# APPENDIX IV

# TAB G

# HEARING EXHIBIT 1

The New York Times



January 16, 2005

# An Alternative to Evolution Splits a Pennsylvania Town

By NEELA BANERJEE

DOVER, Pa. - Ever since the school board here voted to make this town in Pennsylvania Dutch country the first in the nation to discuss an alternative to evolution in high school biology classes, students have been as sharply divided as the rest of this normally close-knit community.

"I think we should have a choice: They should teach you both," said Meagan Hass, 14, while eating pizza after school at KT's restaurant with her friend Abbi Hake. "Evolution to me is like we come from monkeys."

At a nearby table, Jessika Moury, 14, said her mother supported the school board but she did not. "There are so many aspects of religion, so you have to teach what each of them says," Jessika said. "There's Bible Club in school for this, and that's where it should be taught."

With the new instruction on the origin of life set to begin, Dover has become a critical testing ground in a widening national debate about teaching evolution.

In early January, Dover High School's science teachers refused to read to ninth-graders a short statement written by the school board that criticizes evolution and cites a controversial approach called Intelligent Design as an alternative.

The teachers contend that such a change to the curriculum amounts to teaching Intelligent Design and that the approach is inherently religious, not scientific.

"Kids are smart enough to understand what Intelligent Design means," said Robert Eshbach, a science teacher who refused to read the statement. "The first question they will ask is, 'Well, who's the designer? Do you mean God?' "

Jen Miller, who teaches ninth-grade biology, said she saw no conflict between evolution and religion.

"I've never had a problem in my classroom in the way I approach evolution," Ms. Miller said. "Just because I teach evolution doesn't mean that God's not there or that I'm going against the religious beliefs of my students." With the teachers balking, an administrator will read the statement instead, as early as next week. Students may opt out of the reading with their parents' permission.

Several states have issued disclaimers to students questioning the validity of evolution, claiming it is riddled with gaps. But the Dover school board went further on Oct. 18 when it voted to specifically identify an alternative to evolution and encourage students to learn more about it.

Proponents of Intelligent Design, which asserts that life is so intricately complex that an architect must be behind it, say it is a valid scientific theory. Critics argue that Intelligent Design has no basis in

science and is another iteration of creationism. And while people are still polite to one another in Dover, those same arguments have split school board members, clergy, residents and students alike.

"It's been very polarizing," said the Rev. David F. Sproull, pastor of the Dover Assembly of God Church and a supporter of the board's decision. "I see very few people sitting in the middle of it. It evokes very strong feelings."

Some have already moved to stop the school board. In mid-December, 11 local parents represented by the American Civil Liberties Union and Americans United for Separation of Church and State sued the school board, contending that discussing Intelligent Design is a way to foist religion on their children.

"The dispute here isn't between Christians versus non-Christians or non-believers," said Jeff Brown, a former school board member who voted against criticizing evolution. "It's between Christians who are comfortable with the Constitution and those who want special treatment."

Conservative Christians across the country say the re-election of President Bush has given them the momentum to achieve important local goals, including challenging the teaching of evolution, and they are watching developments in Dover closely.

In a November 2004 CBS News Poll, nearly two-thirds of Americans said they favored teaching creationism alongside evolution in schools.

In Grantsburg, Wis., the school board recently voted to teach a critical approach to evolution, without identifying alternatives. In South Carolina, legislation will be introduced to examine the state's curriculum on teaching the origin of species. In Kansas, conservatives who favor challenging the teaching of evolution recently won a majority on the state school board, and they are generally expected to change the state science curriculum as early as the spring.

[A federal judge in Georgia ruled on Thursday that schools in Cobb County must remove from science textbooks stickers that criticize evolution, dealing a blow to local creationists.]

Located 25 miles southwest of Harrisburg, Dover, population 25,000, is a cluster of modest churches, clapboard homes and weathered family restaurants hemmed by rolling farmland. It is in York County, which supported President Bush by a nearly 2-to-1 margin in the November election. The area was largely settled by the small Protestant denominations that grew among the Pennsylvania Dutch, and people learned to be tolerant of those with differing beliefs because of the patchwork of faiths that made up their town, Mr. Brown said.

But a growing number of conservative Christians in Dover, like many elsewhere, bridle at what they see as the marginalization of their faith in a country they believe was founded on biblical values. "I think we're coming to place where we're certainly not browbeating people with religion, but that it has just become a normal part of life now," Mr. Sproull, the pastor, said of introducing Intelligent Design to the local high school. "Everyone in the country seems to have freedom of speech but those who talk about religion and God."

To many in Dover, teaching students that the Earth is millions of years old or that man evolved in ways that contradict biblical accounts is akin to promulgating atheism.

"If they can teach there is no God, then they can teach there is a God," said Jean Eisenhart, 72, as she left the Dover Diner after breakfast on a recent brisk morning.

The six people on the nine-member board who voted for the challenge to evolution have declined to talk to the news media because of the pending lawsuit. But the high school's science teachers said they were first approached by a board member about evolution in fall 2003.

By last summer, some members tried to stop the purchase of a biology textbook recommended by teachers because it mentioned Charles Darwin.

The York Dispatch quoted one board member, William Buckingham, as saying in that debate: "Nearly 2,000 years ago, someone died on the cross for us. Shouldn't we have the courage to stand up for him?" Richard Thompson, president of the Thomas More Law Center, a Christian legal defense group representing the six board members, said Mr. Buckingham made that statement in another context, a dispute about the Pledge of Allegiance in 2003.

The textbooks were ultimately ordered, but the board voted to have teachers read the statement criticizing evolution. Mr. Brown and his wife, Carol, longtime board members, resigned in protest. Many people have supported them; others stopped talking to them.

"I got no joy out of it," Mrs. Brown said. "But people have to be aware: This is dividing the country. Who pays attention to school board meetings anyway?"

The Rev. Warren Eshbach, an adjunct professor at Lutheran Theological Seminary in nearby Gettysburg and the father of Robert Eshbach, the science teacher, warned at board meetings about how divisive the issue might prove. Like many fellow Dover residents, he said the biblical account of the origins of humanity should be taught in a comparative religion class, not a biology class.

"Science is figuring out what God has already done," Mr. Eshbach said. "But I don't think Genesis 1 to 11 was ever meant to be a science textbook for the 21st century."

Noel Wenrich, an evangelical Christian board member who voted with the Browns against the measure, said he wanted approaches other than evolution explained in school. But given a 1987 Supreme Court decision against teaching creationism, he worried that the mention of Intelligent Design would embroil the district in losing lawsuits and drain it of badly needed funds.

"I think that 80 percent of the community might support the measure, but not if taxes go up," Mr. Wenrich said. "Then it's 30 percent."

Ninth graders at Dover High have been following the ruckus, and some say they wish that it would stop, and that Dover might be known for something else, something more run-of-the-mill, like its academics.

Amy Mummerd, a ninth grader, put some of her classmates' frustrations directly. "I think it should be kept out of school," she said of Intelligent Design. "Because it goes against the separation of school and church, or whatever."

n. 95 See p. 3.

# The State of Texas

## SECRETARY OF STATE

The undersigned, as Secretary of State of the State of Texas, HEREBY CERTIFIES that the attached is a true and correct copy of the following described instruments on file in this office:

THE FOUNDATION FOR THOUGHT AND ETHICS

| | |
|---|---|
| ARTICLES OF INCORPORATION | DECEMBER 5, 1980 |
| ARTICLE 9.01 REPORT | DECEMBER 30, 1993 |

*IN TESTIMONY WHEREOF, I have hereunto signed my name officially and caused to be impressed hereon the Seal of State at my office in the City of Austin, on February 15, 1995.*

THE STATE OF TEXAS

DEM

*Antonio O. Garza, Jr.*
*Secretary of State*

# HEARING EXHIBIT 2

Form **990**

Department of the Treasury
Internal Revenue Service

# Return of Organization Exempt From Income Tax

Under section 501(c), 527, or 4947(a)(1) of the Internal Revenue Code (except black lung benefit trust or private foundation)

▶ The organization may have to use a copy of this return to satisfy state reporting requirements.

OMB No 1545-0047

**2003**

Open to Public Inspection

A For the 2003 calendar year, or tax year beginning OCT 1, 2003 and ending SEP 30, 2004

B Check if applicable: ☐ Address change ☐ Name change ☐ Initial return ☐ Final return ☐ Amended return ☐ Application pending

Please use IRS label or print or type. See Specific Instructions.

C Name of organization: FOUNDATION FOR THOUGHT & ETHICS

Number and street (or P.O. box if mail is not delivered to street address): P. O. BOX 830721 — Room/suite

City or town, state or country, and ZIP + 4: RICHARDSON, TX 75083-0721

D Employer identification number: 75-1744350

E Telephone number: 972-661-1661

F Accounting method: ☐ Cash ☒ Accrual ☐ Other (specify) ▶

• Section 501(c)(3) organizations and 4947(a)(1) nonexempt charitable trusts must attach a completed Schedule A (Form 990 or 990-EZ).

H and I are not applicable to section 527 organizations.

H(a) Is this a group return for affiliates? ☐ Yes ☒ No

H(b) If "Yes," enter number of affiliates ▶

H(c) Are all affiliates included? N/A ☐ Yes ☐ No (If "No," attach a list.)

H(d) Is this a separate return filed by an organization covered by a group ruling? ☐ Yes ☒ No

I Group Exemption Number ▶

G Website: ▶WWW.FTEONLINE.COM

J Organization type (check only one) ▶ ☒ 501(c) ( 3 ) ◀ (insert no) ☐ 4947(a)(1) or ☐ 527

K Check here ▶ ☐ if the organization's gross receipts are normally not more than $25,000. The organization need not file a return with the IRS; but if the organization received a Form 990 Package in the mail, it should file a return without financial data. Some states require a complete return.

M Check ▶ ☐ if the organization is not required to attach Sch. B (Form 990, 990-EZ, or 990-PF).

L Gross receipts: Add lines 6b, 8b, 9b, and 10b to line 12 ▶ 465,738.

## Part I Revenue, Expenses, and Changes in Net Assets or Fund Balances

| | | | | | |
|---|---|---|---|---|---|
| Revenue | 1 Contributions, gifts, grants, and similar amounts received: | | | | |
| | a Direct public support | 1a | 382,865. | | |
| | b Indirect public support | 1b | | | |
| | c Government contributions (grants) | 1c | | | |
| | d Total (add lines 1a through 1c) (cash $ 382,865. noncash $ ) | | | 1d | 382,865. |
| | 2 Program service revenue including government fees and contracts (from Part VII, line 93) | | | 2 | |
| | 3 Membership dues and assessments | | | 3 | |
| | 4 Interest on savings and temporary cash investments | | | 4 | 19. |
| | 5 Dividends and interest from securities | | | 5 | |
| | 6 a Gross rents | 6a | | | |
| | b Less: rental expenses | 6b | | | |
| | c Net rental income or (loss) (subtract line 6b from line 6a) | | | 6c | |
| | 7 Other investment income (describe ▶ ) | | | 7 | |
| | 8 a Gross amount from sales of assets other than inventory — (A) Securities / (B) Other | 8a | | | |
| | b Less: cost or other basis and sales expenses | 8b | | | |
| | c Gain or (loss) (attach schedule) | 8c | | | |
| | d Net gain or (loss) (combine line 8c, columns (A) and (B)) | | | 8d | |
| | 9 Special events and activities (attach schedule). If any amount is from gaming, check here ▶ ☐ | | | | |
| | a Gross revenue (not including $ of contributions reported on line 1a) | 9a | | | |
| | b Less: direct expenses other than fundraising expenses | 9b | | | |
| | c Net income or (loss) from special events (subtract line 9b from line 9a) | | | 9c | |
| | 10 a Gross sales of inventory, less returns and allowances | 10a | 82,854. | | |
| | b Less: cost of goods sold | 10b | 106,393. | | |
| | c Gross profit or (loss) from sales of inventory (attach schedule) (subtract line 10b from line 10a) STMT 1 | | | 10c | <23,539.> |
| | 11 Other revenue (from Part VII, line 103) | | | 11 | |
| | 12 Total revenue (add lines 1d, 2, 3, 4, 5, 6c, 7, 8d, 9c, 10c, and 11) | | | 12 | 359,345. |
| Expenses | 13 Program services (from line 44, column (B)) | | | 13 | 176,696. |
| | 14 Management and general (from line 44, column (C)) | | | 14 | 95,925. |
| | 15 Fundraising (from line 44, column (D)) | | | 15 | 78,554. |
| | 16 Payments to affiliates (attach schedule) | | | 16 | |
| | 17 Total expenses (add lines 16 and 44, column (A)) | | | 17 | 351,175. |
| Net Assets | 18 Excess or (deficit) for the year (subtract line 17 from line 12) | | | 18 | 8,170. |
| | 19 Net assets or fund balances at beginning of year (from line 73, column (A)) | | | 19 | <182,988.> |
| | 20 Other changes in net assets or fund balances (attach explanation) SEE STATEMENT 2 | | | 20 | 955. |
| | 21 Net assets or fund balances at end of year (combine lines 18, 19, and 20) | | | 21 | <173,863.> |

RECEIVED FEB 10 2005 OGDEN, UT IRS-OSC

Buell EXHIBIT NO. 5 7/8/05 B. COOPER

EXHIBIT 7/14/05 P2

SCANNED FEB 17 2005

JSX001 12-17-03 LHA For Paperwork Reduction Act Notice, see the separate instructions. Form 990 (2003)



3390124 785983 M122 2003.08000 FOUNDATION FOR THOUGHT & ET M122 1

# HEARING EXHIBIT 3

9 0 1 7 7 2 0 2 9 4 2

FILED
In the Office of the
DEC 30 1993
Secretary of State of Texas
Corporations Section

# The State of Texas
## Secretary of State

JOHN HANNAH, JR.
SECRETARY OF STATE

CHARTER NO. 00541686-01
ARTICLE 9.01, T.N.P.C.A. REPORT
FILING FEE $5.00

PURSUANT TO THE PROVISIONS OF ARTICLE 9.01 OF THE TEXAS NON-PROFIT CORPORATION ACT, THE UNDERSIGNED CORPORATION HEREBY FILES ITS REPORT SETTING FORTH:

1. THE NAME OF THE CORPORATION IS:

   THE FOUNDATION FOR THOUGHT AND ETHICS

2. IT IS INCORPORATED UNDER THE LAWS OF: TEXAS

3. THE STREET ADDRESS OF THE REGISTERED OFFICE OF THE CORPORATION IN THE STATE OF TEXAS IS: 606 EAST SPRING VALLEY ROAD RICHARDSON, TX (MAKE ANY CHANGES HERE)

4. ITS REGISTERED AGENT AT SUCH ADDRESS IS: JON BUELL (MAKE ANY CHANGES HERE)

5. IF A FOREIGN CORPORATION, THE STREET ADDRESS OF ITS PRINCIPAL OFFICE THE STATE OR COUNTRY UNDER THE LAWS OF WHICH IT IS INCORPORATED IS:

6. THE NAMES AND RESPECTIVE ADDRESSES OF ITS DIRECTORS (OR TRUSTEES, ETC AND OFFICERS ARE: (NAME AT LEAST 3)

| NAME | TITLE | ADDRESS |
|---|---|---|
| Jon Buell | President | 606 E. Spring Valley Rd. Richardson, TX 75081 |
| Ed Haltom | Vice President | 4409 Goodfellow Dallas, TX 75229 |
| Jim Manley | Treasurer | 6519 Wickerwood Dallas, TX 75248 |
| | | |

7. THE FOREGOING INFORMATION IS GIVEN AS OF THE DATE OF THE EXECUTION OF THIS REPORT:

DATED December 22, 19 93

Foundation for Thought & Ethics
NAME OF CORPORATION

BY Jon Buell
(SIGNATURE)

ITS Jon Buell, President
(TITLE OF OFFICER SIGNING)

RECEIVED
SECRETARY OF STATE
DEC 30 1993
CORPORATIONS SECTION
MAIL CLERK 4

NOTE: ALL ITEMS MUST BE COMPLETED. MAKE CHANGES TO ITEMS 3 AND 4 AS NECESSARY. RETURN TO SECRETARY OF STATE, CORPORATIONS SECTION,

ARTICLES OF INCORPORATION

OF

THE FOUNDATION FOR THOUGHT AND ETHICS

We, the undersigned natural persons of the age of eighteen (18) years or more, at least two (2) of whom are citizens of the State of Texas, acting as incorporators of a corporation under the Texas Nonprofit Corporation Act, do hereby adopt the following Articles of Incorporation for such corporation:

ARTICLE ONE

The name of the corporation is THE FOUNDATION FOR THOUGHT AND ETHICS.

