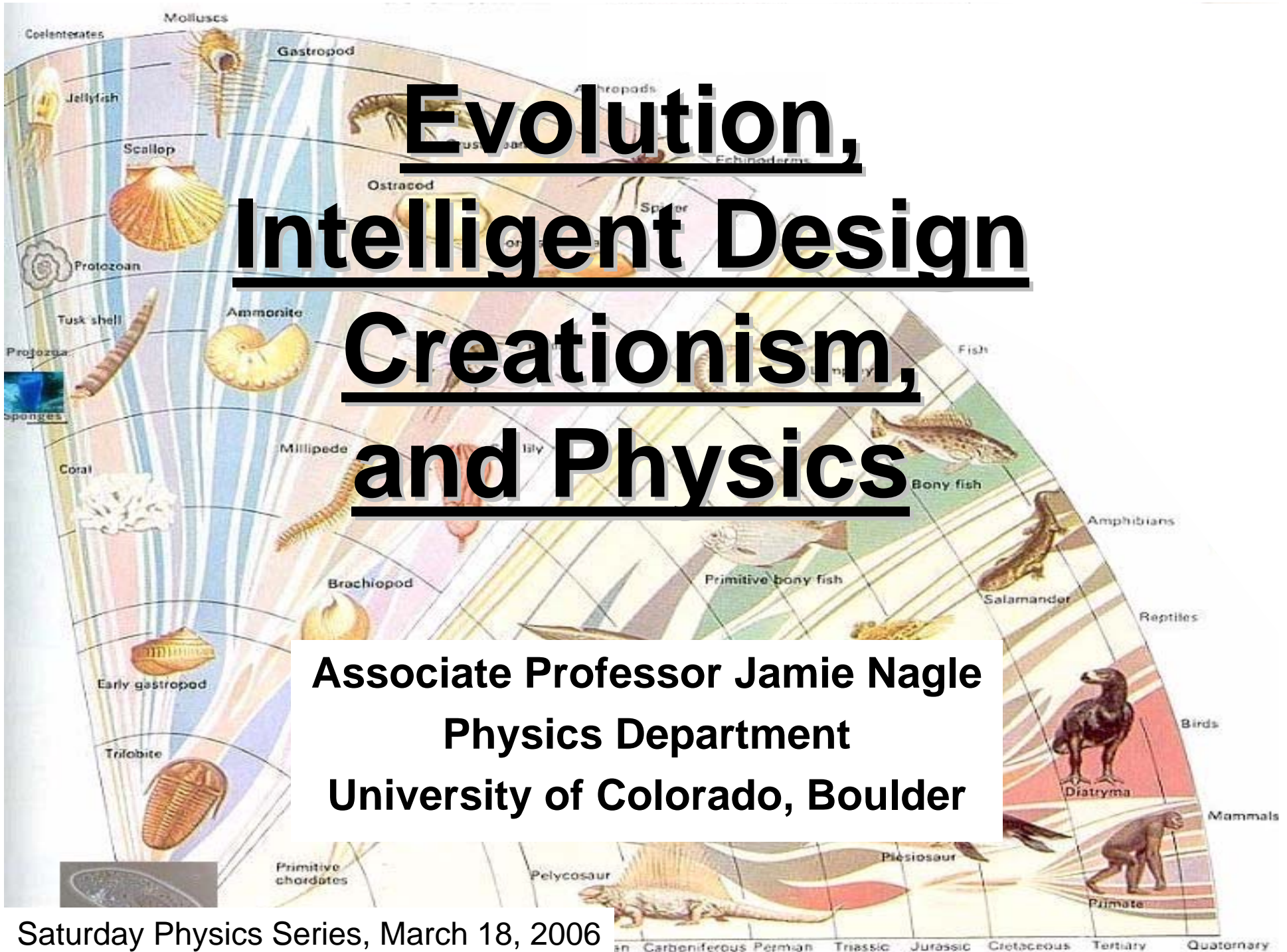


# Evolution, Intelligent Design Creationism, and Physics

Associate Professor Jamie Nagle  
Physics Department  
University of Colorado, Boulder

Saturday Physics Series, March 18, 2006

Carboniferous Permian Triassic Jurassic Cretaceous Tertiary Quaternary



# Evolution/Intelligent Design in the News

Georgia State Schools Superintendent  
Kathy Cox:

Removed references to evolution from  
the proposed biology curriculum  
because it is "a buzzword that causes a  
lot of negative reaction."

Cox said the curriculum could include  
the "teaching of intelligent design."



# Evolution/Intelligent Design in the News

Evolution is a “controversial theory some scientists present as a scientific explanation for the origin of living things, such as plants, animals and humans.

No one was present when life first appeared on earth, therefore, any statement about life’s origins should be considered as theory, not fact.”

1995 Alabama textbook disclaimer  
from the State Board of Education



# Evolution/Intelligent Design in the News

Tom Delay:

The Columbine shootings occurred in part “because our school systems teach our children that they are nothing but glorified apes who have evolutionized out of some primordial mud.”



# Evolution/Intelligent Design in the News

George C. Deutsch, presidential appointee at NASA:

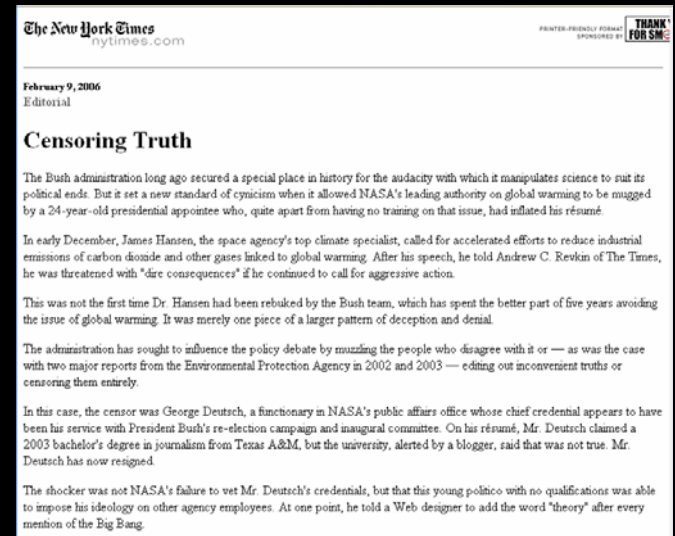
The Big Bang is “not proven fact; it is opinion,” and thus the word “theory” should be used with every mention of Big Bang.

It is not NASA’s place to make a declaration about the origin of the universe “that discounts intelligent design by a creator.”

He claimed a 2003 bachelor’s degree from Texas A&M.

Texas A&M confirmed that he never completed his degree.

He has now resigned.



The New York Times  
nytimes.com

February 9, 2006  
Editorial

**Censoring Truth**

The Bush administration long ago secured a special place in history for the audacity with which it manipulates science to suit its political ends. But it set a new standard of cynicism when it allowed NASA’s leading authority on global warming to be mugged by a 24-year-old presidential appointee who, quite apart from having no training on that issue, had inflated his résumé.

In early December, James Hansen, the space agency’s top climate specialist, called for accelerated efforts to reduce industrial emissions of carbon dioxide and other gases linked to global warming. After his speech, he told Andrew C. Revkin of The Times, he was threatened with “dire consequences” if he continued to call for aggressive action.

This was not the first time Dr. Hansen had been rebuked by the Bush team, which has spent the better part of five years avoiding the issue of global warming. It was merely one piece of a larger pattern of deception and denial.

The administration has sought to influence the policy debate by muzzling the people who disagree with it or — as was the case with two major reports from the Environmental Protection Agency in 2002 and 2003 — editing out inconvenient truths or censoring them entirely.

In this case, the censor was George Deutsch, a functionary in NASA’s public affairs office whose chief credential appears to have been his service with President Bush’s re-election campaign and inaugural committee. On his résumé, Mr. Deutsch claimed a 2003 bachelor’s degree in journalism from Texas A&M, but the university, alerted by a blogger, said that was not true. Mr. Deutsch has now resigned.

The shocker was not NASA’s failure to vet Mr. Deutsch’s credentials, but that this young politico with no qualifications was able to impose his ideology on other agency employees. At one point, he told a Web designer to add the word “theory” after every mention of the Big Bang.

PRINTED-FRIENDLY FORMAT  
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THANKS FOR SM.

# Intelligent Design in the News

President Bush told Texas newspaper reporters that he believes that intelligent design should be taught alongside evolution as competing theories.

“Both sides ought to be properly taught ... so people can understand what the debate is about.”



[washingtonpost.com](http://www.washingtonpost.com)

## Bush Remarks On 'Intelligent Design' Theory Fuel Debate

By Peter Baker and Peter Stevin  
Washington Post Staff Writers  
Wednesday, August 3, 2005; A01

President Bush invigorated proponents of teaching alternatives to evolution in public schools with remarks saying that schoolchildren should be taught about "intelligent design," a view of creation that challenges established scientific thinking and promotes the idea that an unseen force is behind the development of humanity.

