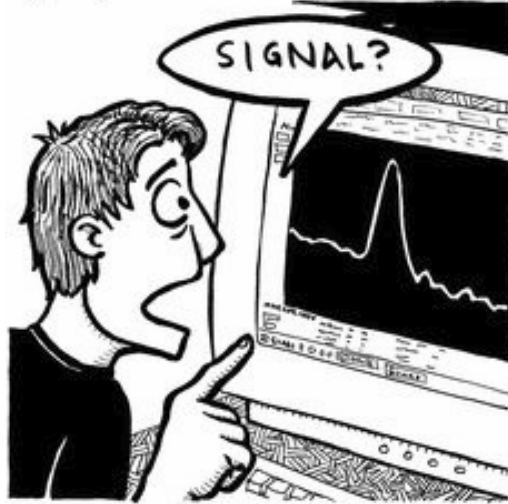


# Today: Practicing Strong Inference then Scientific Articles and how to find them

Ph.D. OFU

by JEREMY JOHNSON



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# **The Rules of Strong Inference:**

Strong Inference is a method for looking at scientific problems by trying to disprove hypotheses and accepting the hypotheses that can not be disproved. Using Strong Inference entails following these rules (from an article by John Platt, 1964):

- 1. Devise multiple hypotheses.**
- 2. Design experiment(s) to eliminate one or more of the hypotheses.**
- 3. Carry out the experiments to get reliable results.**
- 4. Repeat. Refine hypotheses.**

Please be nice to the termites:

- They will not bite or harm you.
- Use about 8-10 per group.
- Only move them with a brush.
- Keep them in a container with a moist towel between experiments.



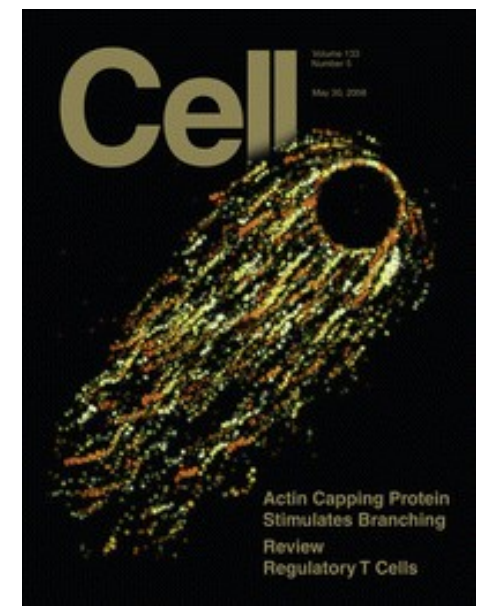
Scientists communicate by publishing their findings in journals...



*Plant Physiology*



Editor's Choice: The New Genomics of Brains & Eyes



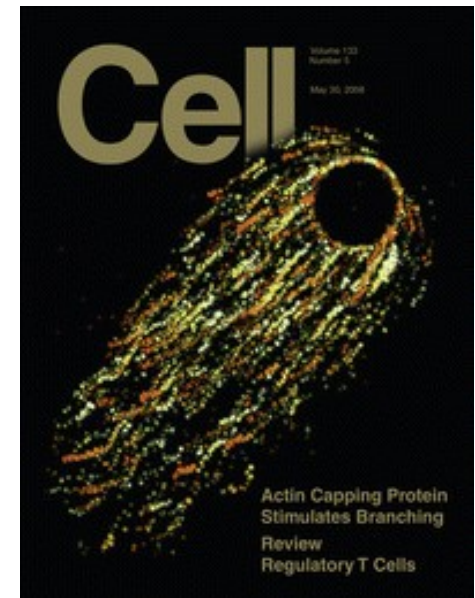
# What is in a research article?



*Plant Physiology*



Editor's Choice: The New Genomics of Blood & Eyes





# What is in a research article?

## Short Report

### Season of Birth Contributes to Variation in University Examination Outcomes

MARTIN FIEDER,<sup>1,2\*</sup> HERMANN PROSSINGER,<sup>2</sup> KAROLINE IBER,<sup>3</sup> KATRIN SCHAEFER,<sup>2</sup> BERNARD WALLNER,<sup>2</sup> AND SUSANNE HUBER<sup>2</sup>

<sup>1</sup>Rector's Office, University of Vienna, A-1010 Vienna, Austria

<sup>2</sup>Department of Anthropology, University of Vienna, A-1090 Vienna, Austria

<sup>3</sup>Research Institute of Wildlife Ecology, University of Veterinary Medicine of Vienna, A-1180 Vienna, Austria

