

**ENHANCING SCIENCE  
EDUCATION THROUGH  
TEACHING ORIGINS  
IN SCIENCE CLASSES**

by David A. Prentice, B.S., M.Ed., M.A.S.T.

email [prentice@instruction.com](mailto:prentice@instruction.com)

# TEACHING ORIGINS IN SCIENCE CLASS

## TABLE OF CONTENTS

Preface	viii
Chapter 1 - INTRODUCTION	1
I. Definition of Creation and Evolution	
A. Creation: Initial complexity.	
B. Evolution: Initial disorganization.	
II. A non-issue: Science and the existence of an influence outside nature	2
A. Necessary characteristics of a creator.	
B. Necessary characteristics of random chance.	3
III. The nature of knowledge (Epistemology)	
A. Sense Experience	4
B. Authority	
C. Logic	
D. Intuition	
E. False knowledge	
IV. Potential problems with logic	
A. Syllogisms	5
B. Incorrect structure	6
C. False premises	
V. Basic premises of creation and evolution	7
VI. Science and Design.	8
VII. How science works.	9
A. Scientific methods.	
B. Laws, theories, laws, and models	10
C. Limitations of science.	11
D. Potential problems with evidence	
Chapter 2 - SETTING UP AND USING MODELS.	14
I. How to set up models of the past.	
II. First prediction - ORGANIZATION OR DISORGANIZATION.	
A. Initial Complexity.	
B. Initial Disorganization.	
C. Actual Observation	15
1. Conditions for entropy decrease	
2. Thermodynamically favorable reactions	16
3. Information vs. order	
4. Chaos theory	17
D. Summary	18
III. Second prediction - ORIGIN OF MATTER AND ENERGY.	
A. LARGEST SCALE: the entire universe.	
1. Initial Complexity.	
2. Initial Disorganization.	
3. Actual Observation	

a. Eternal universe model	18
b. Quantum universe model.	19
c. Oscillating universe model	
d. Steady state universe model	21
4. Summary of origin of matter and energy on largest scale.	
B. SMALLEST SCALE - atoms. Origin of the chemical elements.	
1. Initial Complexity.	22
2. Initial Disorganization.	
3. Actual Observation	
a. Big bang synthesis	
Periodic table	23
b. Synthesis in stars	25
c. Synthesis in supernovae	
4. Summary of origin of matter at the atomic level	27
Chapter Summary	
Chapter 3 - ORIGIN OF LIFE (Biochemistry)	28
I. Origin of Life.	
A. Initial Complexity.	
B. Initial Disorganization.	
C. Actual Observation	
1. Atmospheric oxygen	29
2. Oxygen-Ultraviolet dilemma	30
3. The trapping mechanism	32
4. Nitrogen fixation	
5. The problem of optical isomers	33
6. The problem of chemistry	34
7. The DNA/Enzyme dilemma	36
8. The cell membrane	37
D. Origin of life summary	38
II. Is there life in outer space?	
A. Basic requirements for life	
B. What the Bible says about life in space	39
C. What about reports of UFOs?	40
III. Chapter Summary	41
Chapter 4 - DEVELOPMENT OF LIFE AFTER ITS ORIGIN - How Did Living Things Get the Way They are?	42
I. Review of DNA and genetic information.	
II. Origin of new features in living organisms.	
A. Initial Complexity.	
B. Initial Disorganization.	
C. Actual Observation - effect of mutations	43
1. No mutations known to increase genetic information.	
2. No mutations known to benefit a species.	
3. Unpredictability of number of base pairs.	44
4. Duplication of genes and chromosomes.	