Although he said that curriculum decisions should be made by school districts rather than the federal government, Bush told Texas newspaper reporters in a group interview at the White House on Monday that he believes that intelligent design should be taught alongside evolution as competing theories.

# What is Science?

“Science is a particular way of knowing about the world. In science, explanations are limited to those based on observations and experiments that can be substantiated by other scientists.” National Academy of Sciences

Some of humanity's most profound questions pertain to meaning, purpose, and morality. Their answers lie beyond the reach of science.

# Hallmarks of Science

- Testable (falsifiable) hypothesis making
- Experimental tests
- Willingness to modify theories in light of new evidence
- Critical peer review
- Repeatability of tests by others

In this way, the accuracy and sophistication of descriptions of the natural world tend to increase with time.



# Why should you believe anything I say?

People on both sides of a debate can say anything they want. And often do!

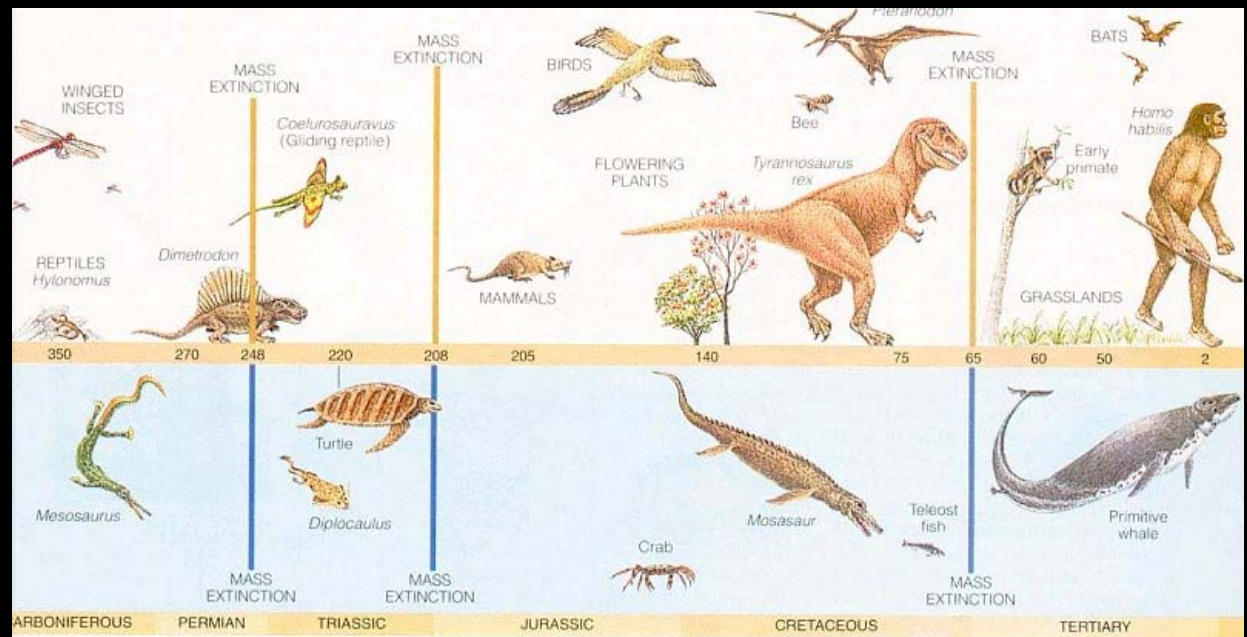
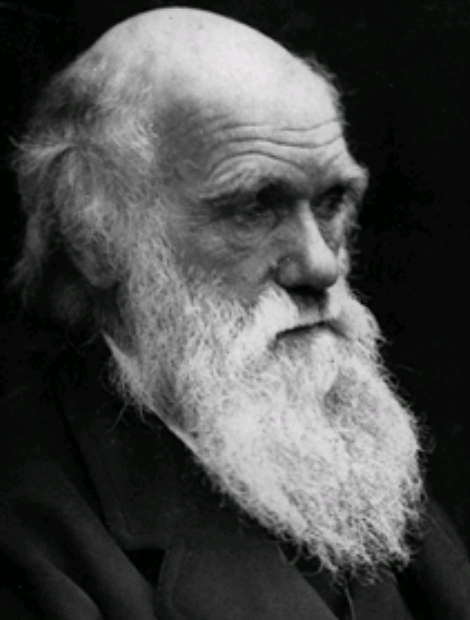
Demonstration – more than words.

Scientific method is a process that gives our words greater weight and meaning due to testing ideas against experiment and by many people through a well defined mechanism.

# What is Evolution?

Biological evolution is the theory that life on Earth has developed from a common ancestor.

This is sometimes described as descent with modification.



# What is Intelligent Design?

This term has many meanings to many different people. It means more than just believing in God.



Is it science or religious creationism? Or both?  
Or neither?

# Discovery Institute

For this talk, I will use the case put forward by the **Discovery Institute** to define Intelligent Design.



Phillip Johnson (often referred to as founder of ID)  
Michael Behe (proponent of irreducible complexity)  
Charles Thaxton (text project chairman for Of Pandas and People )

# Essential Readings

Discovery Institute has effectively lobbied many states and education boards to promote ID.

Here is their list of essential readings.

## ESSENTIAL READINGS

### Essential Books

[Darwin on Trial](#), by Phillip Johnson

[Darwin's Black Box](#), by Michael Behe

[Design Inference](#), by William Dembski

[Design Revolution: Answering the Toughest Questions About Intelligent Design](#), by William Dembski

[Icons of Evolution](#), by Jonathan Wells

[The Mystery of Life's Origin: Reassessing Current Theories](#), by Charles B. Thaxton

[The Privileged Planet](#), by Guillermo Gonzalez and Jay Richards

[Darwinism, Design, and Public Education](#), edited by John Angus Campbell and Stephen Meyer

### Essential Articles

[The Origin of Biological Information and the Higher Taxonomic Categories](#)

By: Stephen C. Meyer

Proceedings of the Biological Society of Washington

[Molecular Machines: Experimental Support for the Design Inference](#)

By: Michael J. Behe

Cosmic Pursuit

[Science & Design](#)

By: William Dembski

First Things

[DNA and Other Designs](#)

By: Stephen C. Meyer

First Things

[Survival of the Fakest \(PDF\)](#)

By: Jonathan Wells

American Spectator

[Are We Alone?](#)

By: Jay W. Richards & Guillermo Gonzalez

The American Spectator

## Exact Definition?

Even within the literature recommended from the Discovery Institute, there are a variety of definitions of Intelligent Design.

Examples:

- The Earth is less than 10,000 years old and all species were created with their essential features as seen today
- The Earth is 4 billion years old, people evolved from other species, but earlier biomolecular structures indicate ID.
- ....

# Brief Legal History in America

## 1925 – Scopes v. State

Criminal prosecution of public school teacher for teaching about evolution. School teacher found guilty and fined.

## 1968 – Epperson v. Arkansas

Supreme court struck down Arkansas's statutory prohibition against teaching evolution.

## 1975 – Daniel v. Waters

Courts struck down equal time for evolution and teaching the biblical view of creation.

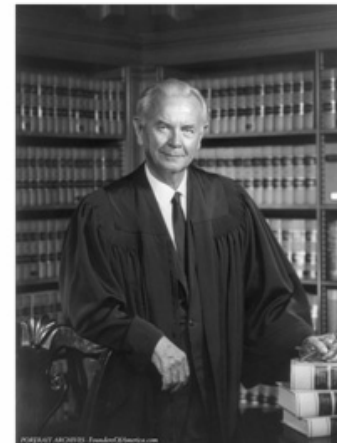
## 1982 – McLean v. Ark. Bd. of Education

Courts concluded that creation science “is simply not science.”

# 1987 – Edwards v. Arkansas

Attempt to “utilize scientific-sounding language to describe religious beliefs and then require that schools teach the resulting “creation science” as an alternative to evolution.”

Struck down by the Supreme Court as violating the Establishment Clause.



WILLIAM J. BRENNAN JR.  
ASSOCIATE JUSTICE  
SUPREME COURT OF THE UNITED STATES  
1956 - 1990



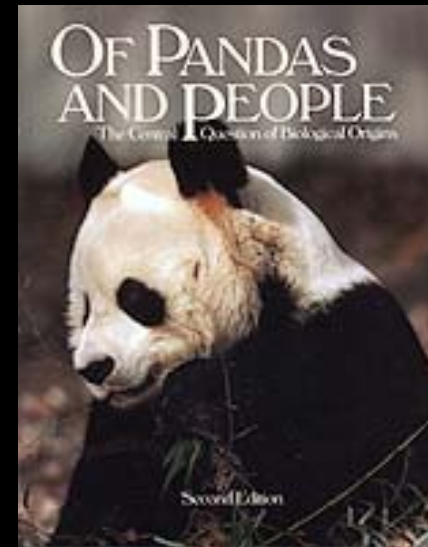
# What is the Establishment Clause?

“Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof.”

Establishment Clause of the First Amendment  
of the United States Constitution

# Evolution/Intelligent Design in the News

In October 2004, the school board in Dover, Pennsylvania voted to require that Intelligent Design be taught in high-school biology classes.



# Dover School Policy

School board required teachers to read to 9<sup>th</sup> graders in biology:

“The Pennsylvania Academic Standards require students to learn about Darwin’s Theory of Evolution and eventually to take a standardized test of which evolution is a part.

Because Darwin’s Theory is a theory, it continues to be tested as new evidence is discovered. The Theory is not a fact. Gaps in the Theory exist for which there is no evidence. A theory is defined as a well-tested explanation that unifies a broad range of observations.

Intelligent Design is an explanation of the origin of life that differs from Darwin’s view. The reference book, Of Pandas and People, is available for students who might be interested in gaining an understanding of what Intelligent Design actually involves.

With respect to any theory, students are encouraged to keep an open mind.”

# Addendum

After administrators read the statement, they added “there will be no other discussion of the issue and your teachers will not answer questions on the issue.”



# Judge at Trial

“Jones is a lifelong Republican appointed to the federal bench in 2002 by President Bush.”

NY Times Dec. 18, 2005.



Dover Judicial Decision

Case 4:04-cv-02688-JEJ Document 342 Filed

12/20/2005

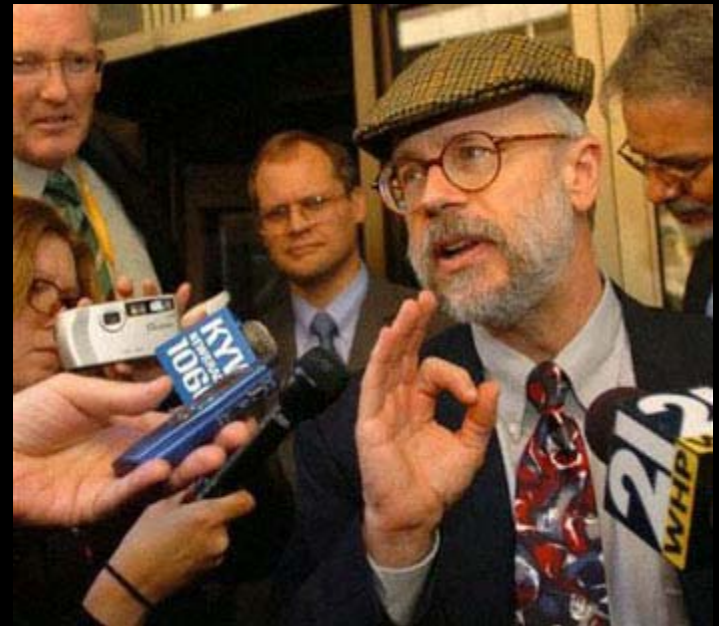
[http://www.pamd.uscourts.gov/kitzmiller/kitzmiller\\_342.pdf](http://www.pamd.uscourts.gov/kitzmiller/kitzmiller_342.pdf)

# Irreducible Complexity

Professor Behe argues that many biological systems are irreducibly complex and thus require an intelligent designer.

“By irreducible complexity I mean a single system which is composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning.”

Professor Behe, Darwin's Black Box



# Logically Flawed Definition

Will a system fail to work if we take away one part?



Is there a step wise process resulting in the final system?

# Irreducible Complexity

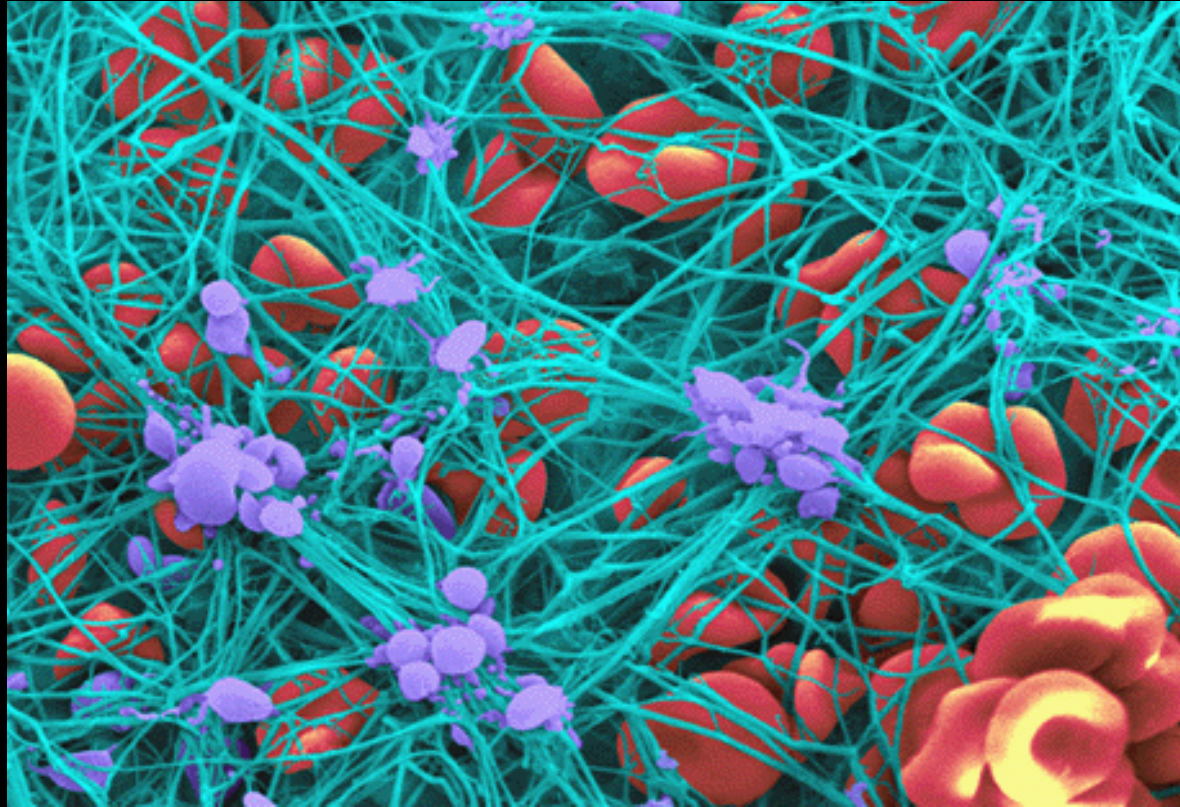
Behe acknowledged that “the task facing evolution, however, would not be to remove parts from sophisticated pre-existing systems; it would be to bring together components to make a new system in the first place.”

Behe says he hoped to “repair this defect in the future.”

No update in four years.



# Blood Clotting Example

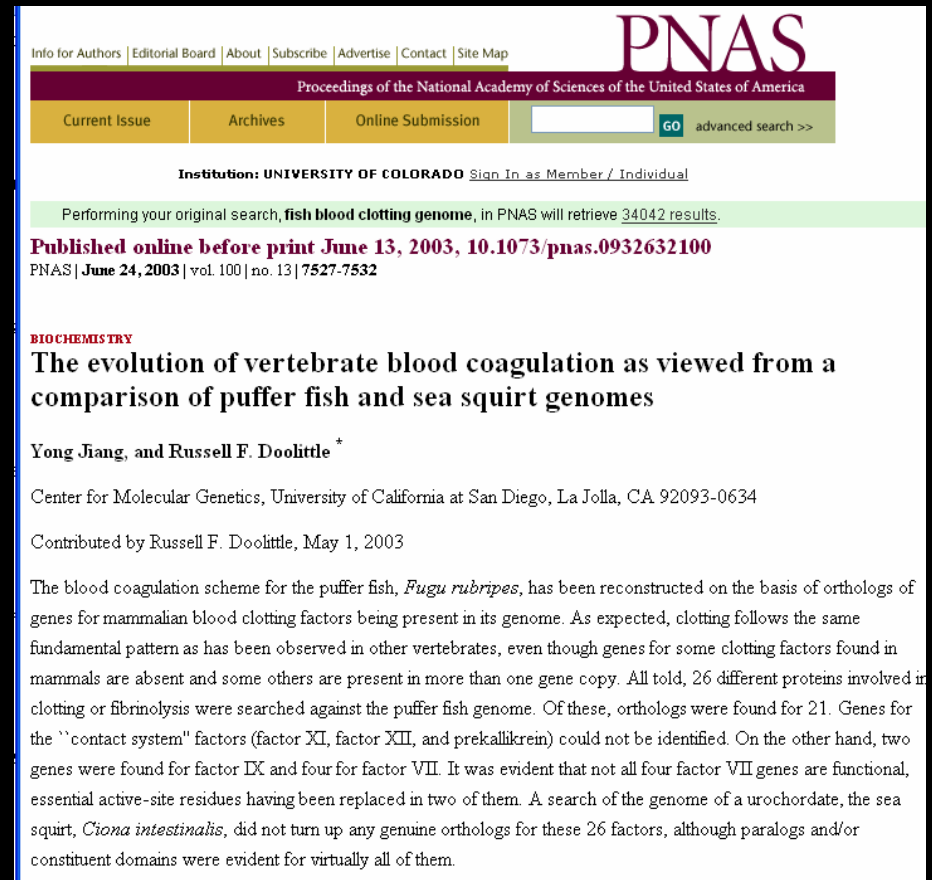


Irreducible complexity examples are falsifiable by showing that there are intermediate structures with selectable functions.