ARTICLE TWO

The corporation is a nonprofit corporation.

ARTICLE THREE

The period of its duration is perpetual.

ARTICLE FOUR

The corporation is to have no members.

ARTICLE FIVE

The purposes for which the corporation is formed are:

n. 95

1) The primary purpose is both religious and educational, which includes, but is not limited to, proclaiming, publishing, preaching, teaching, promoting, broadcasting, disseminating, and otherwise making known the Christian gospel and understanding of the Bible and the light it sheds on the academic and social issues of our day. Achievement of these ends will be accomplished through the utilization of oral and written means as well as a variety of media communications.

2) The general purposes and powers are to have and exercise all of the rights and powers conferred on nonprofit corporations under the laws of Texas, or which may hereafter be conferred, including the power to contract, rent, buy or sell personal or

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2) The general purposes and powers are to have and exercise all of the rights and powers conferred on nonprofit corporations under the laws of Texas, or which may hereafter be conferred, including the power to contract, rent, buy or sell personal or real property; provided, however, that this corporation shall not, except to an insubstantial degree, engage in any activity or exercise any powers that are not in furtherance of the primary purpose of this corporation.

3) The purpose or purposes for which the corporation is organized are to receive and maintain a fund or funds of real or personal property, or both, and subject to the restrictions and limitations hereinafter set forth, to use and apply the whole or any part of the income therefrom and the principal thereof exclusively for charitable, religious, scientific, literary, or educational purposes either directly or by contributions to organizations that qualify as exempt organizations under Section 501(c)(3) of the Internal Revenue Code and its Regulations as they now exist or as they may hereafter be amended.

4) No part of the net earnings of the corporation shall inure to the benefit of any director of the corporation, officer of the corporation, or any private individual (except that reasonable compensation may be paid for services rendered to or for the corporation affecting one or more of its purposes), and no director or officer of the corporation, or any private individual shall be entitled to share in the distribution of any of the corporate assets on dissolution of the corporation. No substantial part of the activities of the corporation shall be the carrying on of propaganda, or otherwise attempting, to influence legislation, and the corporation shall not participate in, or intervene in (including the publication or distribution of statements) any political campaign on behalf of any candidate for public office.

5) The corporation shall distribute its income for each taxable year at such time and in such manner as not to become subject to tax on undistributed income imposed by Section 4942 of the Internal Revenue Code of 1954, or corresponding provisions of any subsequent federal tax laws.

6) The corporation shall not engage in any act of self-dealing as defined in Section 4941(d) of the Internal Revenue Code of 1954, or corresponding provisions of any subsequent federal tax laws.

7) The corporation shall not retain any excess business holdings as defined in Section 4943(c) of the Internal Revenue Code of 1954, or corresponding provisions of any subsequent federal tax laws.

8) The corporation shall not make any investments in such manner as to subject it to tax under Section 4944 of the Internal Revenue Code of 1954, or corresponding provisions of any subsequent federal tax laws.

9) The corporation shall not make any taxable expenditures as defined in Section 4945(d) of the Internal Revenue Code of 1954, or corresponding provisions of any subsequent federal tax laws.

10) Notwithstanding any other provisions of these Articles of Incorporation, the corporation shall not conduct or carry on any activities not permitted to be conducted or carried on by an organization exempt from taxation under Section 501(c)(3) of the Internal Revenue Code and its Regulations as they now exist or as they may hereafter be amended, or by an organization, contributions to which are deductible under Section 170(c)(2) of the Internal Revenue Code and Regulations as they now exist or as they may hereafter be amended.

or any part of the income therefrom and the principal thereof exclusively for charitable, religious, scientific, literary, or educational purposes either directly or by contributions to organizations that qualify as exempt organizations under Section 501(c)(3) of the Internal Revenue Code and its Regulations as they now exist or as they may hereafter be amended.

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11) Upon dissolution of the corporation or the winding up of its affairs, the assets of the corporation shall be distributed exclusively to charitable, religious, scientific, testing for public safety, literary, or educational organizations which would then qualify under the provisions of Section 501(c)(3) of the Internal Revenue Code and its Regulations as they now exist or as they may hereafter be amended.

12) Notwithstanding any of the above statements of purposes and powers, this corporation shall not, except to an insubstantial degree, engage in any activities or exercise any powers that are not in furtherance of the primary purpose of this corporation.

This corporation is organized pursuant to the Texas Non profit Corporation Act and does not contemplate pecuniary gain or profit to the members thereof and is organized for nonprofit purposes.

## ARTICLE SIX

The street address of the initial registered office of the corporation is 606 East Spring Valley Road, Richardson, Texas 75081, and the name of its initial registered agent at such address is Jon Buell.

## ARTICLE SEVEN

The Board of Directors constituting the initial Board of Directors is three and the names and addresses of the persons who are to serve as the initial directors are:

1) Jon Buell
606 East Spring Valley Road
Richardson, Texas 75081

2) Sandy Buell
606 East Spring Valley Road
Richardson, Texas 75081

3) Ed Haltom
4409 Goodfellow
Dallas, Texas 75229

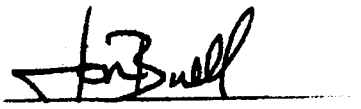
## ARTICLE EIGHT

The name and address of each incorporator is:

1) Jon Buell
606 East Spring Valley Road
Richardson, Texas 75081

2) Sandy Buell
606 East Spring Valley Road
Richardson, Texas 75081

3) Ed Haltom
4409 Goodfellow
Dallas, Texas 75229



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3) Ed Halton
4409 Goodfellow
Dallas, Texas 75229

Jon Buell
Sandy Buell
Ed Halton
Incorporators

THE STATE OF TEXAS, )
COUNTY OF DALLAS. )

BEFORE ME, a notary public, on this day personally appeared Jon Buell, Sandy Buell and E. A. Horton Jr., known to me to be the persons whose names are subscribed to the foregoing document and, being by me first duly sworn, severally declared that the statements therein contained are true and correct.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this the 28 day of December A.D., 1982.

Lorraine Thompson
Notary Public, State of Texas

(Seal)

My commission expires:
August 20, 1985

# HEARING EXHIBIT 4

FTE_what_is_the_FTE_complete

[Transcribed by Nick Matzke of NCSE on 3/29/05.]

WHAT IS THE FOUNDATION FOR THOUGHT AND ETHICS?

Someone has rightly said, "If you wish to alter the destiny of a people, you have only to alter its ideas; actions are the blossoms of thought." The Foundation for Thought and Ethics has been established to introduce Biblical perspective into the mainstream of America's humanistic society, confronting the secular thought of modern man with the truth of God's Word.

Nearing completion, our first project is a rigorous scientific critique of the theory of prebiotic evolution. Next, we will develop a two-model high school biology textbook that will fairly and impartially [five/the/view] scientific evidences for creation side by side with evolution. (In this case Scripture or even religious doctrine would violate the separation of church and state.) A credentialed author team and a consulting editorial board of scholars are being assembled for the project. The manuscript will be placed with a secular textbook publisher for publication.

The Foundation's future projects will include publications on a wide range of topics, each vital to shaping the course of our nation's future. Operating primarily as a Christian think tank, the Foundation emphasizes first, publishing, and second, lectures and seminars. 95% of what the Christian press publishes is written to Christians. We've been talking to ourselves! Through the work of the Foundation, Christians are challenged to make their voice and view heard in the published arenas of discourse where the opinion leaders of society must give them genuine consideration.

For more information, contact the Foundation office.

Foundation for Thought and Ethics
PO Box 727 Richardson, Texas 75080 214 669-0522



EXHIBIT 7/19/05 P4

Buell EXHIBIT NO. 4 7/8/09 B. COOPER

# HEARING EXHIBIT 5

# Foundation For Thought And Ethics

CONFIDENTIAL



February 13, 1995

Dear

I am writing to introduce the Foundation For Thought And Ethics. We are a non-profit organization working in the field of education.

We are pursing a mission that is totally unique. Our goal is to provide supplemental textbooks to teachers in the public schools, giving them well documented information, so they can teach the truth in the classroom. Our immediate goal is to produce textbooks in the areas of Biology, American History, Health/Sex Education and Environmental Science.

Production of the supplemental textbook for Biology is already complete and teachers are now using it in all 50 states. This book, *Of Pandas and People*, is favorably influencing the way origins is taught in thousands of public school classrooms. We have received wonderful comments from many teachers who have said they are thankful there is now, finally, a book available which enables them to teach origins with a much more balanced view. Based upon your interest I would be happy to send you a copy so you can see the high level of scholarship employed in writing *Of Pandas and People*.

I will enclose some of our other materials as well, including some that will give you an idea of our track record. By the sheer grace of God, He has blessed our hard work with some real breakthroughs.

Our commitment is to see the monopoly of naturalistic curriculum in the schools broken. Presently school curriculum reflects a deep hostility to traditional Christian views and values, and indoctrinates students to this mindset through subtle but persuasive arguments.

SUPPORT FOR THE FAMILY

P.O. Box 830721 • Richardson, Texas 75083-0721 • (214) 669-3400 • Fax (214) 669-9339
Field Office: P.O. Box 428 • Monument, CO 80132 • (719) 488-9364

CONFIDENTIAL

This is not merely a war over ideas, but over young people, and how their lives will be shaped. The current deplorable condition of our schools results in large part from denying the dignity of man created in God's image. Even Junior High students recognize that, if there is no Creator, as textbooks teach, then there is no Lawgiver to Whom they must answer, and therefore no need of a moral lifestyle, much less a respect for the life of their fellowman. The message of the Foundation is that this is simply unacceptable.

The Foundation has been gifted with a strong Board of Directors. The Board is comprised of outstanding business and professional leaders with a history of proven success in business, education, and science (list enclosed). The Foundation has a core plan to which it is committed, and, God willing, we will be pursuing it for decades to come.

Because only eight states adopt supplemental textbooks at the state level, it is possible to do an end-run around the highly politically charged state adoption process by marketing supplemental texts directly to teachers and curriculum buyers. Through our successful experience developing and marketing of *Of Pandas and People*, (in one of the most controversial subjects), we have demonstrated the viability of this concept. Now we have launched work on three additional supplemental textbooks, and plan to do approximately 25 books total, and get them all into the public schools.

We also do teacher training, in a variety of formats, primarily for teachers in public schools. For example, Dr. Robert Kaita is one of the Princeton University nuclear physicists that became famous overnight a year ago last December with a breakthrough nuclear fusion reaction that will lead the way to extraordinarily cheap energy in the 21st Century. We brought Dr. Kaita to speak at our session of the Conference for the Advancement of Science Teaching last October. This conference, called CAST, was attended by 4,500 science teachers from 5 to 8 states. The *Wall Street Journal* sent a writer to cover the event, and the enclosed front page article and letters resulted.

Easily the best known example, however, is our work in organizing and co-sponsoring a symposium on Darwinism in March, 1992, on the campus of Southern Methodist University. In this program, we brought together ten of the finest minds on Darwinism, five Darwinists and five proponents of Intelligent Design with extraordinary results. The impact of this conference has spilled over into the top levels of science, as is described in the enclosed article from *The Real Issue*.

Now the proceedings of the symposium are bound in a new publication, *Darwinism: Science or Philosophy?*, which we are marketing aggressively through science journal reviews, to public school and university faculty, public, university, and high school libraries, etc. Phillip Johnson said, "This symposium has been historic...the best academic conference I have ever been involved in" (which is over 60).

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Dr. Daniel Rubenstein, Chair of the Princeton University Biology Dept., has agreed to review the book with a view to making a statement that will help us advertise it.

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Sincerely, in Christ,

Jon Buell,
President

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# HEARING EXHIBIT 6

n. 96 BF000001

Send to Prof Tom Jones

# Foundation For Thought And Ethics

Jon Buell · President

Charles B. Thaxton, Ph.D. · Director of Curriculum Research

January 30, 1987

Mr. Arthur C. Bartlett
Vice President & Publisher
Jones & Bartlett Publishers, Inc.
20 Park Plaza
Boston, MA 02116

Dear Mr. Bartlett,

I'm writing to alert you to a potentially lucrative educational publication opportunity, an opportunity to expand into a subject area where a verifiable market of millions is today totally untouched. A new independent scientific poll (report enclosed) shows almost half of the nation's biology teachers include some creation in their view of biological origins. Many more who don't still believe it should be included in science curriculum.

But wouldn't reference to such views threaten the 1st Amendment separation requirement?

The U.S. Fifth Circuit Court of Appeals says that teachers are free to teach scientific information that happens to support creation if they wish. In ruling on the so-called Louisiana "Balanced Treatment Act" this Spring the U.S. Supreme Court may not affirm state-mandated teaching of creation, but they will almost certainly let stand the above academic freedom for teachers.

But that seems not so much like a market as a curiosity.

Numerous reliable polls (sampling enclosed) in the '80s show better than 3/4 of the public wants creation taught in the schools.

But surely teachers prefer their own personal comments to some curriculum approach.

No. The biology teachers poll shows almost all teachers believe strengths and weaknesses of a plausible alternative to the dominant theory should be given and nearly 3 in every 4 want publishers' help in providing it!

But what is the potential for profit in such a departure?

The enclosed projections showing revenues of over 6.5 million in five years are based upon modest expectations for the market provided the U.S. Supreme Court does not uphold the Louisiana "Balanced Treatment Act". If, by chance it should uphold it, then you can throw out these projections, the nationwide market would be explosive! *

n. 96

P.O. Box 830721 · Richardson, Texas 75083-0721 · 214-669-3400

How could you even begin to develop an enlightened treatment in a difficult area like this?

The beginning has begun! A no-hype, no-nonsense supplement has already been written. Highly informed and credentialed, non-controversial scientists have collaborated together to provide an outstanding, heavily-reviewed manuscript for just this very task.

How would you break the ice to market such an innovative book?

The book is already in use as an experimental program in one school district, and other districts are expressing interest, too. The book qualifies for the new Texas Science Supplements list (where 2/3 of the biology teachers include some creation in their views) without undergoing the textbook review process so famous for basal text adoptions.

