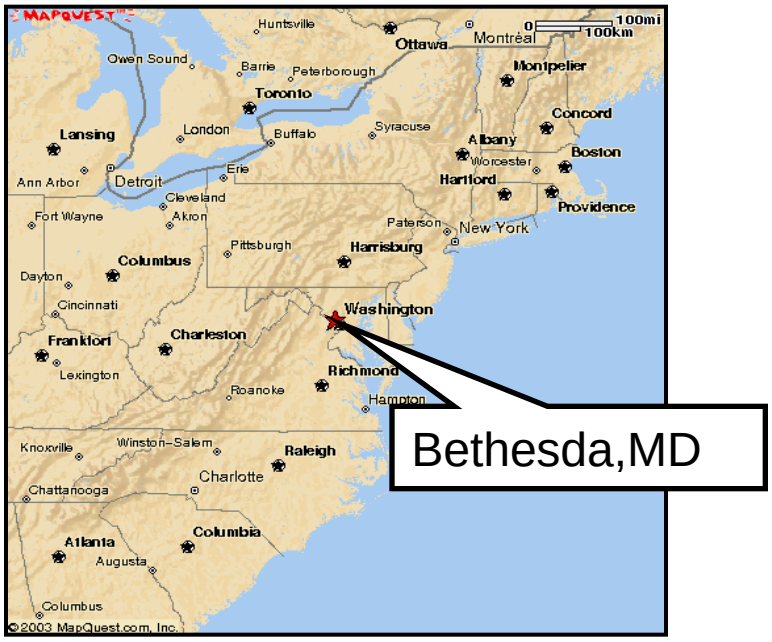
Boolean Operators

- **Questionnaires on Boolean Operators.**

The National Center for Biotechnology Information

www.ncbi.nlm.nih.gov



Created in 1988 as a part of the National Library of Medicine (NLM) at the National Institute of Health (NIH)

- **Establish public databases**
- **Research in computational biology**
- **Develop software tools for sequence analysis**
- **Disseminate biomedical information**

NCBI Databases and Services

- **GenBank** primary sequence database

- Free public access to biomedical literature
  - **PubMed** free **Medline** (3 million searches per day)
  - **PubMed Central** full text online access
  - **MeSH database (Medical Subject Headings)** controlled vocabulary thesaurus

- **BLAST** highest volume sequence search service (100 – 200 K searches per day)

- **Software and databases for download**

The Literature Data Deluge

It is estimated that,

- the scientific literature increases by 2000 pages *every minute*
- it would take 5 years to read the new scientific literature produced in 1 day

Search engines play an essential role in picking out the right articles

PubMed

- PubMed comprises more than 28 million citations for biomedical and related journal from MEDLINE, life science journals, and online books.

- Articles are indexed using a controlled vocabulary called Medical Subject Headings (MeSH).

Search PubMed

- by Authour → name and initials, use no punctuation
  e.g. "lesk am"

- by Subject → no operators, no tags
  e.g. try "lesk am evolution"

*always check the **Search Details***!

- by Journal → use ***tags*** or ***Advanced***
  e.g. find the articles of prof. Lesk on *Nature*

Alternatively, use ***single citation matcher***.

Search PubMed and other Literature Databases

- Find in Pubmed the 1953 Nature article by Watson and Crick revealing the structure of DNA.

- Do the same in Google, Google Scholar, ISI Web of Science and Scopus.

Search Pubmed

- Take all Nature papers by A.M. Lesk and save them, including their abstracts,

  1) in a file
  2) in an email message to me (paola.turina@unibo.it).

- Take the oldest Nature paper authored by A.M. Lesk and

  1) visualize its record as a flat file;
  2) find out what the field codes mean.

The PubMed Screen

Search Pubmed from programming environments

Entrez Direct: E-utilities on the UNIX Command Line

Getting Started

Introduction

Entrez Direct (EDirect) provides access to the NCBI's suite of interconnected databases (publication, sequence, structure, gene, variation, expression, etc.) from a UNIX terminal window.

Entrez Direct Functions

- **esearch** performs a new Entrez search using terms in indexed fields.
- **efetch** downloads records or reports in a designated format.
- **xtract** converts EDirect XML output into a table of data values.
- **epost** uploads unique identifiers (UIDs) or sequence accession numbers.

Search PubMed

- use the filter sidebar to limit the search:
  - try *e.g.* "cancer"
  - then check the filter sidebar for
    "Clinical trial"
    "Review"
    "human"
  - then look at the "Search results" and change eventually the Booleans to further limit your search.

*PubMed uses **Automatic Term Mapping** → Terms entered without a qualifier are looked up against the following **translation tables** and **indexes** in a distinct order:*

1. *MeSH Translation Table*
2. *Journals Translation Table*
3. *Author Index*

Search Pubmed using MeSH

- Search the MeSH database for "chewing".
  - look at the search details
  - click on the MeSH term, look at "Related information" and search in Pubmed
  - for restricting, use "Major Topics"

- Use the Builder Search to search for the combination of the two MeSH terms
  (1) measles
  (2) outbreaks

  and, successively, use the subheading "Statistics and numerical data" for further narrowing your search.

When and How to Search the MeSH Database

1. Use the *MeSH database* to search for a particular term or concept.

2. If multiple items are retrieved, click on the desired term to view and select *subheadings* and other options.

3. Then click on the *Add to Search Builder* button on the right side of the screen.

4. When finished adding search terms, click *Search PubMed* to complete the search.

Advanced Search in PubMed/MeSH

- **Questionnaire on PubMed/MeSH.**