# Intermediate Examples

Scientists predicted that more primitive animals such as fish would be missing certain blood clotting proteins. The recent sequencing of the fish genome has shown just this.

One of thousands of scientific papers published in peer reviewed journals on evolution.

A screenshot of a PNAS (Proceedings of the National Academy of Sciences) article page. The page features a navigation bar with links for 'Info for Authors', 'Editorial Board', 'About', 'Subscribe', 'Advertise', 'Contact', and 'Site Map'. Below this is a search bar with a 'GO' button and a link to 'advanced search >>'. The article title is 'The evolution of vertebrate blood coagulation as viewed from a comparison of puffer fish and sea squirt genomes' by Yong Jiang and Russell F. Doolittle. The page also includes the journal name 'PNAS', the publication date 'June 24, 2003', and the volume and issue information 'vol. 100 | no. 13 | 7527-7532'. The abstract text is visible at the bottom of the screenshot.

Info for Authors | Editorial Board | About | Subscribe | Advertise | Contact | Site Map

PNAS  
Proceedings of the National Academy of Sciences of the United States of America

Current Issue | Archives | Online Submission |  GO advanced search >>

Institution: UNIVERSITY OF COLORADO Sign In as Member / Individual

Performing your original search, **fish blood clotting genome**, in PNAS will retrieve 34042 results.

**Published online before print June 13, 2003, 10.1073/pnas.0932632100**  
PNAS | June 24, 2003 | vol. 100 | no. 13 | 7527-7532

**BIOCHEMISTRY**  
**The evolution of vertebrate blood coagulation as viewed from a comparison of puffer fish and sea squirt genomes**

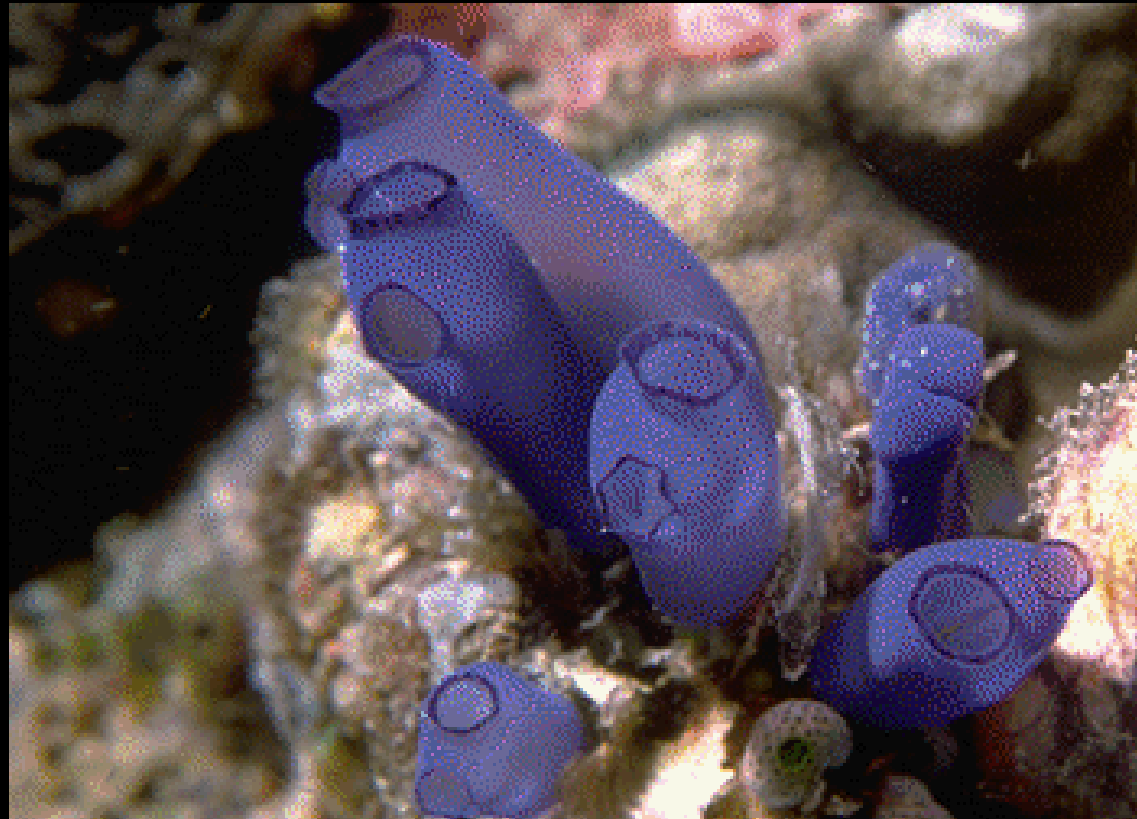
Yong Jiang, and Russell F. Doolittle \*

Center for Molecular Genetics, University of California at San Diego, La Jolla, CA 92093-0634

Contributed by Russell F. Doolittle, May 1, 2003

The blood coagulation scheme for the puffer fish, *Fugu rubripes*, has been reconstructed on the basis of orthologs of genes for mammalian blood clotting factors being present in its genome. As expected, clotting follows the same fundamental pattern as has been observed in other vertebrates, even though genes for some clotting factors found in mammals are absent and some others are present in more than one gene copy. All told, 26 different proteins involved in clotting or fibrinolysis were searched against the puffer fish genome. Of these, orthologs were found for 21. Genes for the "contact system" factors (factor XI, factor XII, and prekallikrein) could not be identified. On the other hand, two genes were found for factor IX and four for factor VII. It was evident that not all four factor VII genes are functional, essential active-site residues having been replaced in two of them. A search of the genome of a urochordate, the sea squirt, *Ciona intestinalis*, did not turn up any genuine orthologs for these 26 factors, although paralogs and/or constituent domains were evident for virtually all of them.

# Sea Squirt



# Intelligent Design Publications

“There are no peer reviewed articles by anyone advocating for intelligent design by pertinent experiments or calculations which provide detailed rigorous accounts of how intelligent design of any biological system occurred.”

Professor Behe at trial

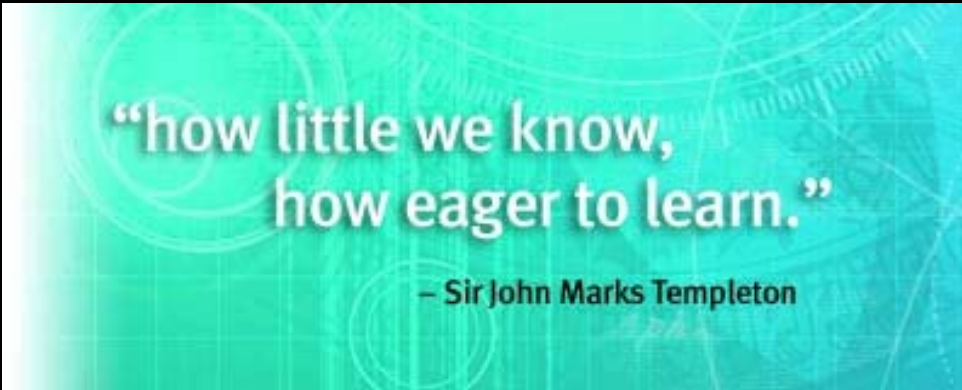
ID also features no scientific research or testing, this despite a significant budget at organizations like the Discovery Institute.

# Templeton Foundation

The Templeton Foundation, a major supporter of projects seeking to reconcile science and religion, says that after providing a few grants for conferences and courses to debate intelligent design, they asked for proponents to submit proposals for actual research.

“They never came in,” said Charles L. Harper Jr., senior vice president at the Templeton Foundation.

“From the point of view of rigor and intellectual seriousness, the intelligent design people don’t come out very well in our world of scientific review,” he said.



“how little we know,  
how eager to learn.”

– Sir John Marks Templeton

Excerpt from NY Times Article.