Our manuscript is entitled Biology and Origins. From the project's inception, our authors recognized such a book could not sidestep the valid criticisms of creation, but must take them seriously, treating the subject with a sensitive and critical approach. At the same time, the book will not be subject to the major criticism of creation, that the supernatural lies outside of science, because its central statement is that scientific evidence points to an intelligent cause, but that science is silent as to whether that intelligence is within or beyond the material universe. So the book is not appealing to the supernatural.

Biology and Origins does not duplicate either general science or biology textbooks. It has been authored by highly gifted and credentialed, previously published authors of major works of biology (Dean Kenyon, co-author of Biochemical Predestination, New York: McGraw Hill, 1969 and P. William Davis, co-author of World of Biology, Philadelphia: W. B. Saunders & Co., 1985). The manuscript has also been evaluated by dozens of reputable scientists of both evolution and creation persuasions. In addition, the authors' perspective is substantially informed by the philosophy of science to handle tricky questions clearly and in a manner consistent with sound scientific methodology.

In case you would like to see an example of our work, we are enclosing some material and reviews about our first book, The Mystery of Life's Origin (New York: Philosophical Library Publishers, 1984), which is an advanced college level critique of chemical evolution. It is now the best selling advanced level book on chemical evolution. The major author among the three authors of the book is Charles Thaxton, our Director of Curriculum Research, and the manuscript was prepared for publication by the Foundation For Thought and Ethics. A copy is enclosed. You will notice that among its favorable reviews are those published by the Yale Journal of Biology and Medicine and the Journal of College Science Teaching, published by the National Science Teachers Association.

We are in touch with a number of science educators, school officials, and university faculty. We have a growing Council of Educational Advisors composed of prestigious intellectual leaders (list enclosed) and a much larger peer review group of readers and scholars with whom we have been interacting.

Undertaking a high school level project would not require new marketing people for Jones & Bartlett. Since in the majority of state adoption states supplements don't require state textbook committee approval, we believe the book will sell very well throughout the U.S. through mailings and distributions of complimentary copies via readily available lists. We could also share other marketing ideas for the book appropriate to its innovative and groundbreaking subject matter. Also, it is possible our organization could be involved in promoting it, preparing residuals, or taking other roles. I will call you after you have had several days to look over our materials to see if you would be interested in receiving the manuscript.

Yours truly,

Jon Buell, President,
Foundation for Thought
and Ethics

JB/am
Enclosures

## COUNCIL OF ACADEMIC AND EDUCATIONAL ADVISORS

### Foundation for Thought and Ethics

**Charles B. Thaxton, Ph.D.**, Director of Curriculum Research, Foundation for Thought and Ethics, coauthor of The Mystery of Life's Origin.

**George Roche, Ph.D.**, President of Hillsdale College, Chairman of National Council of Educational Research.

**Charles Glenn, Ph.D.**, Director of the Bureau of Equal Educational Opportunity, Massachusetts Department of Education.

**Peter J. Stanlis, Ph.D.**, Professor of English, Rockford College, Fellow of the National Endowment for the Humanities, author of Edmund Burke and the Natural Law and several other books.

**T. Rick Irvin, Ph.D.**, Asst. Professor of Toxicology and Genetics and Principal Scientist, Division of Engineering Toxicology, Texas A&M University.

**Ronald D. Townsend, Ph.D.**, Director of Curriculum, School Board of Sarasota County.

**Dean H. Kenyon, Ph.D.**, Professor of Biology, San Francisco State University, coauthor of Biochemical Predestination.

**P. William Davis**, Professor of Biology, Hillsborough Community College, coauthor of World of Biology and several other textbooks for McGraw-Hill and W. B. Saunders & Co.

**Robert B. Eubank, Ph.D.**, Professor of Political Science, Rice University

**Joseph Sobran**, Senior Editor of National Review, nationally syndicated columnist, author, and regular commentator on CBS News feature, "Spectrum".

**Walter Bradley, Ph.D.**, Professor of Materials Science, Texas A&M University, coauthor of The Mystery of Life's Origin.

**Paul C. Vitz, Ph.D.**, Professor of Psychology, New York University, Director of special study on textbook bias for the National Education Institute.

**William H. Stewart, Ph.D.**, Professor of Political Science, University of Alabama, Director of Doctoral Program in Public Administration, author of several journal articles and books on public policy.

**Lamar Allen, Ph.D.**, Senior Vice President, Kaman Sciences, and developer of F-14 Fighter and B-1 Bomber protection systems.

**John F. Walkup, Ph.D.**, Horn Professor of Electrical Engineering and Director of the Optical Systems Laboratory, Texas Tech University.

## NATIONWIDE POLL OF BIOLOGY TEACHERS

### A SUMMARY

In the 1980s several polls of both the general public and of educators have been taken to determine attitudes toward teaching creation in public schools. None of these polls, however, singled out the views of biology teachers for examination. Late in the 1985-86 school year a poll of high school biology teachers was taken concerning the teaching of origins. The Foundation for Thought and Ethics commissioned an outside research organization, Austin Analytical Consulting, to obtain a genuinely representative sample of the opinion of high school biology teachers nationwide, including concentrations in the three largest textbook buying states: Texas, California, and New York.

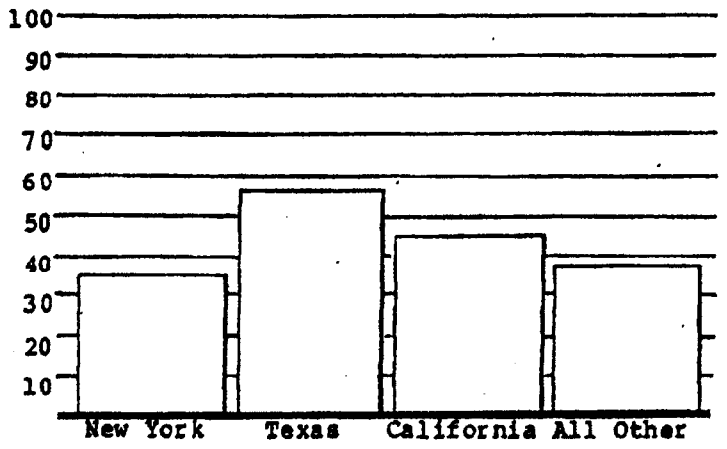
The poll also compared the attitudes and views of seasoned teachers with less experienced ones. The answers given by teachers with 10 years experience or less varied only slightly from answers given by those with 11 or more years. In only one case did the opinions of either group vary as much as 5% from the total sample. Those having taught 10 years or less chose naturalistic chemical evolution as their view of the origin of the first life on earth 5% more than did the total sample.

### TEACHERS' VIEWS SURPRISING

The poll brought to light several unexpected findings. For instance, in the rather straightforward matter of the teachers' personal views of biological origins, 42.3% chose either straight creation, or some combination of evolution and creation. This is only 11.4% fewer than the 53.7% who chose evolution.

But there were substantial regional differences in teachers' views, as illustrated in how they answered this question. The graph below compares the percentages of those with views incorporating some creation for New York (34%), Texas (57.1%), California (44.7%), and all others (37.8%).

**Percent of Teachers With Views Incorporating Some Creation**



**POLL MEASURES KEY CONCEPTS**

Like evolution, creation is a broad concept with many variations. Therefore the questions were designed to measure opinions relating to some of the individual objections to creation and key concepts underlying the debate.

Six frequent objections to creation were given with which teachers could indicate agreement, as well as a write-in space for others. The greatest single objection (48.6%) was that "Proponents of creation are too biased to contribute to the advance of science, exaggerating both the evidence for creation and the problems of evolution." Then they were asked if an approach were developed that would meet the objections they identified and avoid each of the mistakes, would they still remain opposed to it's use in schools? A majority, 58.4% said they would not.

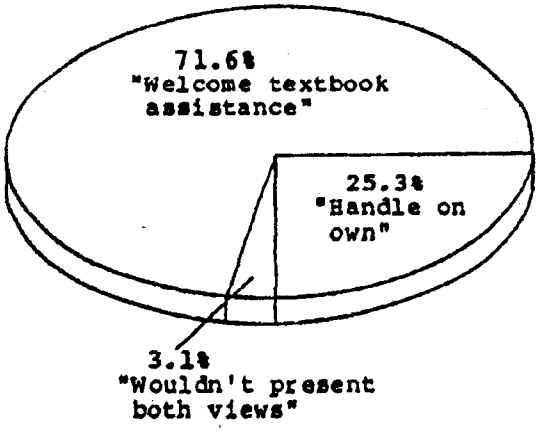
**FREE EXCHANGE CALLED FOR**

The Austin Analytical poll quoted well-known evolutionists Theodosius Dobzhansky and G. G. Simpson who noted that origin events are singularities, occurring only once. It then pointed out that origin events themselves were therefore not subject to empirical test. Teachers were asked about the significance of this isolation. 47.3% said the isolation of origin events from empirical test was only temporary, but another 17.1% felt such isolation may be a door of opportunity for the undetected influence of metaphysics in areas of dispute. Those who saw this possibility were asked how to counteract such an invasion of metaphysics. 88.4% saw free exchange of viewpoints as the appropriate deterrant, 10.5% chose the statements of professional organizations, and only 1.2% chose majority rule.

Those who said that the isolation of origin events from empirical test was only temporary were not asked about appropriate treatment of theories during this "window of uncertainty," but another question asked was "When a plausible alternative to the dominant scientific theory exists, how would you treat that theory in an objective educational manner?" Choices offered were: a. "Teach the theory with the most adherents and ignore the plausible alternative", b. "Just teach your personal view", c. "Give strengths and weaknesses of the dominant theory and of the plausible alternative." Fully 96.9% chose alternative c.

**TEACHERS WELCOME TEXTBOOK ASSISTANCE**

An additional question of implementation was put to those who chose c. Would they "welcome assistance from a textbook publisher in the form of supplementary material" or would they "prefer to handle it on [their] own?" Among teachers with 11 or more years of experience, the answers to these two questions taken together show that all but 3.1% felt that the strengths and weaknesses of both the dominant theory and plausible alternative should be taught. 25.3% felt they should be taught, but preferred to handle it on their own, while 71.6% said strengths and weaknesses of both should be taught and they would welcome assistance from a textbook publisher in the form of supplementary materials to teach them.




But were the poll takers putting words into the teachers' mouths? Perhaps they wouldn't feel there is a plausible alternative. They weren't asked. Yet as reported earlier, 42.3% incorporate some creation in their own view. It is not hard to conclude from these answers that, taken together, teachers themselves perceive a plausible alternative.

One of the poll's most surprising findings resulted when teachers were told "Check any of the following classroom activities which you believe would violate the separation of church and state." Choices included merely mentioning creation or a Creator, giving only weaknesses of creation, and giving strengths and weaknesses of creation. The most frequently checked option, (61.8%) was giving only the weaknesses of creation.

Teachers were also told of a secondary finding of the U.S. Fifth Circuit Court of Appeals in reviewing the Louisiana "Balanced Treatment Act." In its July 8, 1985 opinion, the Court stated that teachers are free to teach scientific information that may happen to be consistent with a religious viewpoint. When asked for their opinion, 72.8% of the biology teachers said they agreed with the Court's findings.

Austin Analytical Consulting observed all of the conventional research procedures in conducting the poll, and, with 305 teachers responding, obtained a result representing biology teachers nationwide with a confidence interval of 95% (standard in the industry).

For further information contact:
JON BUELL
FOUNDATION FOR THOUGHT AND ETHICS
P.O. BOX 830721
RICHARDSON, TX 75083-0721
(214) 669-3400

# HEARING EXHIBIT 7

Intro builds case for experience well but doesn't relate it to science.

INTRODUCTION TO
SUMMARY CHAPTER

CONFIDENTIAL

**The Origins Question**

The study of origins means asking, Where did things come from? What caused them to come into being? In the world around us, we see two kinds of things: natural objects, like stars and mountains, and man-made ~~items~~ things, like houses and computers. To put it in the terminology of origins, we see things resulting from two kinds of causes: natural and intelligent.

5 or so examples follow: A little too many.

How do we decide whether something is the result of natural or intelligent causes? Most of us do it without even thinking. We see clouds and we know they are the result of natural causes. No matter how intricate the shapes may be, we know that a cloud is simply water vapor shaped by the wind and the temperature. On the other hand, we may see something that looks very much like a cloud but that spells out the words "Come to the circus." We know that even though they are white and fluffy like ~~a~~ clouds, the words cannot be the result of natural causes. Why not? Because natural causes never give rise to a complex structure such as a language. We know that somewhere nearby there must be an intelligent cause: the pilot of an airplane doing skywriting.

Consider a few more examples. Hiking along a dry stream bed, you find a smooth rock. Is it the result of natural or intelligent causes? Natural, of course. We know a rock is worn smooth when it is tumbled around and eroded by water. Even if the rock exhibits an unusual shape, we can determine that the shape formed naturally if the softer parts are worn away and the

harder parts are protruding. In other words, the structure is the result of the inherent characteristics of the raw materials. But when you discover an arrowhead, you instantly conclude that it is the result not of natural but of intelligent causes. ~~The chip marks go against the natural grain of the stone, revealing that~~ the shape ~~was~~ is not the result of any properties inherent in the rock but was imposed from outside--probably by an Indian of long ago.

Walking along the beach, you admire the even pattern of ripples in the sand. The scene may look artistic, but was it produced by an artist? No; we know by experience that the natural action of waves creates a rippled pattern. But if you chance upon ~~the~~ a message of words in English ~~"John loves Mary"~~ written in the sand, you know without a doubt that no waves did that. Neither is it the result of grains of sand spontaneously organizing themselves. Instead, some sort of intelligent agent ~~--probably either John or Mary--imposed the shape of~~ inscribed the words in ~~upon~~ the sand.

(main text-Greg loves Mindy)

A sunset is beautiful. But though it may inspire poets, a sunset is the result of purely natural causes, of light striking the atmosphere at a certain angle. A painting of a sunset has the same beautiful array of colors. But there are no natural causes capable of creating a painting. Nothing in the fabric of the canvas determines that the painting should contain a sunset. Nothing in the paint pigment is responsible for creating a lovely landscape. A pattern they would never have achieved on their own was imposed upon the raw materials.

What do these examples tell us? The way we decide whether a given object is the result of natural or intelligent causes is by experience. If experience has shown that a certain type of object results from natural causes, then when we find a similar kind of object we conclude that it came from similar ~~assign its origin to~~ natural causes. If experience has shown that a certain type of object results from intelligent causes, then when we find a similar object we know ~~assign~~ its origin to be an intelligent cause~~s~~, too.

This book is about the origin of life. Where did life come from? What caused it to come into being? Do living things exhibit the characteristics that we see resulting from natural causes or from an intelligent cause? This is the question that divides evolutionists and creationists in modern controversies in biology. Evolution is the theory that natural causes are adequate to account for everything in the natural world, including life itself. Creation is the theory that certain phenomena must be explained by intelligent causes. In this book, we counterpose these two theories about life's origin. How do scientists on each side argue their case? What evidence do they present? Which theory best fits the evidence?

This sets the way for conflict

In this chapter is a summary of the major arguments presented throughout the book. You may read this chapter on its own or as an introduction to the more detailed treatment of each subject in later chapters.