**ABSTRACT** Epidemiological studies show that birth season influences a wide range of biological parameters such as growth, reproduction, mental illnesses, dyslexia, personality, and success in school. The present study is aimed at examining birth season's relationship to examination marks achieved at a university in a very large contemporary sample of male and female undergraduate students. We find that female university students born in spring and summer achieve better marks than those born in autumn and winter. Male students born in spring receive worse marks than those born in other seasons of the year. Furthermore, we find a birth-week periodicity in examination results of female students, with highest examination results for those born in May. We suppose that biological mechanisms might explain part of the observed effects. *Am. J. Hum. Biol.* 18:714–717, 2006. © 2006 Wiley-Liss, Inc.

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#### SUBJECTS AND METHODS

To investigate the influence of birth season on examination marks, we used the (anonymous) examination results from 1995–2001 of undergraduate students at the University of Vienna, together with their dates of birth. We

included only examinations of those students who had taken more than five examinations. In this large data base (947,662 examinations of 33,036 female students, and 411,642 examinations of 16,397 male students), we looked for a possible association between examination marks received by male and female students, separately, with their birth dates. The median age of students at time of examination was 22.75 years (quartiles: 25%, 20.92 years; 75%, 25.67 years). The examinations covered a wide range of disciplines taught in various faculties: theology (0.9%), economics (8.8%), social sciences (33.9%), humanities (27.7%), natural sciences and mathematics (20.6%), and others (8.0%).

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Martin Fieder and Hermann Prossinger contributed equally to this work.

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\*Correspondence to: Dr. Martin Fieder, Rector's Office, University of Vienna, Dr. Karl Lueger Ring 1, A-1010 Vienna, Austria. E-mail: martin.fieder@univie.ac.at

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Basic info: who, what, where, when

AMERICAN JOURNAL OF HUMAN BIOLOGY 18:714–717 (2006)

*Short Report*

## Season of Birth Contributes to Variation in University Examination Outcomes

MARTIN FIEDER,<sup>1,2\*</sup> HERMANN PROSSINGER,<sup>2</sup> KAROLINE IBER,<sup>1</sup> KATRIN SCHAEFER,<sup>2</sup>  
BERNARD WALLNER,<sup>2</sup> AND SUSANNE HUBER<sup>3</sup>

<sup>1</sup>*Rector's Office, University of Vienna, A-1010 Vienna, Austria*

<sup>2</sup>*Department of Anthropology, University of Vienna, A-1090 Vienna, Austria*

<sup>3</sup>*Research Institute of Wildlife Ecology, University of Veterinary Medicine of Vienna, A-1160 Vienna, Austria*

The **abstract** is a summary of the rationale and results.

*ABSTRACT* Epidemiological studies show that birth season influences a wide range of biological parameters such as growth, reproduction, mental illnesses, dyslexia, personality, and success in school. The present study is aimed at examining birth season's relationship to examination marks achieved at a university in a very large contemporary sample of male and female undergraduate students. We find that female university students born in spring and summer achieve better marks than those born in autumn and winter. Male students born in spring receive worse marks than those born in other seasons of the year. Furthermore, we find a birth-week periodicity in examination results of female students, with highest examination results for those born in May. We suppose that biological mechanisms might explain part of the observed effects.



**The introduction**  
has background  
information.

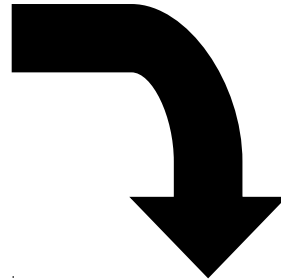
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## What is this?

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References are how scientists cite other people's ideas or data.

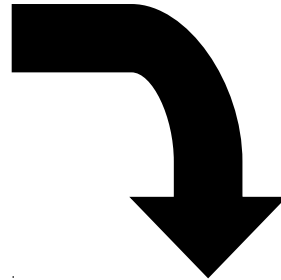
(Castrogiovanni et al., 1998)



Castrogiovanni P, Iapichino S, Pacchierotti C, Pieraccini F. 1998. Season of birth in psychiatry: a review. *Neuropsychobiology* 37:175–181.

Using other's ideas or data is fine, but not citing where the information came from is plagiarism.

(Castrogiovanni et al., 1998)



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**Materials and methods** or other synonymous sections detail how the experiments were done.

## SUBJECTS AND METHODS

To investigate the influence of birth season on examination marks, we used the (anonymous) examination results from 1995–2001 of undergraduate students at the University of Vienna, together with their dates of birth.....