# National Academy of Sciences



The screenshot shows the website for the National Academy of Sciences. At the top, it says "NATIONAL ACADEMY OF SCIENCES" and "THE NATIONAL ACADEMIES". There is a search bar on the right. Below the header are four images: a mountain range, a green abstract pattern, a circuit board, and a red and green abstract pattern. The main content area is titled "About the NAS" and includes a "Member Login" section with fields for "Username:" and "Password:", a "Remember Me" checkbox, and a "LOGIN" button. To the right of the login section is a "Related Links" section with links for "News", "Organizational Chart", "Constitution", "Bylaws", and "Federal Advisory Commission Act". Below the login section is a navigation menu with links for "Home", "About the NAS", "President's Page", "Leadership", "NAS Building", "Members", "Nomination and Election", "Awards", and "Publications". The main text describes the NAS as an honorific society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. It also mentions that the NAS was signed into being by President Abraham Lincoln on March 3, 1863, at the height of the Civil War. The text continues: "As mandated in its Act of Incorporation, the NAS has, since 1863, served to 'investigate, examine, experiment, and report upon any subject of science or art' whenever called upon to do so by any department of the government. Scientific issues would become even more contentious and complex in the years following the war. To keep pace with the growing roles that science and technology would play in public life, the institution that was founded in 1863 eventually expanded to include the National Research Council in 1916, the National Academy of Engineering in 1964, and the Institute of Medicine in 1970. Collectively, the four organizations are known as the National Academies."

NAS signed into being by Abraham Lincoln in 1863. Honorific society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare.

# Document on Creationism



<http://nationalacademies.org/evolution/>

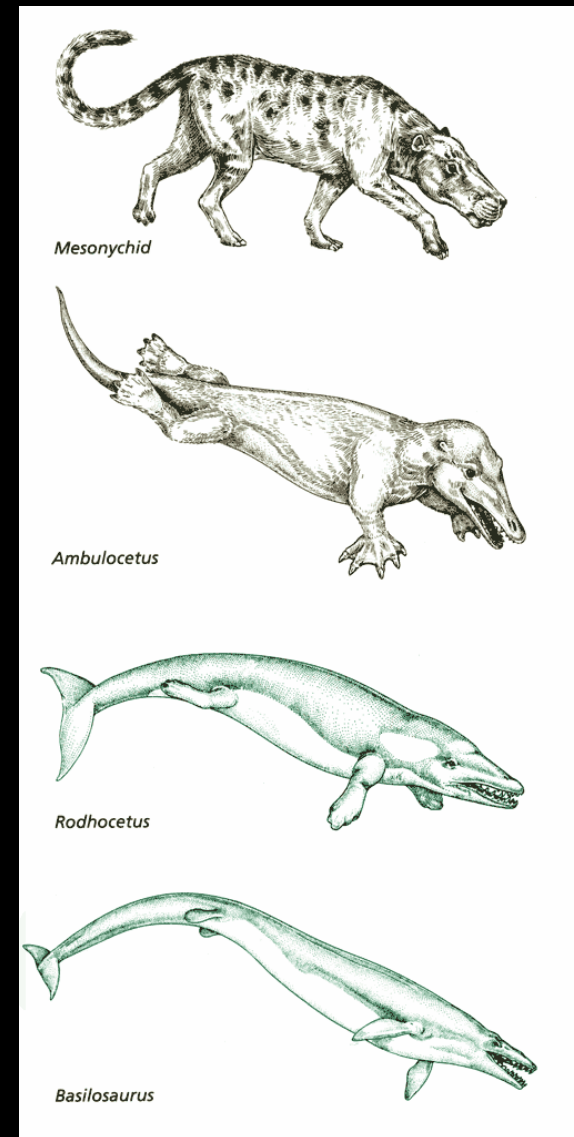
# Gaps in the Fossil Record?

ID often argues there are no fossil records of intermediary species.

NAS disagrees and cites many examples.



How do we decide who to believe?



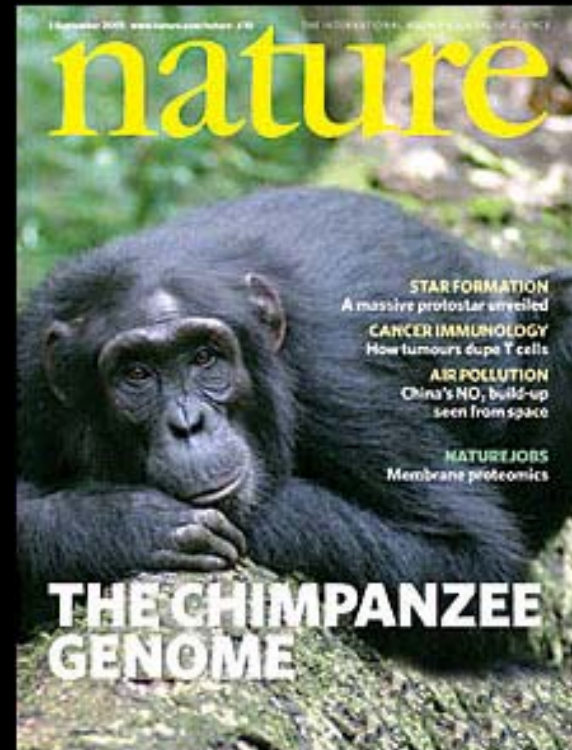


# Detailed Evolution Predictions?

ID often argues there are no detailed predictions from evolutionary theory.

**Scientists disagree citing many examples.**

Theory predicts the number of deleterious mutations in chimpanzee DNA from the number of mutations in a different species' DNA and the two population sizes. Experimental results agree with theory.



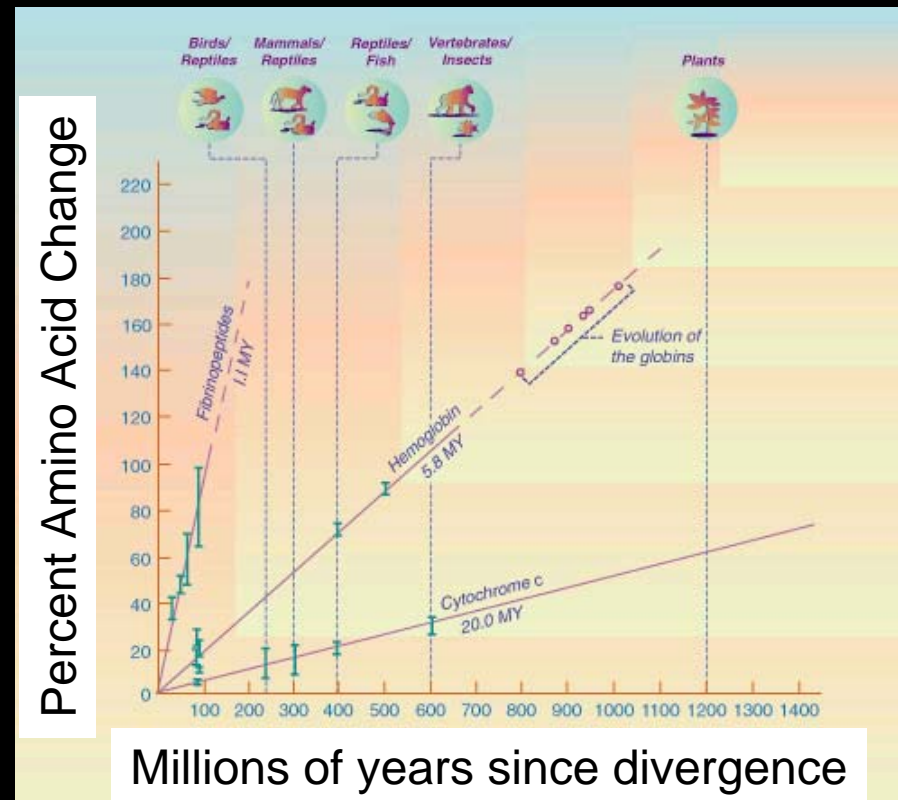
# Detailed Evolution Predictions?

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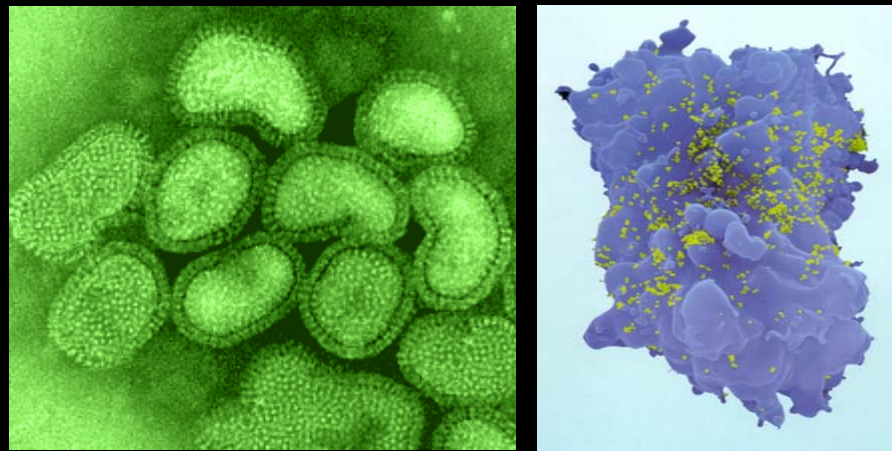
Differences in corresponding proteins detail when different species emerged from common ancestors. The tree sequence agrees completely with that derived from paleontology.