## Chapter One: The First Living Things

**Life From Life**

There was a time when people believed some animals arose full-blown from non-living materials. The belief was called "spontaneous generation." Today it might seem to be no more than a superstition, but at one time the idea seemed to be confirmed by common-sense experience. Leave rotting meat out, and isn't it quickly covered with flies? Leave dirty rags in the corner of a shed, and doesn't it soon become a nest of mice?

With the rise of scientific method, however, belief in spontaneous generation was discredited. In 1668 Francesco Redi conducted experiments in which he ------ ((showed that flies and mice don't simply appear--get more info)).

The idea of spontaneous generation was revived in ((year?)) when the microscope was invented. The microscope revealed the existence of a world hitherto invisible and unsuspected. Microscopic creatures were so small, and appeared to be so simple, that it was not difficult to believe they arose spontaneously from non-living materials. After all, leave bits of straw in a pan of water for a few days, and isn't the water swarming with bacteria?

In the early 1860s, Louis Pasteur laid that notion to rest as well. He showed that water could be kept free of bacteria simply by putting cotton stoppers in the flasks. By doing so, he proved that the microscopic life that mysteriously appeared in water was the result of airborne bacteria. ((check facts))

Pasteur's work was all very well for the advance of scientific knowledge, but it was somewhat troubling for evolutionists. Redi and Pasteur had shown that full-blown organisms do not arise from non-living materials, whether mice or microbes. Yet evolution is the theory that, at least at the beginning, life did arise from non-living matter. How was that possible?

In ((year?)), a Russian scientist named A.I. Oparin came up with a theory he hoped would solve the problem. Living things did come from non-living matter, he suggested, but not all at once. Instead, life arose by stages: Simple chemicals combined to form complex compounds, such as amino acids, which in turn combined to form large, complex molecules, such as proteins and DNA, which aggregated to form an interconnecting network and a cell wall. And there was the first living cell. Oparin's theory is referred to as **chemical evolution** (because it assumes life began in a sea of chemicals) or **prebiotic evolution** (prebiotic means "before life"). It has become the standard evolutionary approach to the origin of life.

Note to JB: hereditary codescript? (see Yockey)

It can be said that the contemporary controversy over creation and evolution represents a revival of the controversy over spontaneous generation in a new form. Evolutionists are convinced that Oparin's step-wise theory overcomes the problems of life arising from non-living matter. Creationists counter that life is too complex to evolve from non-living matter even when the process is broken down into small steps. The structure

The controversy is new; ~~the~~ a form of the idea is revived

color word

of complex molecules, they argue, exhibits the characteristics we associate only with intelligent causes.

**The Necessities of Life**

Before we consider various answers to the origin of life, we must first understand what the questions are. We must set out the features of life that require explanation. What are the basic facts that any theory of the origin of life must take into account?

Fact #1. All life is made of chemicals. Although the functioning of a living cell is marvelously complex, its components are relatively simple. Moreover, these simple organic compounds can be derived from inorganic materials.

Not only that,

Facts are incomplete

Fact #2. All life is made of chemicals--but that is only half the story. These chemicals must be in the right sequence. The large molecules crucial to life, such as protein and DNA, are constructed much like a language, with the chemicals acting as letters and combining to form words, phrases, and sentences. This represents an incredibly complex and unusual structure in nature.

elim 1st sent.

Fact #3. The compounds that form protein and DNA must not only be in correct sequence, they must also form the right three-dimensional shape. Amino acids, sugars, protein, and DNA all

If, as appears, this is isomeric structure alternatives elim.

have a very specific three-dimensional structure. When they are synthesized in the laboratory, they may have the right chemical constituents but still exhibit the wrong three-dimensional form.

This argument does not deserve the space it takes from others

For example, amino acids appear in two forms that are mirror images of each other, just as a right and left glove are mirror images. Indeed, they are referred to as right- and left-handed amino acids. When amino acids are synthesized in the laboratory, the result is a mixture of both forms, like a pile of right- and left-handed gloves. Yet living things use only left-handed amino acids. Right-handed ones don't "fit" the metabolism of the cell, any more than a right-handed glove would fit onto your left hand. If just one right-handed amino acid finds its way into a protein, the protein loses its ability to function. Strangely, by contrast, only right-handed sugars are used in DNA and RNA. Any theory of life's origin must account for the highly specific sequence and structure of these molecules.

These are some of the facts every theory about the origin of life must address. Let's contrast how effectively they are addressed first by evolution and then by creation.

**Evolution: Life in a Test Tube**

Tell up front the fundamental fact that these experiments are supposed to simulate early earth conditions.

One of the advantages of Oparin's theory was that to some extent it could be tested. Scientists could mix batches of chemicals in a test tube and see whether or not amino acids would form. They could then mix amino acids and see if proteins

formed. And that is what scientists have done. Since the early 1950s, many experiments have been conducted testing Oparin's hypothesis. What have been the results?

Oparin suggested that life arose from chemical reactions among simple gases in the atmosphere: methane, ethane, ammonia, hydrogen and water vapor. The chemical reactions were activated by various forms of energy in the environment--by electrical energy from lightening, heat energy from volcanos, kinetic energy from earthquakes, or light energy from the sun. According to the theory, energy caused the atmospheric gases to convert into more complicated compounds to form amino acids, fatty acids, and sugars. These accumulated in the primitive oceans until there were enough to link up and form even larger, more complex molecules, such as proteins and DNA. Eventually these molecules combined to form integrated particles called coacervates ((definition??)), The early coacervates competed in a sort of Darwinian natural selection until the first true cell appeared, complete with cell membrane, complex metabolism, genetic coding, and the ability to reproduce.

An appropriate fact for p. 6: 1. easy-to-form 2. hard-to-form

?

How has this theory been tested in the laboratory? Scientists have taken the simple gases suggested by Oparin, mixed them in a glass container, and then subjected them to ultraviolet light (to simulate sunlight) or electrical discharges (to simulate lightning). In ((year?)) Stanley Miller and Harold Urey ran the first of such experiments. A gooey, tar-like substance formed in the flask. Examining it, Miller identified several of

must tell them simulating prim. soup, where large supply of chemicals ...

the amino acids found in proteins today. Since then, other biological compounds have been detected in similar atmospheric simulation studies. The list now includes most of the basic kinds of organic compounds found in living things.

Imagine the excitement in the scientific community as the results of these experiments were first published. It had always been assumed that organic chemicals were somehow very different from inorganic chemicals. But these experiments showed that simple organic substances could form spontaneously from inorganic starting materials (Fact #1).

But urea synthesis earlier shown

The success of these early experiments greatly increased the bility of evolutionary theory. But when scientists sought beyond the simplest building blocks of life, the momentum d down. The step from simple compounds to the complex ules of life, such as protein and DNA, has proved to be a --and so far impassible--gap. "Advances" in the field over the past thirty years consist merely of the same basic experiments run over and over again with ever more modern, more complicated equipment.

?

The problem is that some chemical reactions occur quite readily, whereas others do not. The simple building blocks of life form relatively easily. The chemical reactions involved belong to the class of reactions that occur readily. But the chemical reactions required to form proteins and DNA do not occur readily. As a result, they have not occurred in any simulation experiment to date.

Moreover, the complexity of organic compounds jumps dramatically once we go beyond the initial building blocks, as Fact #2 and #3 indicate. Though it is true that life is made of simple chemicals, we should not conclude that living things are themselves simple. Shakespeare's sonnets are composed of simple letters put together to form words and phrases. But that does not mean we can write a Shakespearean sonnet by mixing Scrabble letters and combining them at random.

Facts 2 & 3 are not comparable as this implies

Can protein and DNA be "written" by mixing chemical "letters" and combining them at random? As we shall see, most scientists today doubt it. Evolutionary theory has been revised in a way still largely unknown outside the scientific community.

in soup

**Not a Chance**

Most people would define evolution as the theory that life arose by sheer chance. But most people would be wrong. Over the last ~~fifteen~~ twenty years or so ((correct date?)), scientists have abandoned the idea the life arose by chance. Today there is not a single major scientist engaged in origin-of-life research who holds to the chance model.

Since the late '60s

Why have scientists given up on chance explanations? The reason is that the probability of life arising by chance is virtually zero. Take one very simple example. Consider the chance formation of a single protein containing only 100 amino acids (most proteins actually contain several thousand). There are 20 different kinds found in living proteins, and each can be

vs. Ambrose p. 26 - most proteins not nearly several thousand aas

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used repeatedly in a chain of 100. Therefore, they can be arranged in 20^100 different ways. This number can be rewritten as $10^{130}$--i.e., 10 followed by 130 zeros. In other words, there is only one chance in $10^{130}$ of getting a combination of amino acids that form a protein with a given biological function. This number is so enormous that there has not been enough time since the universe began (if we allow that it is 15 billion years old) to try all the different combinations. ((verify these numbers))

no ignores tolerances

These numbers are so forbidding that most scientists today are convinced that there must have been something at work at the origin of life besides random processes. Chance models have been replaced with materialistic models (some force within matter gave rise to life) or with intelligence models (some intelligent agent created life). By materialistic models, we mean that some force within the atomic structure itself is thought to be responsible for ~~driving~~ attracting specific chemicals together in the correct sequence to form protein and DNA. By intelligence models, we mean some form of creation.

state belief

**Creation: A Mind At Work**

Scientists who adhere to an intelligence model of life's origin have a double task. As adherents to a minority view within the scientific community, they must first argue negatively against the predominant view in order to gain a hearing. Then they must present a positive case for their model.

drags debate in unnecessarily

SUMMARY CHAPTER

The intelligence model points to several weaknesses in the standard evolutionary scenario of life's origin. A significant barrier faced by theories of chemical evolution is that chemicals are sensitive to oxygen. Oxygen destroys delicate chemical compounds by reacting with them, a process called **oxidation.** (Many food preservatives are simply substances that protect food from the effects of oxidation.) The presence of even a small amount of oxygen in the atmosphere of the early earth would destroy any organic compounds that might form.

For this reason, the standard theory of chemical evolution assumes that there was no oxygen present in the earth's atmosphere at the origin of life. Yet scientists now know that oxygen has always been present on the earth. Rocks dated the same time that life was supposedly developing show signs of exposure to oxygen. Just as iron rusts, so many minerals react with oxygen. ((fill in as necessary from p. 1-15 as get more info))

A second barrier faced by any theory of chemical evolution can be stated as a paradox. Some chemicals react quite readily with one another. Others resist reacting. To make them react, they must be exposed to some form of energy (to heat, for example, or to electricity). But--and here is the paradox--energy also breaks chemical compounds apart. In fact, it is actually more likely to break them apart than to cause them to bond in the first place.

This ($O_2$) should be #3 on p. 6

No - don't give creationists ownership of the witnesses of evol.

For next page + ½, condenses 2 of authors arguments but they relate poorly, if at all, to ~~the~~ "Facts 1-3"

Summary ignores Assumptns 3, 5, 7

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What this means for the chemist is that when he exposes a mix of chemicals to heat or electricity, some compounds may form but others will break down. Indeed, since the process of destruction is actually more likely to occur, the net result will be only a small amount of chemical compounds. Those that do form will generally be simple ones, since any complex molecules that might form would quickly break back down to their simpler components.

To summarize, the conditions that would have existed on the early earth were far from favorable to the emergence of living things. The most probable scenario of early earth history is not one of evolution but of destruction.

**The Language of Life**

Probability (p. 11) & language two aspects of 1 argument - why split? (Does the chapter itself?)

Since the 1960s, scientists have known that at the core of the living cell is the DNA molecule. The DNA is a string of chemicals that functions precisely like a coded message. Its chemical "language" contains instructions for the entire development and functioning of the cell. It is decoded by the cell much the same way a string of dots and dashes can be decoded by anyone who knows Morse Code.

Wasn't this under stood when Crick & Watson announced its structure?

In other words, when scientists first probed the nucleus of the cell, they stumbled upon a phenomenon akin to finding "John loves Mary" in the sand or "Come to the circus" in the sky. The only difference is that the DNA code is much more complex. If the amount of information contained in one cell of your body were

Variant of Intro to 1 & 2

Is this true?

written out on a typewriter, it would fill as many books as are contained in a large library.

When we find "John loves Mary" written in the sand, we assume it resulted from an intelligent cause. When we find a complex code built into the nucleus of a cell, it is reasonable to draw the same conclusion. Moreover, DNA is not unique. Protein, too, exhibits the structure of a language, with simple chemicals as letters and amino acids as words. Protein differs from DNA in that its code governs not heredity and development but various functions within the cell. Some proteins construct various substances required by the cell. Others act as timers to make sure all the various processes of the cell go on in the correct order. These functions are determined by the sequence and structure of the amino acids in each protein.

but derivative relationship

Protein sequences do govern development - e.g. histones (operates but doesn't code for)

(inclu. developmental)

We often get the impression that scientists have come close to "creating life" in the laboratory. Yet compounds synthesized in the laboratory fail to exhibit the sequences and the three-dimensional structure necessary for biological functioning (Fact #2 and #3). Are natural causes capable of producing this kind of structure?

To say that DNA and protein arose by natural causes, as evolution does, is ~~to say~~ like saying a complex language arose by natural causes. It is akin to saying "John loves Mary" arose from the action of the waves, or from the interaction of the grains of sand. It is like saying the painting of a sunset arose from the atoms in the paint and canvas. When in our experience have we

ever witnessed an event of that nature? Whenever we see meaningful symbols we assume it is the handwork of some intelligent cause. We make that assumption even if we cannot decipher the symbols, as when an archaeologist discovers some ancient inscription on stone. If science is based upon experience, then science tells us the origin of the message encoded ~~for~~ in ~~protein and~~ DNA must have had an intelligent cause origin.

What kind of intelligent agent was it? On its own, science ~~probably~~ cannot answer that question; it must leave that ~~will have to turn~~ to religion and philosophy. But that should not prevent science from acknowledging evidences for an intelligent cause origin wherever they may exist.

Needs: Illust. of gaps & list of categories - plants, vertibrates, etc. Mention that seq. much more pronounced in vertibrates

## Chapter 2: The Story in the Rocks

Bottom line fossil man discussion

It is difficult for us to imagine the surprise people felt when they first discovered fossils. To find the shape of an animal entombed in the earth, and made of stone--what mystery was this? In an superstitious age, ~~that still believed in magic~~, it was easy to attribute the existence of fossils to some mysterious force within the earth itself. Only over time did people become convinced that once-living plants and animals could actually turn to stone if buried under the right conditions. If buried quickly enough (before being eaten away by decay or scavengers), and if buried where the groundwater is rich in the right minerals, any plant or animal can become a fossil.

sounds like a known age - is it?

~~If not~~ Perhaps not use complete structure of chap.; but don't intro. new structure (pp. 23-4)

Scientists now read the fossil record as a chronicle of life in former ages. Skeletons, footprints, tracks, leaves, spores, worm burrows, animal tracks, and even bits of hide can all be found as fossils. By interpreting these clues, scientists seek to reconstruct what living things were like in the past.

What story do the rocks tell? Like everything in science, the answer to that question depends upon one's interpretation of the facts. There are several basic features of the fossil record that must be accounted for by any interpretation:

Fact #1. **Taxonomy** is the science of biological classification. Living things are classified as members of a species, then of a genus, family, order, class, and phylum. Each of these categories is referred to as a **taxon**. ((add a chart showing categories?))

