50
1053e02	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.68
1062a05	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.22
1068c10	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.13
1068f08	CELK01842	LG3	K04H4	1	K04H4.1	emb-9	3.71
1071d10	CELK10298	LG3	K04H4	4	K04H4.5	x	2.61
108f8	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	1.89
1113e11	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.24
1202a01	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.94
1278a06	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	5.49
1285a06	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.08
1285d05	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	2.14
1313a04	CELK02617	LG3	K04H4	1	K04H4.1	emb-9	5.04
1317c06	CELK11193	LG3	K04H4	4	K04H4.5	x	1.92
133d11	CELK02199	LG3	K04H4	3	K04H4.2b	x	1.66
134e1	CELK02199	LG3	K04H4	3	K04H4.2b	x	2.58
1415g03	CELK02199	LG3	K04H4	2	K04H4.2b	x	2.85

Map type selection : K04H4

region of a map to be displayed

- display neighboring cosmids of the selected one
- display the selected cosmid

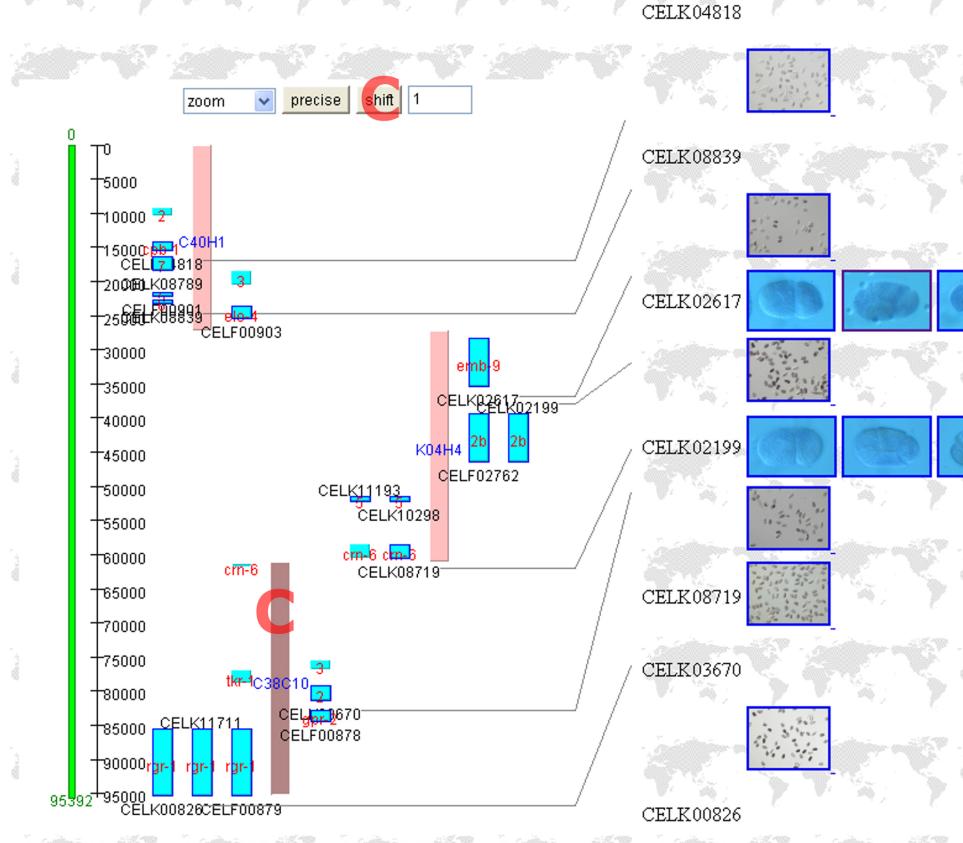
image information to be displayed

- in-situ hybridization
- in-situ hybridization (not arranged)

To go to the map view, select “display neighboring cosmids”. Note here that it is best to start with one cosmid on either side because more will be too crowded for the physical map display. Click on the “submit” button brings up an “Area map” page. On the left hand side of this page is a physical map which is actually an interactive graphical Java application.

Area map (around the cosmid K04H4)

New window for : shift precise help



On this page, clicking on any thumbnail will bring up links to full size *in situ* images. To move ‘downward’ on the physical map, select the pink bar representing the lower cosmid; then click on the “shift” button on top of this page to effect the move. To move by more than one cosmid at a time, one can change the number (defaulted to 1) next to the “shift” button. To adjust the viewable area of the physical map display, one needs to resize the map. “Change map size” control strip is at the very bottom of the web page (not in view here). A warning here is that this Java application may not be stable at all times. Be gentle.

8.3. BCGSC Expression Pattern

BCGSC Expression Patterns <<http://elegans.bcgsc.ca/perl/eprofile/browse>> lists GFP expression data which can be browsed directly or searched by gene name, tissue pattern or life stage.

Expression Patterns

for *C. elegans* promoter::GFP fusions

Browse Gene Search Pattern Search Contact Disclaimer Home

BROWSE

Stage: Tissue:
Genes/Pg: Page:

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Selected Parameters							
Gene(s)	*						
Statistics							
Gene hits	1031 / 1031						
Strain hits	1122 / 1122						

-- any stage --, -- any tissue --

Gene(s)	Locus	Strain	Image(s)	Video(s)	Location (WS1)	Stage	Tissue
AC7.1		BC11537			IV:5122001..5124802 [Wormbase]	Larval	intestinal, renal gland cells, ventral nerve cord, head neurons, unidentified tail
						Adult	intestinal, renal gland cells, head neurons
AH6.10	sra-6	BC13729			II:9549628..9552391 [Wormbase]	Larval	unidentified head, unidentified tail
						Adult	unidentified head
AH6.11	sra-7	BC12595			II:9541703..9544578 [Wormbase]	Larval	head neurons, tail neurons
						Adult	head neurons, tail neurons
AH6.6	sra-2	BC13750			II:9525846..9528704 [Wormbase]	Larval	intestinal muscle, anal sphincter/depressor muscle, hypodermis, unidentified head
						Adult	intestinal muscle, anal sphincter/depressor muscle, unidentified head
B0024.14a		BC10320			V:10331821..10334772 [Wormbase]	Larval	head neurons, tail neurons
						Adult	vulval muscle, head neurons, tail neurons

For each expression pattern, there are text annotations, images or even animations of series of images.

9. Concluding remark

The Web is still growing rapidly, both in terms of technology and content. We can expect that *C. elegans* Web resources will also grow and improve. As more people become accustomed to using the Web in their research, existing resources will improve and more will be made available. It will be a challenge for this chapter to keep up with future changes so that it remains to be useful.



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