The **results** section details the outcomes of the experiments.

## RESULTS

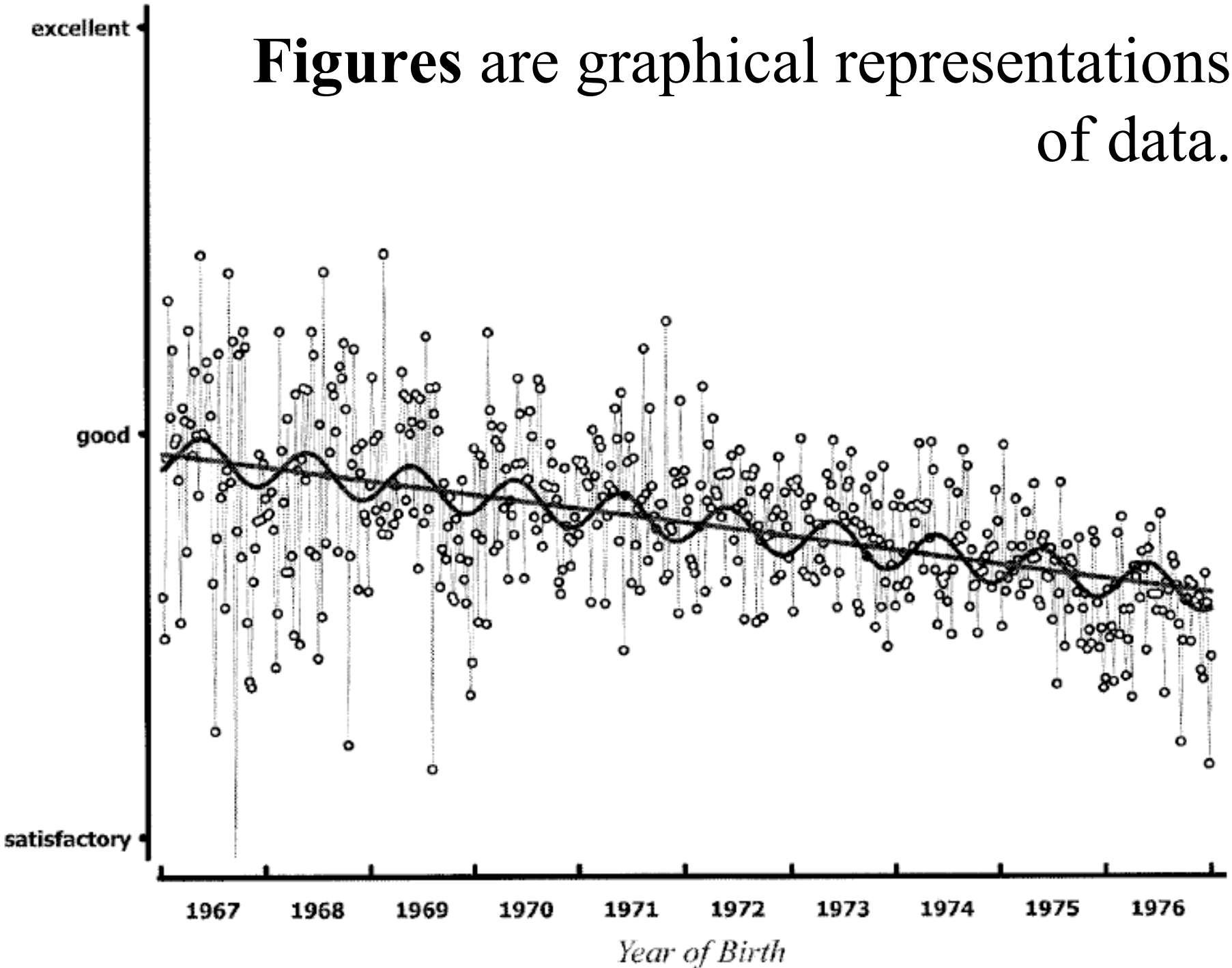
The distribution of scores attained by male and female students is associated with their birth season (see data in Table 1).....

The **results** section details the outcomes of the experiments, and refers to the tables and figures in the paper.

## RESULTS

The distribution of scores attained by male and female students is associated with their birth season (see data in Table 1).....