An interesting (too mild) feature of the fossil record is that fossils from the vast majority of the known phyla of plants and animals (over 95%) appear within a very short period, geologically speaking. There is a veritable (virtual) "explosion" of life forms recorded in the rocks. Any theory of life's origin must explain how all the major body plans for living things appeared virtually (or, "right at the beginning of the history of life") at once.

Fact #2. A definite sequence of fossils appears to run throughout much of the fossil record. For example, among vertebrates, we often find fish in the lowest rock strata,

followed by amphibians, then reptiles, then birds, and then mammals. (simultaneous)

Facts #3. Although fossils form a rough sequence, the various types are not connected to one another. There is no gradual series of forms leading from fish to amphibians, or from reptiles to birds. Instead, fossil types are fully formed and functional when they first appear in the fossil record. For example, we don't find creatures that are partly fish and partly something else, leading gradually up to true fish. Instead, fish have all the characteristics of true fish from the earliest known fossils, reptiles have all the characteristics of true reptiles, and so on.

Fact #4. Moreover, once a fossil type does appear, it remains relatively unchanged throughout the fossil record. Instead of gradually transforming into another type, it merely diversifies within type. This characteristic of the fossil record is referred to as **stasis**. In other words, the fossils parallel what breeders have discovered: we may get all sorts of interesting and unusual varieties of roses or dogs, but each retains the diagnostic features that make it a rose or a dog.

**Darwin: The "Gravest Objection Against My Theory"**

In Darwin's day, the dominant interpretation of the fossil record was creationist. Scientists explained the succession of

retain "creationist" here

fossil types as evidence of a series of separate acts of special creation. Darwin's theory eventually overthrew all previous interpretations, however. His theory of evolution posited that living things formed a continuous chain back to an original, primeval cell.

Not necessarily one only - one or a few - Ambron p.131

Does Darwin's theory match the story told by the fossils? To find out, we must first ask, What kind of story **would** his theory match? If Darwin's theory is true, the fossils should show a continuous chain of creatures, each **taxon** (taxonomic category) leading smoothly to the next. In other words, there should be a vast number of transitional forms connecting each taxon with the next. The differences separating invertebrates and the first fish, for example, or reptiles and the first birds, are so great that they could only be bridged by a huge number of transitional forms. As Darwin himself noted in The Origin of Species, "The number of intermediate varieties, which have formerly existed on earth, [must] be truly enormous."

use a dif example

Yet this enormous number of intermediates simply does not exist in the fossil record. The fossils do not reveal a string of creatures leading up to fish, or to birds, or to mammals. Darwin conceded this fact: "Why then is not every geological formation and every stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic chain." Indeed, this was, in Darwin's own words, "the most obvious and gravest objection which can be urged against my theory."

And yet, fossil findings were still quite patchy in Darwin's day. The fossils discovered to that point were scattered here and there across the map of fossil types. Darwin placed his bet on the hope that intermediates connecting these individual fossils might still be found.

Thus began the search for "missing links." Convinced by Darwin's theory that fossil **taxa** (plural of taxon) must be linked by a graded series of intermediates, scientists began an intensive search. A few odd-ball types did show up that failed to fit neatly within any existing taxa, like the so-called reptile-bird Archaeopteryx, and these have been considered by some scientists to be intermediates. But most of the candidates for missing-link status have been rejected. Like the duck-billed platypus living in Australia today--which has a bill like a duck but fur like a mammal--these forms displayed mixed features without being true evolutionary links.

tatus of Arch. must fit in tone & position expressed w/text titut

This strongly suggests that it was taken at one point as a serious candidate

For over a century, **paleontologists** (scientists who study fossils) were puzzled by this glaring lack of transitional fossils. It was one thing to hold out the hope of finding missing links in Darwin's day when the science of paleontology was still in its infancy. The failure to find them could be attributed to a simple failure to search hard enough. But it is another thing to continue to hold out the same hope today, after 125 years of searching. Today the number of fossils that have been unearthed is staggering. About a quarter of a million

Wrong: term. lack of sufficient searching or insufficient searching

fossil species have been catalogued, and new ones are being discovered faster than they can be catalogued.

As larger numbers of fossils were found, they began to etch a definite pattern. Instead of forming a graded series, as Darwin had hoped, the fossils filled in existing taxa and left the gaps between them conspicuously empty. The pattern of the fossils is one of clusters separated by gaps. ((include a diagram something like Ross' "Discontinuous Conclusion")) see next page Perhaps that should not be surprising--it is, after all, precisely what we see among living organisms as well. There are many breeds of horses, but they are clearly separated from cows; there are many varieties of corn, but no one would confuse them with wheat. Varieties cluster around a basic **morphological** design (morphe means form, shape, structure) rather than leading smoothly from one design to the next.

**Evolution By Leaps**

or, scientists have rejected more and more of Darwin's theory

In recent years, Darwin's theory has been rejected by most scientists. Does that mean these scientists have rejected evolution itself? Not at all. Most are simply seeking to formulate new ideas about how evolution works. Since the fossil record shows clusters separated by gaps, scientists are trying to conjecture what sort of evolutionary process would leave such a pattern. The current view is that evolution is a step-wise process, remaining on a single level for some time (clusters, or

I have understood stasis as a term describing longevity in the fossil record, not as a biological term. Am I wrong?



**stasis**), then jumping to the next level so suddenly that the process leaves little fossil evidence (gaps).

A major proponent of the new theory of evolution is Stephen Jay Gould, a paleontologist at Harvard University. He calls his theory **punctuated equilibrium.** Equilibrium refers to the fact that taxa remain relatively stable for long periods of time (stasis). Changes that do occur represent diversification within type, not progress to a new type. According to the theory, this stability is sometimes broken--punctuated--by a sudden leap to a new taxon. Since only a small population of organisms undergoes this dramatic evolutionary leap, the transitional forms involved are few. Those that happened to fossilize are even fewer. Hence the gaps in the fossil record.

Gould's theory is only one of several approaches currently being investigated by scientists. The attractive feature of the new theories of evolution is that they account for Fact #3 and #4--the gaps in the fossil record--where Darwin's theory failed. Until recently, most people viewed Darwinism as nearly synonymous with evolution. But today scientists distinguish the belief **that** living things evolved from theories about **how** they evolved. ~~(whether slow and gradual or sudden and jerky).~~

**Creation: Taking the Rocks At Face Value**

The newer forms of evolutionary theory may fit the facts better, but their weakness is that they are based upon negative evidence. There is still no positive fossil evidence for

evolutionary descent from one taxon to the next. The fossils show diversification within type but not progression from one type to another.

Taking the rocks at face value, one might conclude that there never was a progression from one type to another--that each type originated independently. This is the creationist position. Creation is the theory that various forms of life began abruptly, with their distinctive features already intact: fish with fins and scales, birds with feathers and wings, mammals with fur and mammary glands. Gaps exist in the fossil record not because vast numbers of transitional forms mysteriously failed to fossilize but because they never existed.

Just as there ~~are~~ is more than one approach to evolution, so there is more than one approach to creation. Creationist theories split over Fact #2, the order of the fossils. Is there a sequence in the fossils and, if there is, what does it mean? The standard evolutionary interpretation is that rock strata around the world were laid down over several million years. Thus, they document a time sequence: Organisms that appear as fossils in lower strata lived earlier than those in higher strata. The evolutionist concludes that the later set developed from the earlier.

Among creationists there is considerable scepticism regarding this traditional interpretation. Three major alternative interpretations are found in creationist literature:

~~Doesn't~~ Don't accord w/chapter - we need to follow it closely

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1) **Old-Earth Creation.** Some creationists accept the same time sequence in the rocks as evolutionists do--but they draw a different conclusion. They propose that at various times throughout the history of the earth, an intelligent agent stepped into the course of natural history to create a new type of living thing. The gaps in the fossil record result from these creative acts. This position is sometimes referred to as Progressive Creation.

supernat. ural "acted in nat hist."

2) **Young-Earth Creation.** Other creationists acknowledge a certain order in the fossils but argue that it does not necessarily indicate a passage of time. It is possible that the earth is actually quite young and that the order we see in the rocks is due to something besides a progression of life forms.

For instance, in pre-Darwinian geology the fossil record was viewed as the result of a series of catastrophic events, such as floods and volcanic eruptions, each of which lay down thick strata within a very short time. Many modern creationists hold to this view, and consider different fossil groupings to be the result of ecological zonation: Marine animals are buried in different strata from land animals not because they evolved earlier but because they lived in different places.

Some creationists go further and consider all strata to be the result of a single, world-wide catastrophe. Fossils are found only in sedimentary rock, i.e., water-laid rock or volcanic ash. It is possible to attribute all the sedimentary rock layers

that cover the globe to a single, enormous disruption that caused both a flood and extensive volcanic activity. This position is sometimes referred to as Flood Geology. The order in the fossils is said to be the result of ecological zonation and hydraulic sorting, i.e., the tendency of moving water to sort things by size and shape.

3) **Agnostic Creationists.** Under this label we include scientists who deny that there is any real order in the fossil record at all. The much-touted sequence of the fossils simply does not exist, they argue. Nowhere do we find anything like a complete record of all the geological ages in one place. Most sites contain only a tiny fraction of the entire geological column. Moreover, large areas of the world are out of order for evolutionary theory. The entire Alps, for example, has so-called older fossils lying on top of so-called younger fossils.

What is the alternative in-top. of this group - (who are they?)

The "sequence" of the fossils is a paper construct only. It is put together by plugging in various segments from all over the world, many of which do not actually lie one above the other. So fragmentary is the evidence that putting the fossils together to tell the story of evolution is like putting a book together from bits of paper containing only words and phrases scattered all over the world.

Finally, new fossil discoveries have forced paleontologists to change the date for the first appearance of various organisms in the fossil record again and again. If you picture each order,

class, and phylum as a line, the line keeps reaching further and further back toward the beginning. Is it possible that all major groupings of plant and animal life were created in the beginning? This position accounts admirably for Fact #1, the explosion of life in the early rocks.

**Fact and Interpretation**

The order of the fossil record is sometimes treated as the evolutionist's trump card. Despite controversies over how evolution proceeds, many argue, nonetheless the fossil record establishes that evolution is a fact. That argument assumes, however, that evolution is the only plausible interpretation of the fossil record. As we have seen, there are several possible interpretations of the fossil record. The **existence** of the fossils is a fact; to explain what the fossils **mean** is to construct a theory--and evolution must take its place as one among several competing theories.

a little frontal

What the evolutionist is really saying is that he is willing to accept natural-cause explanations for the fossil record only. If we allow only natural-cause explanations, then if one fossil type lies above another type, the latter **must** have evolved from the former. ?

The question really comes down to the distinction between natural and intelligent causes. If a scientist comes to the study of geology with his mind already made up that science can deal only with natural causes, then he must adopt an evolutionary

framework. If, on the other hand, he comes with an open mind, then he is free to consider all interpretations and accept the one that best fits the evidence.

## Chapters 3 and 4: Of Fur and Feathers

To organize living things by whether they sport fin or feather or fur--that is the job of the taxonomist. His goal is to group organisms by their similarities and to distinguish them by their differences. But that's only half the story. Having recognized patterns of similarities, he then reaches out to explain what those patterns mean. Why are all vertebrates constructed on essentially the same body plan? Why do birds range from the spritely wren to the gangly ostrich, yet each retains the characteristics that make it a bird? Why can we classify living things in a hierarchical pattern as representatives of a species, genus, family, class, order, and phylum?

a little too breezy

(sub) groups w/in grps?

~~Two thousand~~ Twenty-three hundred years ago, in ancient Greece, an astute observer of the natural world named Aristotle asked himself the same questions. He developed what is called the typological approach to taxonomy. What makes both the wren and the ostrich birds in spite of their differences, Aristotle said, is that each embodies a pattern, or idea, or archetype--a set of characteristics that together constitute an idealized or generalized Bird type.

Bring this up? Feature it?

Likewise, the lion, the tiger, the leopard, the caracal, the cougar, the bobcat, and the domestic cat each embodies the Cat type. The wolf, the fox, the dingo, the jackal, and the domestic dog each embodies the Dog type.

singular?

The typological model seemed to match common-sense observation of the world. For nearly two thousand years of

Western intellectual history, it was the accepted way of understanding the organic world. Christianized Europe translated Aristotle's concept of archetypes into the more theological concept of patterns used by God in creation--"ideas in the mind of God," as they phrased it. In its Christian form, the typological model survived essentially intact throughout the development of taxonomy and zoology as scientific disciplines.

Then in the 1800's with the rise of evolutionary theory, the typological model came under attack. Darwin argued that taxonomic groupings exist only in the mind of the beholder. All that exists objectively are individuals; the living world is a continuous chain of individual organisms shifting gradually from one body plan to the next. Similarities, Darwin said, indicate not an archetypical pattern but a common ancestor. All birds share a set of characteristics because they all descended from a generalized bird that evolved in the distant past. Indeed, the existence of similarities became the single strongest argument for the validity of evolution.

true?

Today, with the decline of Darwinism, the debate over typology is being revived. Both creationists and certain anti-Darwinian evolutionists have argued that the typological model fits the living world better than Darwin's chain of individuals related by descent. Let's trace the lines of this debate and see its relevance for biology today. Again, our strategy will be first to lay out the basic facts uncovered by the science of

Have we explained "the decline of Darwinism" in light of new textbook emph?

yes?

taxonomy, and then to see how evolutionists and creationists account for these facts.

**Mary Had a Little Lamb (Ovis Aries)**

The fact that we can classify living things at all means that we perceive degrees of similarity among them. A dog is more like a wolf than it is like a fox; as a result, the dog and the wolf are classified in the same genus (**Canis**) but the fox is classified in a different genus. Yet a dog is more like a fox than it is like a cat; so they are classified in the same family (Canidae) but the cat is classified in a different family. Yet a dog is more like a cat than it is like a horse; they are placed in the same order (Carnivore), but the dog and the horse are placed in different orders. Still, a dog is more like a horse than it is like a fish; therefore, they share the same class (Mammal) but the fish is in a different class. Yet a dog is more like a fish than it is like a worm; both dog and fish belong to a single phylum (vertebrates) but the worm belongs to a different phylum. The dog has more in common with a worm, however, than it has with an oak tree; therefore, they are in the same kingdom (animals) and the tree is in a different kingdom (plants).

This may all sound rather simple, but the its simplicity is deceptive. Once we proceed beyond the rather obvious similarities--~~all~~ birds have feathers, ~~all~~ vertebrates have backbones--it is not always so easy to decide how to group

(cordata-notchord)

organisms. Similarities appear in a patchwork pattern that makes classification difficult.

Fact #1. Similarities are sometimes contradictory.

Consider the marsupials--mammals that nurture their newborn progeny in a pouch on the mother's belly (in contrast to placental mammals, such as humans). Marsupials and placental mammals are sometimes strikingly similar. For instance, in skeletal structure, the Canadian wolf and the now-extinct Tasmanian wolf are nearly indistinguishable. If found as fossils, they would surely be counted as members of the same species. The behavior and life-style of the Tasmanian wolf was likewise quite similar to that of the North American wolf. Despite these close parallels, because the two animals differ in their mode of reproduction, the standard taxonomic approach is to classify them in widely different categories--the Canadian wolf with the dog and the Tasmanian wolf with the kangaroo.

use same wolves as main text

Besides wolves, there are also marsupial look-alikes to cats, squirrels, ground hogs, anteaters, moles, and mice. Marsupials raise an interesting question for taxonomy: If similarity is the basis for classification, what shall we do when similarities conflict? The marsupial wolf is strikingly similar to the placental wolf in most features, yet it is like the kangaroo in one significant feature. Upon which similarity do we build our classification scheme?