**How do we decide who to believe?**



# Evolution Everyday

We observe evolution of microscopic organisms on short time scales. Evolutionary theory is a key part of understanding influenza, AIDS HIV, and antibiotic resistant bacteria as examples.



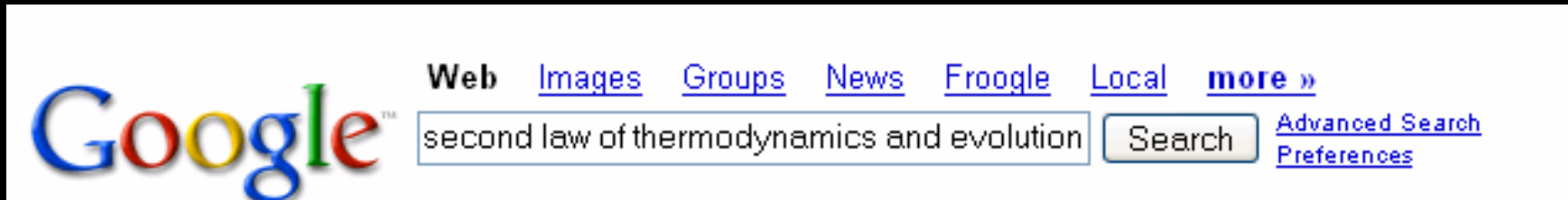
ID proponents say this is only changes within a kind (adaptation or microevolution), although “kind” is not specifically defined.

## Scientific Method

Note that there are over 100,000 scientific publications in peer reviewed journals testing aspects of evolution.

There are only 3 publications in peer reviewed science journals containing arguments for ID.

# Be Careful What You Google!



About half the web hits indicate that evolution must be wrong because it violates the second law of thermodynamics.

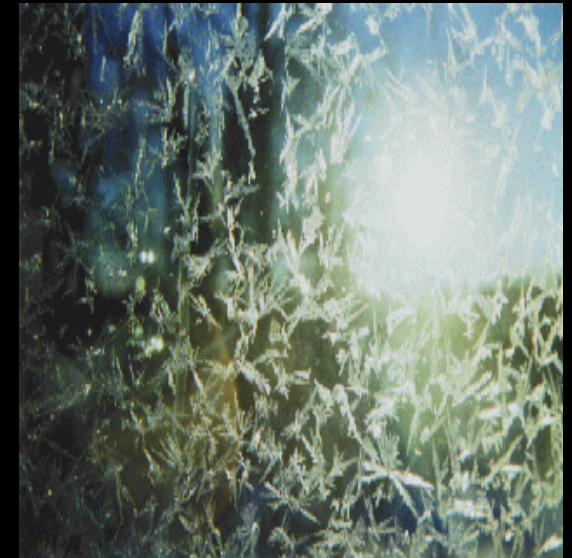
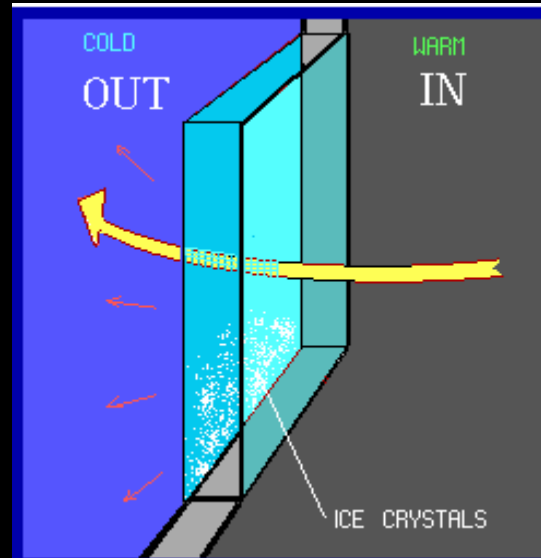
“In any process in which a thermally isolated system goes from one state to another, the entropy tends to increase.”

Reif p. 122-123.



# No Violation of the Law

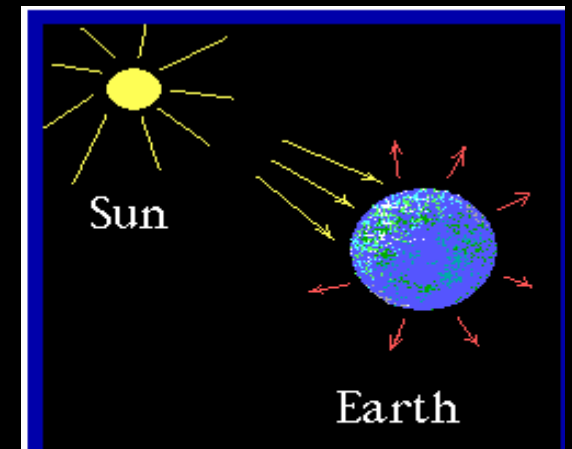
Ice crystals on your window do not violate the law of thermodynamics.



“In any process in which a thermally isolated system goes from one state to another, the entropy tends to increase.”

Reif p.

122-123.



Similar situation with the Earth.

# Blog versus Peer Reviewed Journal

There is an enormous difference between what someone decides to write on a blog and what is written in a peer reviewed scientific journal.

We often forget this key point.

For example Wikipedia.



# Theory or Opinion

The Dover statement says evolution is “just a theory’ which plays on the colloquial or popular understanding of the term theory and suggests that evolution is only a highly questionable ‘opinion’ or ‘hunch.’”

Judge Jones

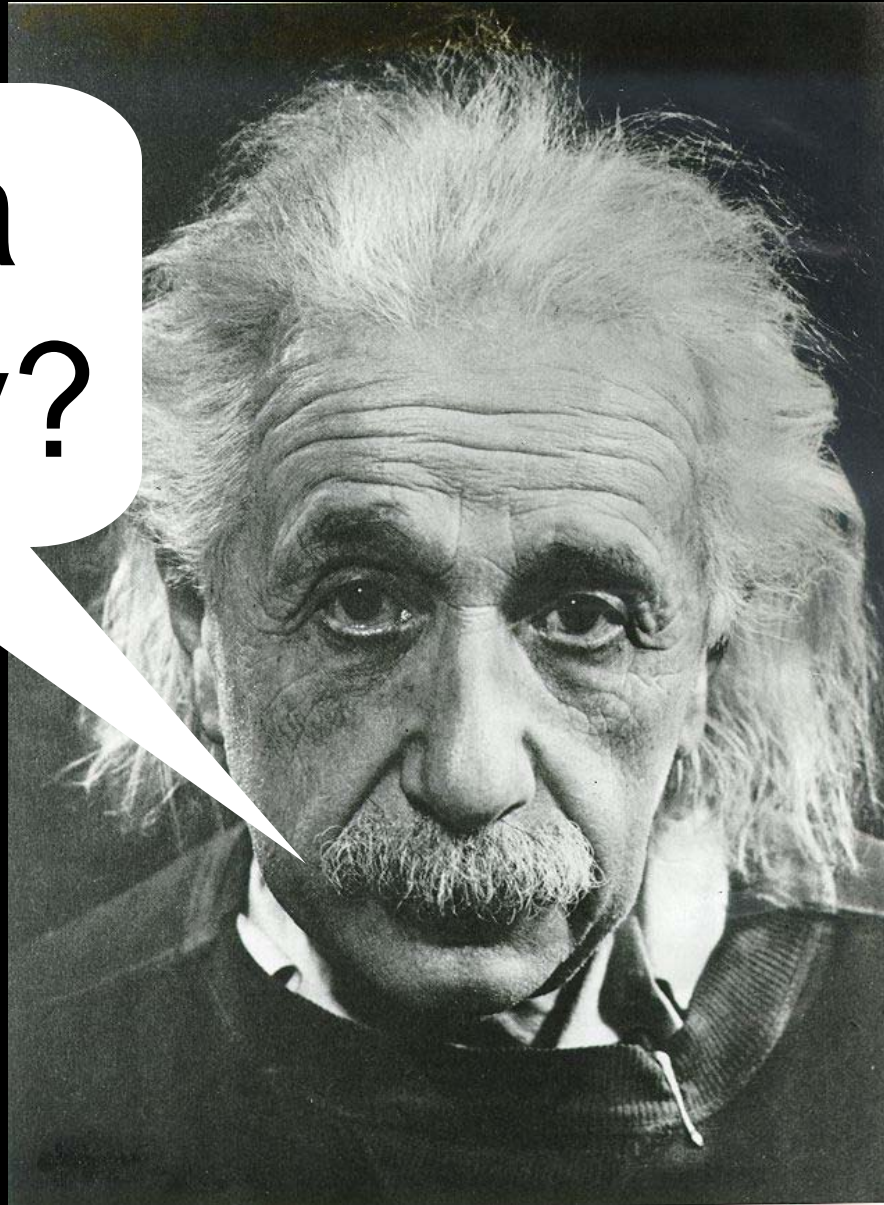
“Scientific theories are explanations of natural phenomena built up logically from testable observations and hypotheses.”