D. Summary of effects of mutations.	45
III. Error-correcting mechanisms in DNA reproduction.	
A. Initial Complexity.	
B. Initial Disorganization.	
C. Actual Observation.	46
1. Effects of mutations.	
2. Operation of enzymes.	47
a. Nucleotide selection.	47
b. Preliminary proofreading.	48
c. Final error detection and correction.	
3. Summary of error correcting mechanisms.	49
IV. Sexual vs. asexual reproduction	
V. Protein manufacturing - UNIVERSAL GENETIC CODE.	
A. Initial Complexity.	
B. Initial Disorganization.	
C. Actual Observation.	
D. Summary of protein manufacturing.	51
IV. Chapter summary.	
Chapter 5 - DEVELOPMENT OF LIFE - The Fossil Record	52
I. Contrasting Beliefs about the development of life since its origin	
A. Initial Complexity.	
B. Initial Disorganization	
C. Actual Observation - not possible.	53
II. The Geologic Column	
A. Nomenclature	
B. Source of names	54
III. Adequacy of the Fossil Record.	
A. Arguments for and against Initial Complexity.	
B. Arguments for and against Initial Disorganization: Neo-Darwinism.	55
C. Arguments for and against Initial Disorganization: Punctuated Equilibria.	
D. Summary of the three models.	56
IV. Contrasting Beliefs about how strata were deposited.	
A. Initial Complexity - Catastrophism.	57
B. Initial Disorganization - Uniformitarianism.	
C. Actual Observation.	
1. Large scale deposition and erosion of strata in nature.	
2. Deposition of strata under laboratory conditions.	58
D. Summary of Actual Observation	
V. Contrasting Beliefs about how fossils were formed.	
A. Initial Complexity - rapid burial.	
B. Initial Disorganization - slow fossilization.	
C. Actual observation - conditions needed to preserve fossils.	
1. Fossilized bones under laboratory conditions.	59
2. Oil.	
3. Rapid mineralization.	
D. Summary of actual observation.	

VI. Contrasting Interpretations of the Rock Strata.	
A. Initial Complexity - Strata represent Ecological Communities.	59
B. Initial Disorganization - Strata represent time periods.	60
C. Actual Observation.	
1. Strata identified by suites of fossils.	
2. Missing or out of sequence strata.	
3. Origin of life and the stratigraphic level of fossils supposed to be the oldest.	
D. Summary of Interpretations.	61
VII. Expected Characteristics of the Fossil Record.	
A. Initial Complexity.	
1. Sudden Appearance.	
2. Stasis.	
B1. Initial Disorganization - Neo-Darwinism.	
1. Gradual development of terminal forms.	
2. Continual gradual change.	
B2. Initial Disorganization - Punctuated Equilibria.	
1. Stasis.	
2. Sudden Appearance.	
C. Actual Observation.	62
1. Sudden Appearance of Terminal Forms.	
a. The Ediacaran Fauna.	
b. Sudden appearance of many higher taxonomic categories - the Cambrian Explosion.	
c. Explosive appearance of mammals in the Cenozoic.	63
2. Stasis.	64
VIII. Chapter Summary.	65
A. Expectations of Initial Complexity.	
B. Expectations of Initial Disorganization.	
 Chapter Six - FOSSIL FISH AND AMPHIBIANS	67
I. Classification systems.	
A. Linnaean system	
B. Phylogenetics (cladistics)	
II. Fish to Amphibians.	69
A. Most common textbook scenario	
B. Why would fish evolve into amphibians?	
1. Contrast of basic explanations for origin of amphibians	
2. Genetic information in DNA	70
3. Insufficiency of drought scenario	
C. Fish proposed as ancestors of amphibians	71
1. Coelacanths	
2. Lungfish (Order Dipnoi)	72
3. The Notochord: Anatomical problem with both types	
D. General differences between fish and amphibians	
1. Major anatomical differences	
2. Method of fertilization	73
3. Metamorphosis	74