How main text cap? (wolf?)

Fact #2. It may be difficult to distinguish similarity in function from similarity in structure.

A bird's wing and an insect's wing are both used for flying. Both function in the same way: air currents pushing against the flat surface of the wings provides lift, and flapping the wings provides forward thrust. Yet the internal structure of a bird's wing is very different from that of an insect's wing. The bird's wing consists of flesh, supplied with food and oxygen by a network of blood vessels. Its support is on the inside, in its bones. The insect's wing, on the other hand, has no bones or blood vessels. It consists of a thin membrane stretched tightly around a network of wiry structures, similar to a kite.

The two terms - homology & analogy don't fall out on a structure/function axis ?

2 Pandas - thumbs, for example

Which is relevant for classification--similarity in function or similarity in structure? The first great taxonomist, Linnaeus, faced this problem and chose the latter: he classified the flying insects with other insects and not with birds, which seems quite right to us as well. Similarity in structure he referred to as homology. Similarity in function he referred to as analogy.

Yet the distinction between homology and analogy is not always easy to draw. Early in his career, Linnaeus mistakenly classed the Cetaceans (whales) as fish, not realizing that their fish-like shape was not a homologous but an analogous resemblance. Indeed, in the history of taxonomy, over and over again structures of astonishing similarity that were at first thought to be homologous were later found to be merely analogous.

The giant panda is an eloquent illustration of the problem. The giant panda is native to the bamboo/alpine forests of southwest China. So is the lesser panda, or red panda. For over a century, scientists studying the two pandas have been unable to agree on whether they are members of the bear family or of the raccoon family. Since the first attempt to classify them in 1869, more than 40 major scientific studies have been published on the subject. About half of the studies concluded that the pandas were bears; half concluded they were raccoons.

undercuts interest in main text presentation?

In 1964, Dwight Davis, Curator of Vertebrate Anatomy at the Chicago Natural History Museum, published what has since been accepted as the definitive interpretation. Davis concluded that the giant panda was a bear, but the red panda was a racccon.

Here is a classic case of scientists' being unable to decide which similarities to treat as decisive. Until Davis, scientists were unanimous at least on one point: that the two pandas were close relatives and should be classified in the same family. After all, there are compelling similarities between the two animals. In skeletal structure, their snouts, or muzzles, are similar in shape, as are their jaw bones. There are likewise several similarities in their internal organs that tie the two pandas together and set them off from bears. Genetically, the giant panda has only 42 chromosomes, far closer to the red panda count of 36 than to the 74 chromosomes of most bears. Moreover, unlike most bears, the giant panda does not hibernate. Neither

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does it growl or roar like other bears; instead, it bleats like a sheep.

Perhaps the most dramatic similarity between the two pandas, however, is their "thumbs." This is not a true thumb but rather an enlarged bone of the panda's wrist. Yet it operates much like a thumb and is even partly opposable. The giant panda uses it to strip bamboo, an activity that consumes a major part of its day. The red panda's thumb is smaller than the giant panda's but is used in much the same way.

For over a century, the striking similarities between the two pandas were considered homologies and the animals were classified together. Today, however, they are classified in different families and the similarities are considered analogies.

Fact #3 Similarity in anatomy may be contradicted by similarities in biochemistry.

New techniques have enabled scientists to compare organisms on a cellular level. For example, blood proteins can be compared to determine degrees of chemical similarity. If we inject human serum into the body of a rabbit, the rabbit will react and build up antibodies to the serum. If we then mix the rabbit's serum with a new sample of human blood, the antibodies will react and form a cloudy, solid precipitate. On the other hand, if we mix the rabbit's serum with blood from other animals, there appears less cloudiness. This test can be used to determine how similar in chemistry the blood from other animals is to human blood. The

Not clear

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results obtained from experiments are: ape--62 percent of the precipitation caused by human blood; monkey--22 percent; cat--6 percent; chicken--0 percent.

What this test tells us is that animals similar in skeletal structure (e.g., apes and humans) may be similar in blood chemistry as well. But the results are not always so neat.

Another technique recently developed is protein mapping. Researchers can now employ high-technology equipment (the protein sequence analyzer) to map the amino acid sequences of proteins. By comparing the sequences of a particular protein, such as cytochrome c, taxonomists can map similarities between different animals. Cytochrome c is composed of a string of one hundred and four amino acids. Theoretically, animals with a greater number of differences in amino acids will be those classed farther apart taxonomically.

In some cases, our theoretical expectations are borne out, and organisms with similar skeletal structures also exhibit a low ~~number of~~ differences in protein structures. For instance, in humans and monkeys, the sequence of amino acids in cytochrome c is identical except for one amino acid. In other cases, however, similarities on the macro level fail to match up with similarities on the micro level. For instance, turtles have less in common with another reptile, snakes, than with birds. Chickens have less in common with ducks than with penguins. Similarly, analysis of the amino acids in hemoglobin, another

terms not introduced

generally, or in comparisons of a couple of proteins?

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protein, shows that crocodiles have less in common with snakes than with chickens. ((give more examples))

What do we learn from blood and protein analysis? The pattern of similarities and differences revealed by such procedures often contradicts the patterns revealed by anatomy and behavior. Sometimes animals that are similar in overall appearance are also similar on a molecular level. Sometimes they are not. Resemblances form a sort of patchwork pattern. Now let's see how evolutionists and creationists explain that pattern.

to be fair, we must acknowledge that a disproportionate # of cases go the evolutionist's way, however

## FAMILY RESEMBLANCE

good for use at top of discussion (p.1)

For Darwin, similarity was the major argument for evolution. Similarity is interpreted as "family resemblance": two organisms are similar because they are descendants from a common ancestor. Imagine a photograph of a large extended family. The family features are obvious; moreover, brothers and sisters resemble one another most closely, cousins somewhat less, and so on. In a comparable way, say evolutionists, degrees of similarity reveal how closely related organisms are.

For instance, the fact that all vertebrates are built on a common body plan means that they descended from a common ancestor, which evolved that body plan originally. Differences among vertebrates reveal how the basic plan has been adapted in each species under the pressure of natural selection.

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Yet, as we have seen, similarities are not always easy to discern nor to interpret. A given animal may resemble one group in certain features and another group in other features (as in the case of marsupials) requiring scientists to select which similarity to use in classification. In short, they must distinguish between homology and analogy. If the former indicates descent from a common ancestor, what does the latter indicate? According to evolutionary theory, similar features that are not inherited from a common ancestor result from **convergent evolution**, parallel adaptations to a similar environment. The Tasmanian wolf, for example, developed a skeletal structure nearly identical to that of the Canadian wolf because of genetic responses to a similar environment.

why withhold this term til 5 pages after analogy?

Unfortunately, the very term "homology" has been redefined to include the concept of evolution. Most biology books today define homology as correspondence of structure derived from a common ancestor. As a result, evolutionists sometimes fall unwittingly into a circular argument: the concept of evolutionary descent is employed to explain similar structures, and then the existence of similar structures is cited as evidence that evolution has occurred.

The argument from similarity has achieved even greater prominence today than in Darwin's day. Why? Because of the gaps in the fossil record. Because scientists no longer hope to trace a line of descent in the fossils from one organism to another,

prominence or importance?

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they must rely on similarities alone to construct a theory of relationships.

This it would serve quite well to help frame the problem initially

Indeed, some go so far as to argue that the sheer fact that we can classify living things at all is evidence for evolution. Antony Flew writes that the existence of homologous structures "should make the thesis of individual and separate creations of all species wholly unbelievable." ((**Darwinian Evolution** (London:Granada, Paladin Movements and Ideas Series, 1984), 28)) The assumption is that if creation had occurred, organisms would fail to resemble one another at all. Each would be constructed on a different pattern from the ground up. Classification would be impossible. Instead of falling into clusters marked by shared traits (such as all birds sharing wings and feathers) each individual species would be totally unique.

If the sheer fact that living things are classifiable leads inevitably to an evolutionary conclusion, it is surprising that over several millennia no one drew such a conclusion. Classification went on quite successfully before the appearance of Charles Darwin in the 18th century without employing the concept of family relationships. Instead, the organic world was seen as the handiwork of intelligent design. Structures held in common by large groups of organisms were interpreted as the outworking and adaptation of an original Idea or Archetype.

slightly awkward phrase

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confusing since we're in the discussion centering on biological analogy.

By analogy, think of the many things that can be classified that are **not** derived from a common ancestor--things like cars and paintings and carpenter's tools. In short, human artifacts. What makes all Fords look similar, or all Rembrandts, or all screwdrivers, is that they are derived from a common design or pattern in the mind of the person making them.

If not exaggeration re: critics, consider using Nova-"small vocab. of shapes" here!

Critics argue that if an intelligent agent created life, each major life form should be completely different from all others--the assumption being that the creative agent began from scratch in making each new design. But that assumption is ~~an~~ unwarranted. In our own experience we know that when people create things--whether car engines or computers--they begin with one basic design and adapt it to different ends. As much as possible, designers try to piggyback on existing designs instead of starting from scratch. Our experience of how human minds work provides an analogy to how a primeval, creator mind probably worked.

**A Living Mosaic**

Since both creation and evolution can logically account for similarities, the sheer existence of similarities cannot count as evidence against either theory. And yet, argue creationists, the erratic, patchwork pattern of similarities can be better accounted for by creation.

Recall the puzzle of the marsupials. According to evolutionary theory, the pattern for wolves, cats, squirrels,

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ground hogs, anteaters, moles, and mice each evolved twice: once in placental mammals and again, totally independently, in marsupials. This amounts to the astonishing claim that a random, undirected process of mutation somehow hit upon identical features several times in widely separated organisms.

Or take the problem of flight. The ability to fly requires a tremendously complex set of adaptations, affecting virtually every organ of the body. Yet evolutionists insist that flight has evolved independently not once but four times: in birds, in insects, in mammals (bats), and in reptiles (flying dinosaurs).

30-40 genes had to be mutated into a highly coord. cluster to fashion fruit fly wing - Ambrose

Finally, consider the case of hemoglobin. Hemoglobin is the protein that carries oxygen in red blood cells. It is considered a homologous feature in nearly all vertebrates. Yet it can also be found in invertebrates: in some annelids (the earthworm group), some echinoderms (the starfish group), some mollusks (the clam group), some arthropods (the insert group), and in some bacteria. Hemoglobin even appears in the root nodules of peas. In all these cases, it is the same molecule that we find in vertebrates--complete and fully functional. If hemoglobin evolved, we ought to be able to trace some line of descent here. But that turns out to be impossible. As one scientist admits, "It is hard to see a common line of descent snaking in so unsystematic a way through so many different phyla."

who? source? Do they (evolutionists) not have a sufficient explanation of "molecular stasis"? Isn't selection pressure sufficient?

Logically, the evolutionist might conclude that the existence of hemoglobin in these widely different groups is not due to evolutionary descent after all--that the molecule is not a

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homology but an analogy. But then he must say it evolved independently ~~each~~ many times time. That seems equally difficult to swallow. Parallel evolution might have sounded like a plausible explanation some decades ago when hemoglobin was thought to be a relatively simple structure. But we now know that hemoglobin is one of the largest and most complex molecules in nature, a web of about a hundred atoms arranged about a central iron atom. It does not seem possible that the entire eight-helix, twisted, exact, three-dimensional sculpture could appear repeatedly by chance mutations.

Do you mean amino acids?

Spatial precision of inter-molecular forces.

What all these examples reveal is that similarities do not trace a simple branching pattern suggestive of evolutionary descent. Instead, they occur in a complex mosaic or modular pattern. As creationist Gary Parker puts it, similarities like the hemoglobin molecule appear here and there in the mural of living things like a blue-colored tile in an artist's mosaic. ((Henry Morris and Gary Parker, **What Is Creation Science?** (San Diego: Creation-Life Publishers, 1982), 24.))

Don't want to quote Parker, Morris

Not sure these terms convey the picture we want

This may be the best imagery to use - but must be "unfolded more slowly"

Using different imagery, Michael Pitman describes similarities as fixed patterns or discrete blocks that can be assembled in various patterns, not unlike subroutines in a computer program. Genetic programs each incorporate a different permutation of these subroutines, generating the diversity of biological forms we see today.

To use another analogy, similarities among living things are like pre-assembled units that can be plugged into a complex

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electronics circuit. They can be varied according to an organism's need to perform particular functions in air or water or on land. Pitman concludes: "Organisms are mosaics made up from such units at each biological level, and nothing of ancestry can be deduced from their possession." ((Michael Pitman, **Adam and Evolution** (London: Rider, 1984), 38-41. These illustrations from Parker and Pitman are good. Can we use them?))

no yes

**True Homology**

Of course, we are talking here about macroevolution, not microevolution. The latter refers to small-scale variation and diversification, analogous to what breeders and farmers do when they breed for fatter cattle or sweeter apples. All domestic cattle were probably derived from one or a few initial wild forms. Likewise with apples. In these cases, the presence of similarities is indeed a clue to relationship. Here, in short, is true homology. ((Have we actually used the terms macro- and micro-evolution before? In our initial definition of creation we should have introduced these terms, or at least the distinction between large-scale change and minor variation.))

The principle suggested by breeding is this: when we can establish on other grounds (e.g., historical grounds) that a group of organisms is related, then we may use homology to determine relationships within that group. For example, creationist Wayne Frair has used protein comparison techniques to determine the precise classification of the leatherback turtle

How does Frair's work ex- emplify a historical basis for relating groups?

within the family of sea turtles. Creationist theory does not preclude all change; it merely denies the large-scale changes required by evolution, changes exceeding anything actually observed either in nature or in controlled experiments. In short, homology may play a restricted role in classifying variations within type but it is not conclusively evidence of evolutionary descent of one type from another.

it exceeding ?

SIDEBAR:

Paint and Ink

Evolutionists often cite findings of similarity in biochemistry as powerful, new confirmation of common ancestry. It was indeed impressive when scientists first discovered that all living cells contain ~~the same~~ DNA, composed of the same sugars and bases, and ~~the same~~ protein, composed of the same twenty amino acids. Clearly, organisms differ from one another much less at the cellular level than at the anatomical level. But what does this biochemical similarity mean? That all living things are related by descent from one original cell? To the creationist, it means merely that we have got down to the "raw materials" from which all living things were created.

under-states their case

The discovery that proteins are the basic building blocks of all living things generated great excitement. But would there be such excitement if we were to analyze Fords and Chevys and discover that they were constructed of the same kind of steel? Or that the paints used by Rembrandt and by Picasso were composed

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of the same chemical elements? Would these facts tell us anything about where the cars or the paintings came from?

Likewise, the discovery that DNA is the molecule of heredity in all living things was hailed as compelling new evidence for evolution. But would there be any such excitement if we were to discover that all the books in the Library of Congress were composed of chemically identical paper and ink? Would we construct from that fact a theory on the origin of the books?

was it? function completes the logic of this analogy

The theory of intelligent design does not mean each new living type must be produced out of thin air, entirely different from all other types. Indeed, if there were such wide variation in living things, food chains would be impossible and our present-day ecology could not exist. A universe made up of mutually dependent parts places considerable restraints on what variations are possible. The similarities we see at the biochemical level reflect the constraints of the starting materials and of the environment in which all living things must survive.

overstated - food chains would require more energy spent in gaining energy. True? support?