National Academy of Sciences



# Einstein's Theory of Special Relativity

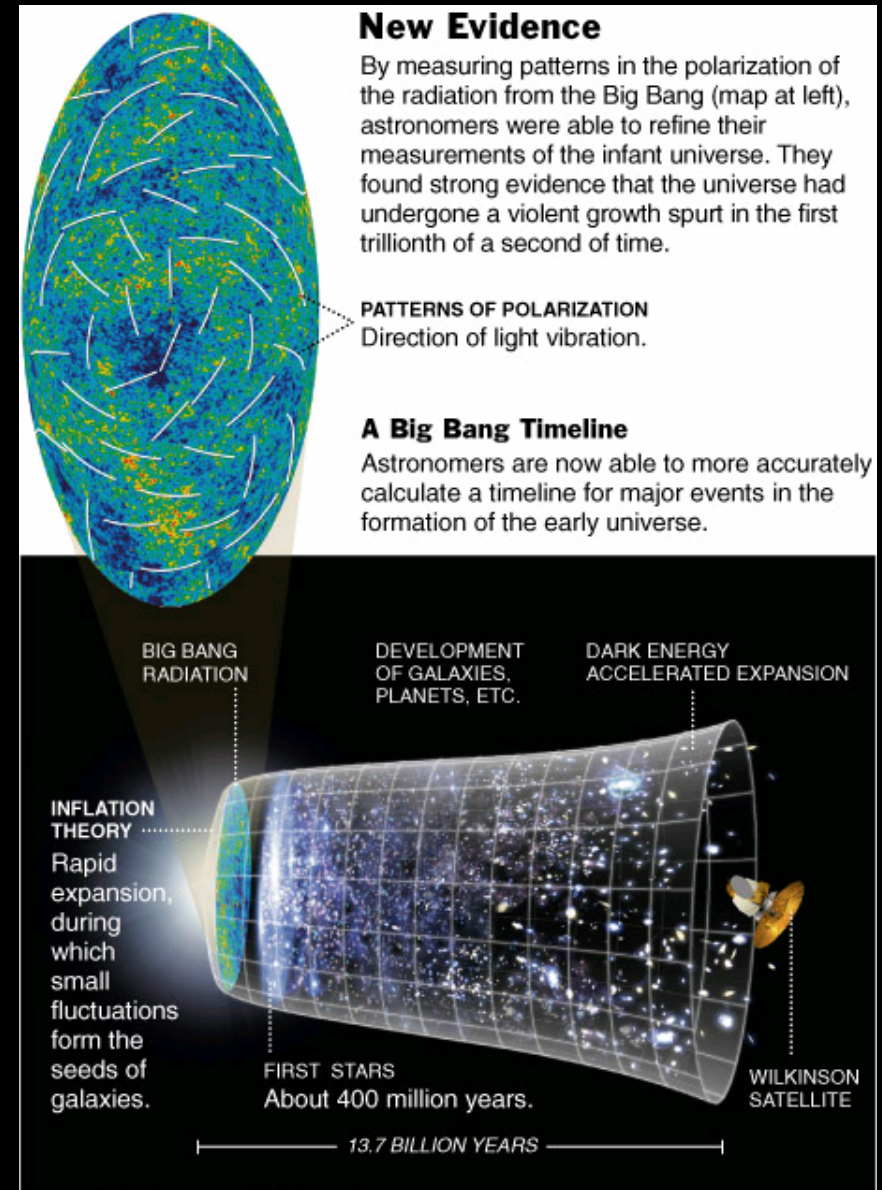
Just a  
Theory?



# What it means to “be there”?

“No one was present when life first appeared on earth, therefore, any statement about life’s origins should be considered as theory, not fact.”

In fact, scientists measure photons traveling to us from 14 billion years ago. This is “seeing” as much as we “see” with our eyes.



Sources: NASA; Johns Hopkins University

The New York Times

# Intelligent Design or Intelligent Design Creationism?

*King James Bible – Genesis*

19: And the evening and the morning were the fourth day.

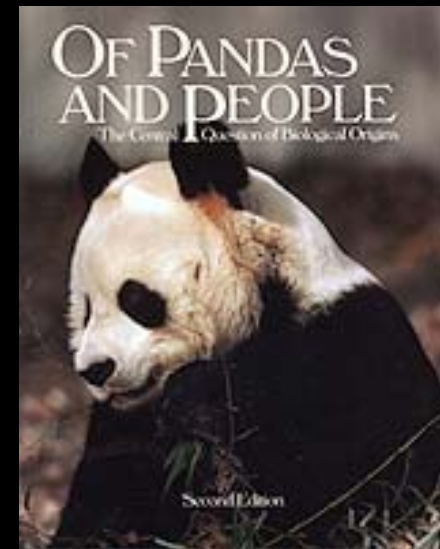
20: And God said, Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven.

21: And God created great whales, and every living creature that moveth, which the waters brought forth abundantly, after their kind, and every winged fowl after his kind: and God saw that it was good.

# Creationism

Creationism was defined as “various forms of life that began abruptly through an intelligent agency with their distinctive features intact – fish with fins and scales, birds with feathers, beaks and wings, etc.”

This was the definition used in a pre-1987 version of the book.



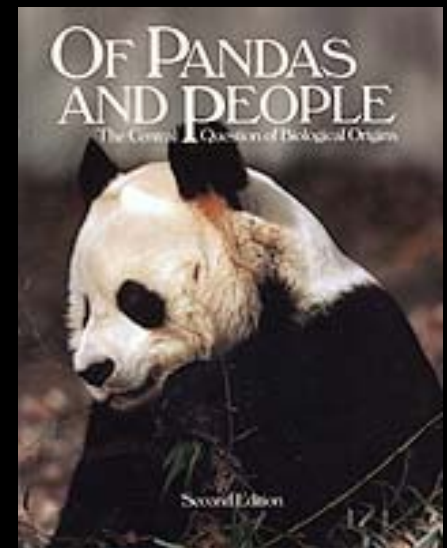
# Intelligent Design

“Intelligent design means that various forms of life began abruptly through an intelligent agency with their distinctive features already intact, fish with fins and scales, birds with feathers, beaks and wings, etc.”

## Comparing pre and post 1987 versions

Cognates of the word creation, which appeared approximately 150 times were deliberately and systematically replaced with the phrase intelligent design.

What happened in 1987?



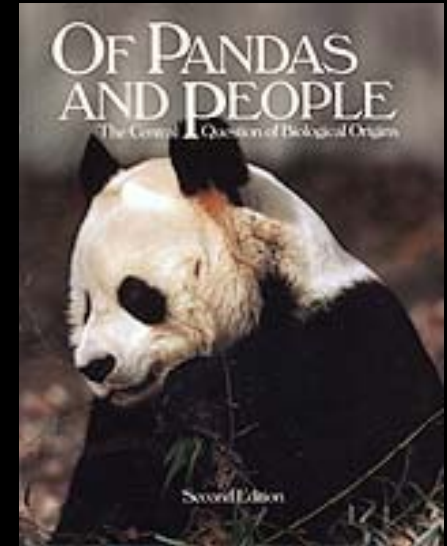
## Supreme Court Decision Edwards v. Arkansas

## ID Response

At trial, Professor Behe responded that the excerpt from the book was “somewhat problematic”.

Behe was asked why he had not objected since he was a reviewer of the book. He said he had reviewed only the section he himself had written.

He acknowledged it was not typical for critical reviewers to review only their own work.



## ID and Religion

Jonathan Wells, a fellow of the Discovery Institute wrote that as a follower of the Reverend Sun Myung Moon, he was given a mission to undermine Darwinism. Only then did he decide a degree in biology would boost his credentials.



At a recent debate, Stephen Meyer, also at the Discovery Institute, indicated that one of the reasons why humans and chimpanzees cannot share a common ancestor is that humans have immortal souls and chimps do not.



## Dover Decision

“The overwhelming evidence at trial established that ID is a religious view, a mere re-labeling of creationism, and not a scientific theory.”

“ID backers have sought to avoid the scientific scrutiny which we have now determined that it cannot withstand by advocating that the controversy, but not ID itself, should be taught in science class. This tactic is at best disingenuous and at worst a canard.”





# What is a “Canard”?

**ca·nard**

An unfounded or false, deliberately misleading story.

A short winglike control surface projecting from the fuselage of an aircraft, such as a space shuttle, mounted forward of the main wing and serving as a horizontal stabilizer.

An aircraft whose horizontal stabilizing surfaces are forward of the main wing.

# Dover Decision

“We hold that the ID Policy is unconstitutional pursuant to the Establishment Clause of the First Amendment of the United States Constitution.”



# Evolution Conflict

Many religious people are made to feel the need to defend ID without even knowing much about it.

This is because the rhetoric paints a dichotomy between faith and science.

Either accept the literal interpretation of Genesis or else believe in the godless system of evolution.

This is a false dichotomy.