**Figures** are graphical representations of data.





# Sometimes **tables** are used.

*TABLE 1. Data and statistical estimators of examination scores<sup>1</sup>*

	Female students				Male students			
	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn
Excellent (%)	33.07	33.14	33.08	32.48	34.58	34.06	34.45	33.87
Good (%)	27.75	27.63	27.56	27.68	25.45	25.13	25.53	25.40
Satisfactory (%)	18.87	18.96	18.95	19.28	18.04	18.11	18.14	18.18
Passing (%)	11.23	11.18	11.29	11.52	11.69	11.92	11.47	11.97
Failure (%)	9.08	9.08	9.11	9.05	10.24	10.77	10.41	10.58
Mean mark	3.6449	3.6457	3.6422	3.6303	3.6245	3.5979	3.6215	3.6001
Standard error	0.0026	0.0026	0.0027	0.0027	0.0042	0.0041	0.0041	0.0043
Median age (years)	22.71	22.47	22.42	22.66	23.81	23.50	23.45	23.60
N (examinations)	238,229.0	250,390.0	234,128.0	224,915.0	102,404.0	107,515.0	106,286.0	95,437.0

<sup>1</sup>Distribution of scores awarded (percentage), mean score, standard error, median age of students, and sample size (*N*) for birth seasons, separately for females and males taking examinations.

The **discussion** is where the results are explained and related to other research. (sometimes it is combined with the results)

## DISCUSSION

We find that examination scores are related to season of birth in both female and male students, indicating that there could be some biologically significant underlying ontogenetic or early life-history mechanism.....

# Where and how do you find a journal article?

## Short Report

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# University of Texas Libraries

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## Introduction to Scientific Literature

Based on information from Roxanne Bogucka, Science Instruction Librarian

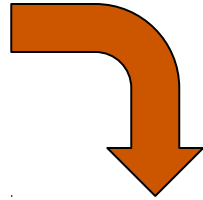


# Kinds of Science Literature

**Grey Literature** Unpublished research articles, working papers, company reports, etc.

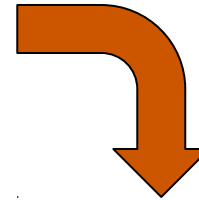
## Primary Literature

Journal articles (research), dissertations & theses, datasets, conference papers & posters



## Secondary Literature

Journal articles (review), term papers, scientific books



## Tertiary Literature

Newspaper articles, magazine articles, textbooks, lab manuals, popular science books, popular science web sites, reference books, encyclopedias

## Scholarly Articles vs. Popular Articles

---

Here are two articles on the same topic.

Hites *et al.*, 2004. [Global assessment of organic contaminants in farmed salmon.](#) *Science* 303: 226-229.

Stokstad, 2004. [Salmon survey stokes debate about farmed fish.](#) *Science* 303: 154-155.

Are [these articles](#) popular or scholarly? Why do you think so?

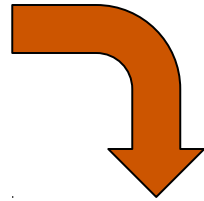
View the UT Libraries [chart on scholarly vs. popular articles.](#)

# Kinds of Science Literature

**Grey Literature** Unpublished research articles, working papers, company reports, etc.

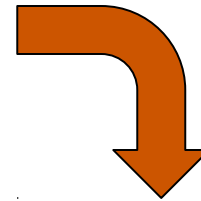
## Primary Literature

Journal articles (research), dissertations & theses, datasets, conference papers & posters



## Secondary Literature

**Review articles,  
term papers,  
scientific books**



## Tertiary Literature

Newspaper articles, magazine articles, textbooks, lab manuals, popular science books, popular science web sites, reference books, encyclopedias

## Review Articles vs. Research Articles

---

Life Science Library's pages on [review articles](#) and [research articles](#)

Look at these articles:

“

[Omega-3 fatty acids and the benefits of fish consumption: Is all that glitters go](#)  
”

“

[Preliminary examination of contaminant loadings in farmed salmon, wild salmon](#)  
”

Look at the rest of these articles. Are they are popular or scholarly?  
If they are scholarly articles, are they research articles or review  
articles? Record your answers on the worksheet.