a. Absence of metamorphosis in either crossopterygians or lungfish	74
b. Metamorphosis in non-crossopterygians fish	
E. Amphibians proposed as earliest types	75
1. Absence of intermediates	76
2. Alleged transition ( <i>Tiktaalik</i> ) out of sequence	
F. Unexplained origin of non-labyrinthodont amphibians.	
1. Structure of backbones and vertebrae	77
a. Rhachitomous vertebrae	
b. Lepospondylous vertebrae	78
2. Extinct amphibians.	
a. Order Ichthyostegalia.	
b. Order Temnospondyli.	
c. Order Anthracosauria.	
3. Amphibians on the geologic column	
a. Subclass Labyrinthodontia	
b. Subclass Lepospondyli	79
4. Living amphibians (Subclass Lissamphibia).	
III. Amphibians to reptiles	80
A. Some of the major differences between amphibians and reptiles	
1. Maturation	
2. Skin	81
3. Breathing	
4. Fertilization	
Amphibian vs. Reptile Eggs	
B. Amphibians and reptiles on the geologic column	82
IV. Chapter summary.	83
A. Reasons for belief in Initial Disorganization	
B. Reasons for belief in Initial Complexity	
 Chapter Seven: DINOSAURS AND BIRDS.	85
I. Dinosaurs from a non-religious perspective.	
A. Linnaean classification of Class Reptilia.	
B. Cladistics .	86
C. Explanations for missing transitions.	
D. Things that were not dinosaurs.	87
1. “Mammal-like reptiles (cotylosaurs)- included among synapsids	
2. Marine reptiles - Orders Ichthyosauria, Sauropterygia, and Squamosa.	
3. Flying reptiles of Order Pterosauria.	88
4. Other non-dinosaur orders in Subclass Archosauria.	89
E. True dinosaurs.	
1. Order Saurischia	
2. Order Ornithischia.	
F. Suites of fossils containing dinosaurs.	90
G. Number of dinosaur types.	91
1. Triassic animals.	
2. Lower Jurassic animals	92
3. Middle Jurassic animals.	

4. Upper Jurassic animals.	92
5. Lower Cretaceous animals.	93
6. Upper Cretaceous animals.	
H. Were dinosaurs warm-blooded?	
II. Questions about dinosaurs with religious implications.	94
A. How long ago did dinosaurs live?	
B. What killed off the dinosaurs?	
1. Basic presuppositions of evolution and creation.	
a. Natural processes vs. possibility of non-natural processes.	
b. Only one possible explanation vs. multiple possibilities.	
c. Extremely slow (old earth) vs. no specific age required.	
d. Uniformitarianism (no flood) vs. catastrophism (possibility of flood).	
2. Proposed explanations for extinction.	95
a. Initial disorganization - volcanoes, climate change, asteroids.	
b. Initial complexity - catastrophic events.	
C. Have humans ever seen living dinosaurs?	96
1. Initial disorganization - impossible.	
2. Initial complexity.	
a. Possible Biblical references.	
b. Modern stories of large reptiles.	97
c. Physical artifacts.	98
d. Legends and historical references to dragons.	99
D. How could any dinosaurs have survived a worldwide flood for humans to see them?	100
1. God brought the animals.	
2. Most dinosaurs were not huge.	
3. Continual growth of reptiles.	
4. Size of the Ark.	
E. Were dinosaurs ferocious predators?	100
III. Summary of information about dinosaurs	101
IV. Did birds evolve from dinosaurs?	102
A. Arguments for dinosaur to bird evolution	
1. Pelvis	
2. Overall shape	101
3. Reptilian features	
4. Feathers	
5. No other plausible ancestors	
B. Arguments against dinosaur to bird evolution	
1. Ornithischia vs. Saurischia	
2. Internal structures of birds	
a. Lungs	
b. Body temperature	103
c. Brain structure	
d. Wing vs. arm movement	
e. At least 12 different types of feathers	
3. Why would anything evolve?	104
4. Fossil birds - <i>Archaeopteryx</i>	103
a. Reptilian characteristics	

b. Avian characteristics	104
c. Wrong timing	
d. Inadequacy as an ancestor	
5. “Feathered dinosaurs”	105
V. Chapter Summary.	
Chapter Eight - DID REPTILES EVOLVE INTO MAMMALS?	106
I. Similarities and differences between living things.	
A. Source of similarities and differences.	
1. Initial complexity - common design.	
2. Initial disorganization - common ancestry and random mutations.	
B. Classification systems	
1. Linnaean system	
2. Cladistics	107
C. Why would anything evolve into anything else?	
1. Lamarckianism.	
2. DNA error checking and correcting mechanisms	108
a. Initial complexity	
b. Initial disorganization	
II. Origin of mammals.	
A. Initial complexity	
B. Initial disorganization	
C. Relevant strata on the geologic column	109
1. Archeozoic Era	110
2. Paleozoic	
3. Mesozoic (the “age of reptiles”)	
4. Cenozoic (the “age of mammals”)	
a. Paleogene sub period	
b. Neogene sub period	111
c. Quaternary period	
D. General steps necessary for amphibian-to-reptile-to-mammal evolution	
1. Recap of differences - Amphibian to reptile	
a. Amniote eggs	
b. Method of fertilization	
c. Elimination of metamorphosis	
d. Miscellaneous features	
e. Genetic potential	
2. Skull structure in reptiles	
a. Anapsids	
b. Synapsids	112
c. Diapsids	
d. Euryapsids	
3. Problems with timing	
a. Transition from amphibian to reptile	113
b. Earliest stem reptiles	
c. Contrasting explanations	114
4. Marine reptiles	