Tends to make strong assertions of general nature, rather than giving #s, like, for instance, Ambrose does. Afraid the #s are necessary. Most teachers will not be up to take enough to buy the conclusions otherwise.

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## Chapter 5: WHERE DO LIVING THINGS COME FROM?

Open any book on evolution and you will see photographs of light- and dark-colored moths, finches with different-sized beaks, varieties of roses, and races of human beings. Here before your eyes is evolution is action, says the text. Here is empirical proof that evolution occurs.

something's missing not sure what

But wait--the moths are still moths, the finches still finches, the roses still roses, the human beings still human. This is not evolution but merely diversification within type, says the creationist. Changes **within** type are not the origin of **new** types.

How do new types of living things arise? To answer that question we turn to the source of change within organisms--to genetics. What are the basic facts of genetics relevant to origins questions?

Fact #1. Most variations are produced by recombination of existing genes. The tremendous differences that divide a Pekinese, a Poodle, and a Greyhound illustrate the range of variation that may exist within a single gene pool. These variations are produced when dog breeders isolate particular genes governing size, curly hair, or speed within a single breed. The genes can be combined and recombined in a vast number of different ways. Most changes in the living world are produced in this way--not by the introduction of anything new into the gene pool but by simple recombination of existing genes.

defined?

Recombination may produce interesting and useful varieties, but it takes its toll upon the animal in terms of strength and survivability. Highly bred animals are weaker, more prone to disease, and less fertile. In fact, if bred too far, the animal simply becomes infertile and dies out. There is a limit to how far animals can be bred from their original form.

Fact #2. The only known means of introducing genuinely new features into the gene pool is by **mutation,** a change in the DNA structure. **Gene mutations** occur when individual genes are damaged from exposure to heat, chemicals, or radiation. **Chromosome mutations** occur when sections of the DNA are duplicated, inverted, lost, or moved to another place in the DNA molecule.

Mutations are quite rare. This is fortunate, for they are in virtually all instances harmful. Recall that the DNA molecule is like a message. A mutation is a random change in the message, akin to a typing error. Typing errors rarely improve the quality of a written message; if too many occur, they may even destroy the information contained in it. By the same token, mutations rarely improve the quality of the DNA code; too many may even be lethal.

EVOLUTION: NEW TRAITS FROM OLD

Behold the giraffe: Oversized limbs, stretched-out neck, ungainly posture--everything apparently precariously out of proportion. And yet its parts are marvelously coordinated to

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each other; it moves with graceful ease and delivers such a powerful kick that it has no natural enemies.

The outlandish body shape of the giraffe has been a puzzle to evolutionists since before the time of Darwin. Jean Baptiste de Lamarck, one of Darwin's predecessors, suggested that the giraffe's long neck resulted from its constant stretching upward to reach leaves to eat. Bone structure changed in response to the animal's need to reach ever higher. But scientists now know that body structure does not respond to the organism's needs or habits. If it did, Olympic racers should give birth to yet faster racers, and centuries of shaving should yield men without whiskers.

Darwin's theory of natural selection turned Lamarck's explanation around: instead of the environment giving rise to habits, which in turn produce new traits, Darwin maintained that something within the organism itself gives rise to new traits, which are either preserved or weeded out by the environment. In place of an organism needing a longer neck to survive, Darwin put an environment favoring organisms with longer necks, and then preserving any that happened along--the giraffe, as it turned out.

This is not correct & is almost totally dis-mantled in 7 lines (☆)

Clearly, the crux of Darwin's theory was to find that "something" within the organism that is the source of new traits. To maintain that organisms either survive or perish depending on whether they are well suited to the environment was no new insight. What was unique about Darwin's theory was his idea that

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some force within organisms could throw out new traits--traits that over time would produce an entirely novel sort of organism.

What force could this be? Darwin himself did not know. But ironically, at the same time Darwin was constructing his theory, an Austrian monk named Gregor Mendel was conducting experiments to answer just that question. Mendel discovered that traits could be lost in one generation only to reappear in a later generation. This meant, he concluded, that heredity was governed by particles (later called genes) passed on from parent to offspring. A trait might be lost temporarily, but the gene that ~~coded for~~ gave rise to that trait remained present within the organism and would be passed on to its offspring.

Was it evident then?

If Darwin had read Mendel's papers, he may never have published his own theory. For the gist of Mendel's work was that living things are remarkably stable. When a breeder, for example, causes some characteristics to appear or disappear, this represents neither a true loss nor a true gain. It represents merely the interplay of dominant and recessive genes. A trait "lost" is present still and will reappear. A "new" trait that seems to appear out of nowhere is not new at all but simply the expression of a recessive gene that existed all along. When breeders produce new show dogs or fatter cattle, they shuffle genes around and bring some of these recessive genes to expression.

bean bag vs. clusters (see p. 5too)

not 1 for 1

In short, Mendel showed living things are remarkably stable. His discovery fit neatly with the theory of intelligent design--

It did?

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the theory that each type of living thing was created with a limited pool of possible variations. But it clearly contradicted evolutionary theories (which may be why for decades Mendel's work was ignored). Evolution assumes that living things are constantly developing new traits--that from its beginning in a pool of chemicals, life is ever evolving new and varied structures.

It did, clearly?

Mendel's theory was not taken seriously until the first decade of the twentieth century, when evolutionists realized they had something to gain from it. Up to this point, the most commonly held concept of inheritance was a "paint-pot" model--the father's contribution mixed with the mother's the way blue and red combine to form purple. If paint-pot model were correct, then any new trait that might evolve would be lost, just as the original blue and red colors are lost. In Mendel's "bean-bag" model, by contrast, genes act separately and are inherited essentially unchanged. Mendelian genetics appeared to make evolution possible by explaining why a single new advantageous genetic trait could survive and become dominant in a population.

Mendelian genetics, then, has proved to be a mixed blessing for evolutionary theory. On the one hand, it provides the stability necessary for a trait to become established in a population. On the other hand, stability is just what evolution doesn't need if change is to be so far-ranging as to produce the whole complex web of life from a single one-celled organism.

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CHAPTER 5

Does Nature Select?

Darwin himself was a breeder

Darwin was impressed by the work of breeders, and with good reason. By selecting animals with particular traits and allowing them to reproduce, breeders were able to create greater differences **within** species than often exist **between** species in the wild. Could not nature do the same and much more, Darwin asked, given enough time?

It is obvious that, in nature, many more young are born than survive. It happens that at times, through recombination of existing genes and through mutation, some young may acquire a new trait not present in their peers. If the new trait renders these youngsters better suited to the ecological niche they inhabit, they have a better chance of surviving and passing the trait along to offspring. If they are lucky enough to survive, and if their succeeding generations are likewise lucky, eventually animals that possess that particular trait will come to outnumber those who do not. The trait has become established.

Too easy

Darwin dubbed this process natural selection, to emphasize its parallels to what breeders do when they select for given traits. Unfortunately, the term implied that nature was capable of actually "selecting"--of foreseeing what is needed, of choosing appropriate traits, of guiding and directing the process of evolution. Of course, nature can do none of these. The term natural selection simply refers to the interplay between organism and environment that allows new traits to become established within a population.

N.S. should be shown as conservative force

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N.D. Synthesis

Darwin's classic theory of natural selection was eventually refined to include Mendelian genetics and our current knowledge of mutations. But Neo-Darwinism is under attack today, and not just from creationists. Within the evolutionist camp itself, criticism has erupted.

not really

## The Wrong Kind of Change

The volley against Neo-Darwinism was delivered by both paleontologists and geneticists. On the one hand, paleontologists finally resigned themselves to the reality of gaps in the fossil record; as a result, they have reluctantly rejected Darwin's schema of evolution by a steady accumulation of minor changes (see Chapter Two). On the other hand, geneticists have spent the last several decades studying genes and mutations; they have concluded that the changes observed do not constitute the **kind** of change required by evolution.

They have? The kind of change required by which kind of evol?

Scientists sometimes give the impression that any change is evidence for evolution. But evolution is not just any change. It is a very special kind--the transformation of one type of organism into another. If you picture in your mind an evolutionary tree, the change produced by breeders is horizontal change, the flowering and elaboration of a single branch. This is diversification within type, sometimes called micro-evolution. What is needed, however, is vertical change, leading up the evolutionary tree. This is the origin of new types, sometimes called macro-evolution.

within a given level of complxty

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Neo-Darwinism assumes that micro-evolution leads to macro-evolution. To put that into English, it assumes that small-scale changes will accumulate and lead to large-scale changes. But half a century of experiments with genes and mutations has led geneticists to reject that assumption. The changes observed in the laboratory and the breeding pen are all limited, all micro; they do not accumulate the way the theory requires in order to produce macro changes. The process that produces macro-evolutionary changes must be different from any that geneticists have studied so far.

This speaks for the whole science

What is that process? No one knows. At present there is no accepted genetic theory to replace Neo-Darwinism. Evolutionists are in the uncomfortable position of being unable to present a mechanism to explain how living things evolve. They continue to be committed to the belief **that** evolution occurs but are uncertain **how** it occurs.

But suggestions are put forth

## INTELLIGENT DESIGN: PACKAGE DEAL

The giraffe's long neck may appear ungainly, but it is actually an integral part of the animal's overall structure. Darwin supposed the giraffe's long neck was necessary to reach foliage high in the trees. That may be true, but the fact is that the giraffe also bends its head down to the ground to eat grass and drink water. Given the giraffe's long legs, its neck may just as well be required to reach the ground as the trees. In short, the giraffe is an adaptational package in which each

Why bring D. up?

Too short to make the point yet

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save til "single schema" ¶

part is suited to the others. Trying to explain which one came first is like trying to explain which came first, the chicken or the egg.

There is more. The giraffe requires a very special circulatory system. When standing upright, its blood pressure must be extremely high to force blood up its long neck, which in turn requires a very strong heart. But when the giraffe lowers its neck to eat or drink, the blood rushes to its head and it faces a potentially dangerous situation: its high blood pressure together with the weight of the blood in the neck could produce such a high pressure in the head that the blood vessels would burst.

To counter this effect, the giraffe is equipped with a coordinated system of blood pressure controls: Pressure sensors along the neck's arteries monitor the blood pressure and activate contraction of the artery walls to counter the increase in pressure.

yes? Rete M. too

In short, the giraffe represents not a mere collection of individual traits but a package of interrelated adaptations. It is put together according to an overall "Bauplan," or design, that integrates all parts into a single schema. Where did such a schema come from? ?

The evolutionist says the giraffe evolved to its present form by an accumulation of individual, random changes preserved by natural selection. But it is difficult to see how a random process could produce an integrated package of adaptations.

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Ambrose discussion of sheep here, or in main chap?

Random mutations might adequately explain change in a relatively isolated trait, such as color. But major changes, like the evolution of the giraffe from some other animal, would require an entire series of co-ordinated adaptations. The complex circulatory system of the giraffe must appear at the same time as its long neck or the animal will not survive. An overall integrated design must be present from the beginning.

No sense of proportion connotes high potentiality for "tinkering" better

To explain the appearance of new body types, we need a mechanism capable of generating not detailed change but **systemic** change (affecting an organism's general physical structure). As an analogy, suppose you are a plumber by education and trade. Experience can teach you quite a bit about how to be a better plumber. But experience as a plumber cannot teach you how to be an electrician. No amount of refining of your plumbing skills will change you into an electrician. Instead, you must start all over again learning the new subject area. Likewise, minor changes caused by recombination of genes and by mutation are acted upon by natural selection to refine an organism, enabling it to fit better within its ecological niche. But no amount of refining of its current body plan will produce a new body plan.

minor" needs to be addressed more quantitatively (can happen, but don't build a theory out of it)

The 2 kinds of change must be more convincingly distinguished (as by Ambrose) or this gives away the ballgame

upward? more info?

In creating a new organism, as in building a new house, the blueprint comes first. We cannot build a palace by tinkering with a tool shed and adding bits of marble here and there. We have to begin by devising a plan for the palace; then all the parts will be coordinated into an integrated schema.

The analogy is good, but only after the case has been persuasively made

CHAPTER 5

Evolution locates the origin of new organisms in material causes, the accumulation of individual traits. That is akin to saying the origin of a palace is in the bits of marble added to the tool shed. Intelligent design, by contrast, locates the origin of new organisms in an immaterial cause: in a blueprint, a plan, a pattern, devised by an intelligent agent.

## Chapter 6: The Origin of Species

The creation/evolution controversy is very complex, involving arguments from biology, genetics, geology, paleontology, embryology, and comparative anatomy. The ordinary person is hard-pressed to grasp it all.

Yet, the core of the controversy is relatively simple: It is the question whether change in living things is limited or unlimited. Darwin believed change is unlimited, that species are infinitely plastic. He thought a species could vary indefinitely and in any direction. Yet all changes scientists have actually observed--in breeding experiments, for example--are limited. Breeders have created all sorts of interesting varieties of cats and horses and roosters, but the new animals are still cats and horses and roosters.

Yet evolutionists argue that the mechanism for unlimited change lies in **speciation** (the origin of new species). Darwin was certain that the mechanism for the rise of new species would also be the mechanism for the rest of evolution. If a new species can arise, then the same process continued further should give rise to a new genus, then a new family, order, class, and phylum.

Is speciation the door to unlimited evolutionary change? What do scientists know, a hundred and thirty years after Darwin, about speciation?

Didn't we say earlier (a point unfamiliar to me) that Darwin rejected the notion of species for a continuum of individuals? Does this appear to conflict w/ Chap. 3&4, p. 2?

CHAPTER 6

Fact #1. The rise of new species depends on what we mean by the word "species."

capable of ongoing propagation (Check:) See p. 4 breeding chain

A species is generally defined as a interbreeding population. Therefore, a new species is produced when a group splits off from its parent population and no longer interbreeds with it.

This might happen when some physical barrier cuts the group off from its parent group. For example, birds might be blown by storms onto an island that is too far from the mainland for them to fly back (which apparently happened to the finches that now inhabit the Galapagos Islands). Or animals may cross to a new continent by a land bridge that later erodes away.

Once physically isolated, the two groups may change in different directions. They may accumulate a different set of mutations. Each is also subject to **genetic drift**, which means that the frequency of certain genes may change. Eventually the two groups may not be able to interbreed any more, even if they are brought back into contact with each other.

But Hardy-Weinberg principle

Fact #2. Speciation is more likely to occur in smaller populations.

The effects of mutation and genetic drift are much more dramatic in small populations. Because members of a small group are forced to interbreed very closely, a mutation could become widespread very quickly. Genetic drift is more pronounced because the laws of genetics are statistical. When a black

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This appears to illustrate a change in gene frequency rather than just providing an example of small sample/large sample

guinea pig mates with a white guinea pig, the laws of genetics may tell us to expect so many white offspring, so many black, and so many gray. But the individual case may be all white or all gray or any other combination. Why? Because, according to the laws of probability, the smaller the number of cases, the larger is the deviation from the expected results.

When you toss a coin, it has a fifty-fifty chance of turning up heads. If you toss it only four times you may not get an even two-to-two ratio. You may even get all heads, or all tails. Yet if you toss it a million times the results would be very close fifty-fifty. By the same token, a small population may show greater deviances from expected gene frequencies.