# University of Texas Libraries

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## Using Databases Effectively

# Using Search Terms

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Use the worksheet to create hierarchies of search terms around two of these topics:

pasta

hybrid cars

computers

video games



## Search Terms: Keywords

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Look at these searches in the database [Academic Search Complete](#).  
<statistics on obesity in U.S. children>

## Search Terms: Keywords

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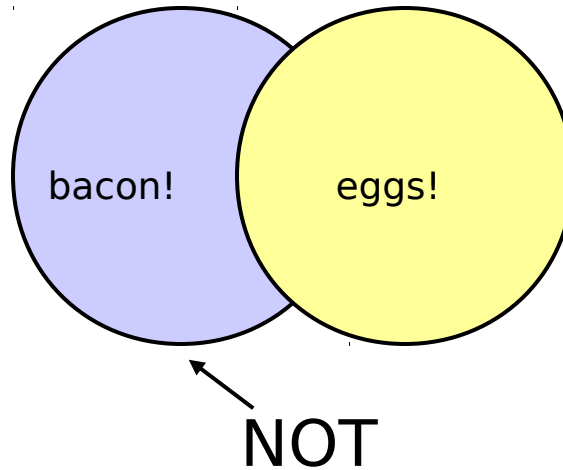
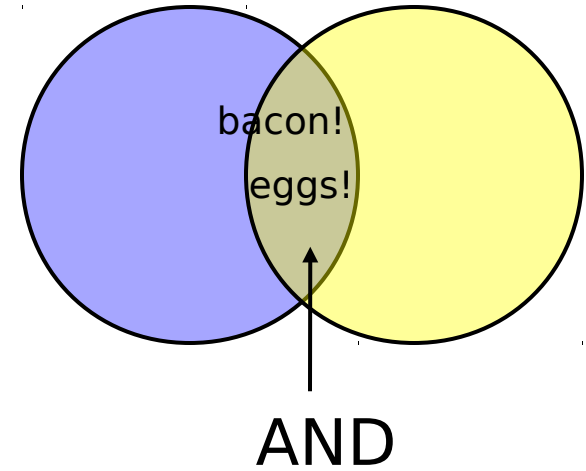
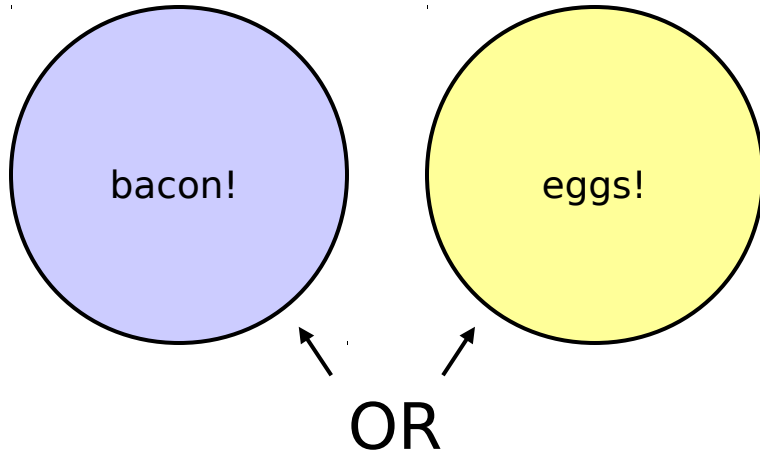
Look at these searches in the database [Academic Search Complete](#).

<statistics on obesity in U.S. children>

<obesity AND statistics AND child\* AND “united states”>

# Boolean terms (connectors)—AND, OR, NOT

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## Putting It All Together

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Picard, A.L., 2005. Courtship in the zig-zag salamander (*Plethodon dorsalis*): Insights into a transition in pheromone-delivery behavior. *Ethology* 111(9): 799-809.

From the [citation](#) above, you could construct a search strategy like this—

courtship		Plethodon
OR		OR
behavior	AND	amphibian*
OR		OR
reproduc*		salamander*

Look at [these citations](#). Construct search strategies to find more like them. Use the worksheet to record your search strategies.

Try the searches in the database ASFA.

# University of Texas Libraries

Where and How to Search

## Databases vs. the Library Catalog

### The Library Catalog

1. Title=ecology + Location=Journals
2. Journal Title1=ecology
3. Journal Title2=ecology
4. Keyword=ecology + Location=Journals

### Databases & Indexes to Articles

Where should you search for [these items](#)?

In the [library catalog](#)? Or in a database (like [Academic Search Complete](#))?



## Searching in PubMed

I want to find...

1. articles on dugongs by a researcher named Wirsing
2. articles on whales in the journal *Anatomical Record*
3. articles from 2004 forward, on the genetics of hantaviruses

Other useful databases:

Web of Science,

which can be found via the UT library at:

<http://www.lib.utexas.edu/indexes/titles.html?let=W>

Google Scholar

[scholar.google.com](http://scholar.google.com)

Next week's lab:  
Inquiry 1 proposal due (office hours on  
calendar)

Literature Search  
Practice

PhD OFU

by JEREMY JOHNSON