# At Churches Nationwide, Good Words for Evolution

More than 10,000 ministers signed a letter stating that the theory of evolution is “a foundational scientific truth.” To reject it “is to deliberately embrace scientific ignorance and transmit such ignorance to our children.”

## At Churches Nationwide, Good Words For Evolution

February 13, 2006, Monday

By NEELA BANERJEE AND ANNE BERRYMAN; GRETCHEN RUETHLING CONTRIBUTED REPORTING FOR THIS ARTICLE. (NYT); National Desk

Late Edition - Final, Section A, Page 16, Column 6, 754 words

**'Please Note:** Archive articles do not include photos, charts or graphics. [More information.](#)

**DISPLAYING FIRST 50 OF 754 WORDS** -On the 197th birthday of Charles Darwin, ministers at several hundred churches around the country preached yesterday against recent efforts to undermine the theory of evolution, asserting that the opposition many Christians say exists between science and faith is false. At St. Dunstan's Episcopal Church, a small contemporary structure...

# Vatican Speaks Out

The official Vatican newspaper published an article labeling as 'correct' the recent [Dover trial] decision ... that intelligent design should not be taught as a scientific alternative to evolution.

[The New York Times](#)

January 19, 2006

## **In 'Design' vs. Darwinism, Darwin Wins Point in Rome**

By [IAN FISHER](#) and [CORNELIA DEAN](#)

ROME, Jan. 18 - The official Vatican newspaper published an article this week labeling as "correct" the recent decision by a judge in Pennsylvania that intelligent design should not be taught as a scientific alternative to evolution.

"If the model proposed by Darwin is not considered sufficient, one should search for another," Fiorenzo Facchini, a professor of evolutionary biology at the University of Bologna, wrote in the Jan. 16-17 edition of the paper, L'Osservatore Romano.

"But it is not correct from a methodological point of view to stray from the field of science while pretending to do science," he wrote, calling intelligent design unscientific. "It only creates confusion between the scientific plane and those that are philosophical or religious."

# Saint Augustine

“Usually, even a non-Christian knows something about the earth, the heavens, and the other elements of the world... And this knowledge he holds to as being certain from reason and experience.

Now, it is a disgraceful and dangerous thing for an infidel to hear a Christian, while presumably giving the meaning of Holy Scripture, talking nonsense on these topics....

If they find a Christian mistaken in a field which they themselves know well, and hear him maintaining his foolish opinions about Scriptures, how then are they going to believe those Scriptures in matters concerning the resurrection of the dead, the hope of eternal life, and the kingdom of heaven?”



# Exciting Scientific Questions

New scientific ideas and discoveries are missed when all the focus is on non scientific ID debates.

Source: [Carnegie Museum Of Natural History](#)

Posted: February 24, 2006

## Scientists Discover First Swimming Mammal From The Jurassic

A team of international researchers have discovered a new species of primitive mammal capable of [swimming](#) in the Middle Jurassic lake beds of China.

In a cover article published in [Science](#), the team of researchers from Carnegie Museum of Natural History, Nanjing University, and Chinese Academy of [Geological Sciences](#) describe a fossilized skeleton of *Castorocauda lutrasimilis* ([Castoro] - Latin for beaver, [cauda] - Latin for tail, [lutra] - Latin river otter) and [similis] - Latin for similarity). *Castorocauda* had a beaver-like tail, strong arms for digging, and sharp teeth specialized for aquatic feeding, similar to the modern river otter.

*Castorocauda* is a new taxon of docodonts, an extinct mammal group that existed from the Middle Jurassic to Late Cretaceous. But this Mesozoic group has no modern descendants, and is not directly related to modern placental mammals.

Uncovered from the Middle Jurassic Jiulongshan Formation of the Inner Mongolia Region, dated approximately 164 million years ago, *Castorocauda* is the earliest-known mammal that had specialized skeletal and soft-tissue features for swimming and teeth for eating fish. This significant fossil offers the first evidence that some Mesozoic mammals occupied the semi-aquatic niche and that Mesozoic mammals as a whole had a much great ecological diversification than previously thought.

*Castorocauda* is preserved with a pelt (guard hairs and under furs), making it the most primitive-known mammal to be preserved with hairs. Carbonized in the fossil, the short and dense under-furs were to keep water from the skin; the longer guard hairs are preserved as impressions on the fossil slab. Fossilized furs of this animal provide fresh evidence on phylogenetic evolution of mammalian fur  $\approx 1/2$ " this kind of specialized pelt developed well before the rise of modern mammals. All previously discovered fossils with fur belong to the more derived taxa within the Mammalia or mammalian crown group.

"Its lifestyle was probably very similar to the modern day platypus," said Dr. Zhe-Xi Luo, curator of Vertebrate Paleontology at Carnegie Museum of Natural History. "It probably lived along river or lake banks. It doggy-paddled around, ate aquatic animals and insects, and burrowed tunnels for its nest."

Dr. Luo pointed out that, perfectly shaped for aquatic life, *Castorocauda* had a broad and scaly tail that propelled it through water just like the modern beaver. Its tail vertebrae are also similar to those of beavers and otters. Because *Castorocauda* is not related to modern placentals, its adaptation for swimming is a convergent evolution to the modern beaver and modern river otter, both of which are placentals.



Castorocauda lutrasimilis being fed (during the flight of dinosaurs, 160 m.p.a.)  
Reproduction by: Mark A. Klingler/CMNH

*Castorocauda lutrasimilis* life reconstruction. This art has been selected for the cover of the February 24, 2006 issue of *Science Magazine*. The artwork of the reconstructed animal is 50% of actual fossil size. (Illustration: Mark A. Klingler/CMNH)

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NEWS - News Releases - 2006

**NASA's Cassini Discovers Potential Liquid Water on Enceladus**  
March 9, 2006  
(Source: NASA/JPL)

NASA's Cassini spacecraft may have found evidence of liquid water reservoirs that erupt in Yellowstone-like geysers on Saturn's moon Enceladus. The rare occurrence of liquid water so near the surface raises many new questions about the mysterious moon.

"We realize that this is a radical conclusion -- that we may have evidence for liquid water within a body so small and so cold," said Dr. Carolyn Porco, Cassini imaging team leader at Space Science Institute, Boulder, Colo. "However, if we are right, we have significantly broadened the diversity of solar system environments where we might possibly have conditions suitable for living organisms."

*Enceladus the Storyteller*

High-resolution Cassini images show icy jets and towering plumes ejecting large quantities of particles at high speed. Scientists examined several models to explain the process. They ruled out the idea that the particles are produced by or blown off the moon's surface by vapor created when warm water ice converts to a gas. Instead, scientists have found evidence for a much more exciting possibility -- the jets might be erupting from near-surface pockets of liquid water above 0 degrees Celsius (32 degrees Fahrenheit), like cold versions of the Old Faithful geyser in Yellowstone.

*Spray Above Enceladus III*

Mission scientists report these and other Enceladus findings in this week's issue of *Science*.

"We previously knew of at most three places where active volcanism exists: Jupiter's moon Io, Earth, and possibly Neptune's moon Triton. Cassini changed all that, making Enceladus the latest member of this very exclusive club, and one of the most exciting

# Summary

Is there an Intelligent Designer?

On this I question I **do not** know the answer.

Have the specific proponents of Intelligent Design shown scientific evidence or scientific proof of an intelligent designer?

**Absolutely not.**

Intelligent Design as detailed in this talk is not only not science, but an attack on science and an attack on the pursuit of scientific knowledge.



# Interesting Reading

In preparing for this talk, I read a large number of books, articles in the press, scientific peer reviewed articles and physics and biology texts.

Below I list a few of these that I found particularly useful and accessible to a broad audience. Note that “useful” does not mean I agree with everything or anything written in the text.

<http://nationalacademies.org/evolution/>

(Many useful free downloadable documents and references included)

Origin of Species, by C. Darwin

(It is very useful to see the topics of scientific discussion at the time)

Evolution vs. Creationism, by E.C. Scott and N. Eldredge

(Covers both sides of the debate and on many different fronts)

Intelligent Design Creationism and its Critics, by R.T. Pennock

<http://www.discovery.org/csc/essentialReadings.php>

(Link to Intelligent Design proponents suggested readings).

Darwinism, Design, and Public Education, edited by J.A. Campbell and S. Meyer

(Includes essays by most of the leading proponents of ID)

Darwin's Black Box, by M. Behe

Of Pandas and People, by P. Davis and D.H. Kenyon

(Textbook on ID proposed for use by the Dover School Board)

[http://www.pamd.uscourts.gov/kitzmiller/kitzmiller\\_342.pdf](http://www.pamd.uscourts.gov/kitzmiller/kitzmiller_342.pdf)

(Dover Judicial Decision – extremely useful and accessible)

[http://www.marquette.edu/education/pages/resources/news/documents/cornell\\_science\\_and\\_religion.mov](http://www.marquette.edu/education/pages/resources/news/documents/cornell_science_and_religion.mov)

(Nobel Prize winner Eric Cornell's comments on ID and Science)