Fact #3. Other events can also affect gene frequencies.

I think this is inclusive of Fact #2

The **founder effect** operates when a small group colonizes a new habitat or ecological niche. Suppose, for example, our guinea pig family is brought by settlers to a remote island; two of them escape and establish themselves in the wild. Since two individuals represent a very small population, it is highly likely that the gene frequencies represented will show some deviance from those in the larger parent population.

The **bottleneck effect** operates when some environmental event, such as drought, greatly reduces the size of a population. The gene frequencies in the remaining population can vary greatly from those in the original population.

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CHAPTER 6

Fact #4. Speciation may occur when a breeding chain is broken.

A **breeding chain** is not unlike what we see in dogs. A Chihuahua may not breed with a Great Dane because of sheer size, but it will breed with other dogs closer to its size. These dogs in turn will breed with other dogs slightly larger in size, until finally we reach the Great Dane. In other words, though the two extremes cannot interbreed, there are intermediate breeds connecting them. Therefore all dogs are considered a single species.

Such a breeding chain may exist in nature as well. A classic example is a species of fruit fly living in the Amazonian and Central American rain forests. These forests originally covered an immense area, the size of the European continent. At one time, a single species of fruit fly had a continuous distribution over the entire vast domain. Recent studies, however, have found that subpopulations now exist within the species. Adjacent subpopulations can interbreed with each other but those at the opposite edges of the rain forest cannot interbreed with each other.

This is happening in the Amazon now

What would happen if the intermediate links disappeared? If some environmental event, say the development of a great plain, cut the rain forest in two, the intermediate links would die out. The extreme subpopulations would now be considered separate species, although at one time they were part of the same species.

CHAPTER 6

## WHAT SPECIES OF SPECIES?

Darwin presumed that if he proved the origin of new species, he had proved evolution. Hence the title of his book on evolution, The Origin of Species. But he was working with an entirely different definition of species from the modern one.

The ancient Greek philosopher and biologist Aristotle taught that species are eternal and unchanging. For him, a species was a generalized Form of Cat or Sparrow or Whale, of which all particular cats and sparrows and whales were representatives. Aristotle believed matter was evil and constantly resisted the pattern imposed on it by the ideal Forms; this was the source of individual variations.

(they held that...)

The Christians of the Middle Ages rejected Aristotle's view that species are eternal (only God is eternal). But the influence of classical culture was so great that the medievals did not break completely with the Aristotelian approach to nature. And so Christians continued to hold that once created, species never change and never die out. With the discovery of other continents, they added the notion of creation in location: that the species of Africa were created there, the species of America created there, and so on.

This definition of species made it relatively easy for the early evolutionists to "refute" creation. All they had to do was to prove that many organisms once alive are now extinct (species don't last forever), that variation does occur (species are not

unchanging), and that organisms often migrate (species were not created in their current locations).

Much of Darwin's book **Origin of Species**, for example, is taken up with just such arguments. Yet today such arguments would not be persuasive. Why not? Because the definition of species has changed. Modern creationists allow for extinction, variation, and migration. Today "the species question," as it is called, is simply whether there is a natural unit in the organic world beyond which change will not go. The evolutionist is committed to unlimited change. The creationist maintains that there is a natural unit that limits the kind of change that will take place in living things.

The Modern "Species"

pretty cozy w/Aristotle ?

Modern evolutionists are eager to get away from any hint of Aristotelian Forms or Archetypes. The most common definition of species today is an interbreeding population. A new species, then, is simply a race or variety that has become reproductively isolated from its parent population. But is this evolution?

Yes, says the evolutionist. Once reproductive isolation occurs, the road lies open to large evolutionary change. Each of the two separated populations will now continue to evolve further independently.

No, says the creationist. Speciation represents change, but not the right kind of change. Think again of the illustration of dogs. What if the intermediate-sized breeds somehow all died

out, leaving only Chihuahuas and Great Danes? The species Dog would now consist of two reproductively isolated populations. But would we consider them separate species? Would we conclude that they now were capable of evolving into something other than dogs?

The appearance of reproductively isolated populations represents micro-evolution, not macro-evolution. It is one of the ways in which there can be diversification within type. As we put it earlier, it is a mechanism for the flowering of a branch in the evolutionary tree, not for going up the tree.

change w/in a level of complexity

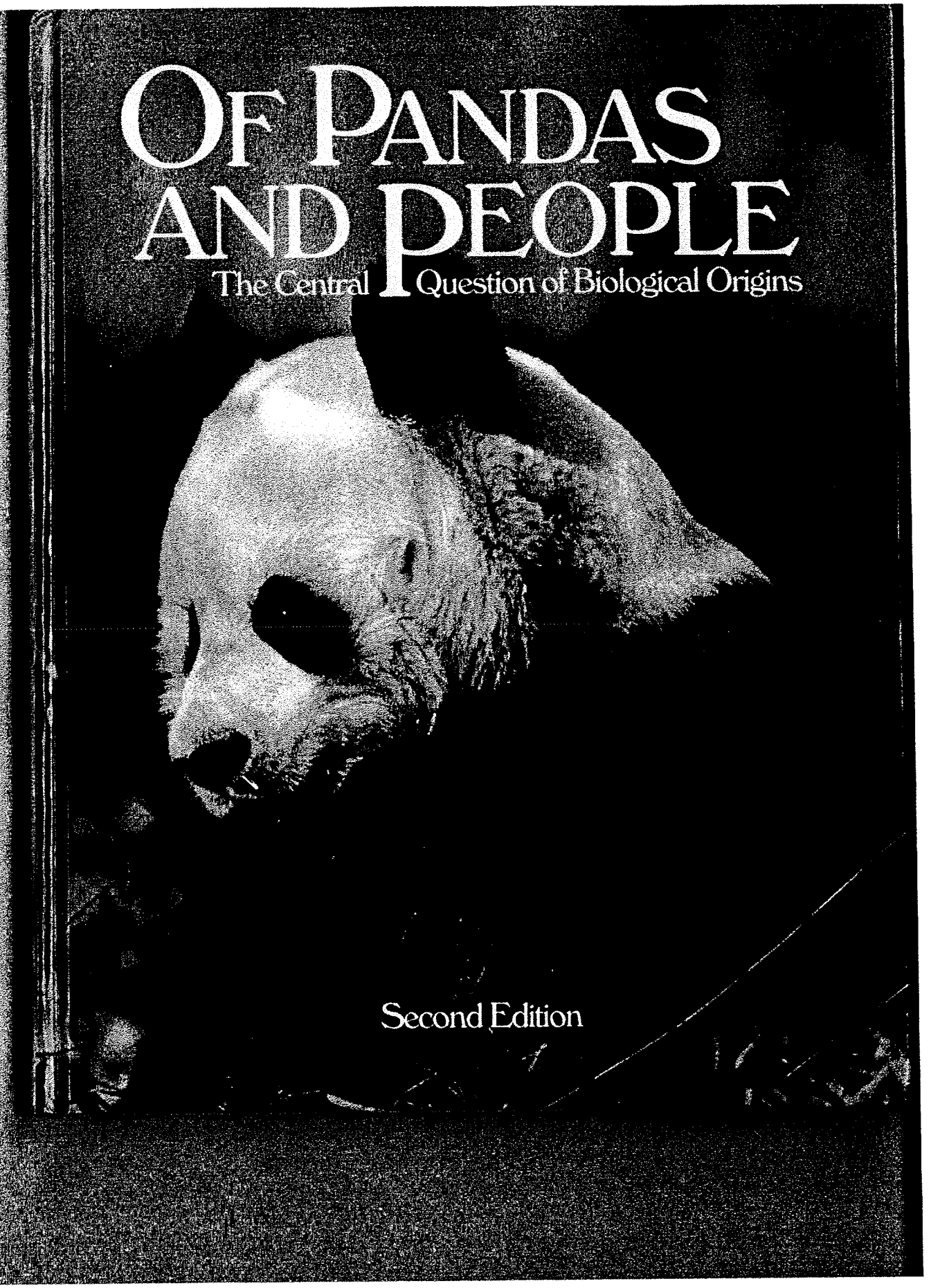
Mechanisms of speciation all represent a loss of genetic information. Yet going up the evolutionary tree requires the creation of additional genetic information. To go from a one-celled organism to a human being means that information must be added to the genetic code. The founder effect and the bottleneck effect both create varieties by cutting a small population off from its parent population and building a new group from the more limited genetic information contained in that small population. Mechanisms for the loss of genetic information cannot be used as support for a theory requiring the gain of genetic information.

Speciation is actually much akin to what breeders do: They isolate a small group of plants or animals and force them to interbreed, cutting them off from the larger gene pool to which they belong. Centuries of breeding testifies to the fact that this produces limited change only. It does not produce the unlimited change required by evolution.

# HEARING EXHIBIT 8

# Of Pandas and People

## The Central Question of Biological Origins



Second Edition

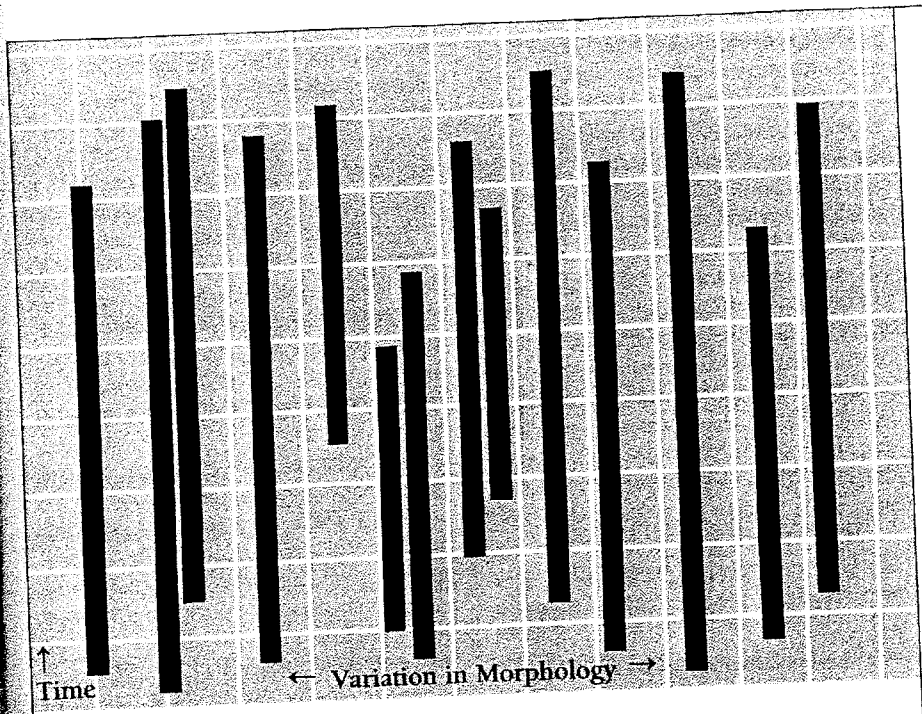



Figure 4-4. *The pattern of phylogenetic origins, according to the face value interpretation of the fossil record.*

alive today. Those that end before reaching the top represent extinct forms like *Archaeopteryx* (ar-kee-OP-tuh-rix) or the dinosaurs. The vertical lines do not converge at the bottom as they did in Figure 4-1. This indicates that as more fossils are being discovered, organisms within distinct groups, not transitional forms, are being found in older and older strata.

The intelligent design view is also consistent with Feature No. 2—the observation that some forms of life have undergone little or no change (by conventional reckoning) for tens or hundreds of millions of years. Some of these forms are still surviving today. Table 4-1 lists examples of some of these "living fossils."

Darwinists object to the view of intelligent design because it does not give a natural cause explanation of how the various forms of life started in the first place. Intelligent design means that various forms of life began abruptly through an

Examples of "Living Fossils"

| Organisms | First Appearance | Years Ago |
|---|---|---|
| Aardvarks | Early Miocene | 20 My* |
| Alligators | Early Oligocene | 35 My |
| New World Porcupines | Early Oligocene | 35 My |
| Snapping turtles | Late Paleocene | 57 My |
| Sirens (amphibians) | Late Cretaceous | 80 My |
| Sturgeons | Late Cretaceous | 80 My |
| Echinoneid sea urchins | Late Cretaceous | 80 My |
| Bowfin fishes | Middle Cretaceous | 105 My |
| Calatheid crabs | Middle Jurassic | 170 My |
| Horseshoe crabs | Early Triassic | 230 My |
| Notostracan crustaceans | Late Carboniferous | 305 My |
| *Kakabekia* (possible Precambrian protozoan) | | 1,900 My |

*My = millions of years

Table 4-1. *A sample of organisms remaining largely unchanged over vast periods of time.*

intelligent agency, with their distinctive features already intact—fish with fins and scales, birds with feathers, beaks, and wings, etc. Some scientists have arrived at this view since fossil forms first appear in the rock record with their distinctive features intact, and apparently fully functional, rather than gradually developing. No creatures with a partial wing or partial eye are known. Should we close our minds to the possibility that the various types of plants and animals were intelligently designed? This alternative suggests that a reasonable natural cause explanation for origins may never be found, and that intelligent design best fits the data.

## Gaps and Groupings in the Fossil Record

### Mammals

A most impressive example of transition to which Darwinists point is the series bridging from the reptiles to the mammals. This class-level transition is to have taken place through a group of mammal-like reptiles called Therapsids (thuh-RAP-sidz). Among the several Therapsid lineages were the dominant land-dwelling vertebrates from the middle of the Permian period to the middle Triassic. Indeed, it does appear that they provide Darwinists with a superior example of a transitional series. In 1987, evolutionary biologist James Hopson published an article describing a series of eight Therapsid skulls that made up a fairly well-filled-in sequence of intermediate types, apparently leading to the ninth, an early mammal named *Morganucodon* (mor-guh-NOO-kuh-don).[11]

Hopson detailed several characters exhibited by the series, characters that progress together toward the mammalian body plan. These include: 1. Change in the way the limbs are connected. 2. Increased mobility of the head. 3. Fusing of the palate. 4. Improved musculature of the jaw. 5. Migration of the articular and the quadrate bones from the back of the reptile's jaws toward the middle ear (where in the mammal they would be transformed into auditory ossicles). It is the simultaneous movement of several traits, says Hopson, that clearly infers that the Therapsids are a continuous lineage to the mammal. (Of course, fossils can't record the potentially vast differences in systems like the reproductive and circulatory systems, nor the organs, glands, and other soft tissues they entail.)

What Hopson actually presented, however, is a structural series, not a lineage. Although he predicts "that the series of mammal-like reptiles ordered on the basis of morphology will also form a series in geologic time,"[12] in actuality, the first three of Hopson's Therapsids are contemporaries from two separate orders, and some are not thought to be mammalian ancestors. Rather than older, the fourth is more recent than the fifth, and the final Therapsid is more recent than the mammal (Morganucodon) presented as its descendent!

It is legitimate to assemble a morphological series for the purpose of speculating about which skull is structurally intermediate to which others, but it is certainly not in the interest of education if it is presented as a single path of descent—an actual evolutionary lineage.

There are numerous fossil Therapsid species in the record. In fact, Douglas Futuyma said:

> The gradual transition from Therapsid reptiles to mammals is so abundantly documented by scores of species in every stage of transition that it is impossible to tell which Therapsid species were the actual ancestors of modern mammals.[13]