5. “Mammal-like” reptiles	114
a. Pelycosaurs	
b. Therapsids	
c. Non-mammalian cynodonts	115
6. True mammals	
a. Monotremes	116
b. Marsupials	
c. Placentals	117
E. Hypothetical steps needed for transition from reptile to mammal	
1. Major anatomical differences.	
a. Jaws and skulls.	
b. Middle ears and hearing.	118
2. Why would mammalian jaws and middle ears have evolved?	119
F. Proposed transitional forms - Morganucodonts	
1. Representative types.	
2. Fossil evidence for Morganucodon.	120
3. Differing interpretations for the fossils	121
4. Similarities of morganucodont jaws and middle ears to living monotremes and marsupials	122
a. Monotremes	
b. Marsupials	
ci. Common features	123
5. Possible alternate explanations for morganucodont fossils	
III. Chapter Summary.	
 Chapter Nine - LOWER PRIMATES AND MONKEYS	 125
Major groups of primates	
I. Why would anything evolve?	
A. Use and disuse of body parts ve. mutators	
B. Need for parallel and complementary mutations	
II. Difficulty in classifying fossils	126
III. Scarcity of primate fossils	
IV. Recap of proposed ancestors of the lowest primates	128
A. Mesozoic mammals	129
1. Marsupials and monotremes	
2. Placental mammals	
3. Multituberculates	
B. Paleocene (Early Cenozoic) mammals	
1. Plesiadapiformes	130
2. Apatotherians	131
C. Eocene insectivores and primates	
1. Lack of transitions from non-primate insectivores to earliest primates	132
a. Incorrect sequence of fossils	
b. Major differences between tupaiids and primates	133
c. Lack of transitions from insectivores to earliest primates	
d. Major divisions of primates from the Eocene onward	134
e. Proposed earliest primates of the Eocene	135

i. <i>Cantius</i>	135
ii. <i>Teilhardina</i>	
iii. Eosimiids.	136
iv. Eocene sister taxa	137
2. Means of dispersal across open water	
D. Summary of lower primates	138
II. Lack of transitions to higher primates (monkeys)	
A. Modern monkeys	
1. Old World monkeys (part of the catarrhine group)	
Proposed possible cladogram of monkeys	139
Alternate proposed cladogram of monkeys	140
2. New World monkeys (Platyrrhines)	141
B. Proposed fossil ancestors of monkeys	142
1. Old World monkeys (subgroup of catarrhines)	
a. <i>Catopithecus</i>	
b. Parapithecines	143
c. <i>Oligopithecus</i>	
d. <i>Aegyptopithecus</i> (propliopithecines)	
e. <i>Proteopithecus</i>	144
f. <i>Victoriapithecus</i> / <i>Prohylobates</i>	
2. New World monkeys (Platyrrhines)	145
a. <i>Branisella</i>	146
b. <i>Perupithecus</i> / <i>Ucayalipithecus</i>	
C. Alleged common ancestors of platyrrhines and catarrhines	147
1. Differences from prosimians and tarsiers to monkeys	
2. Obvious differences between catarrhines and platyrrhines.	
a. Size	
b. Dental formula	148
c. Color vision	
d. Olfactory apparatus (sense of smell)	
3. Fossils proposed as common ancestors of catarrhines and platyrrhines	
a. <i>Darwinius massilae</i> (“Ida”)	
b. <i>Anthrasimias</i> / <i>Marcgodinotius</i>	
c. Amphipithecids / Pondaungids	149
d. Eosimiidae	
e. Parapithecidae	150
f. <i>Apidium</i>	
g. <i>Saadanius</i>	
4. Summary of proposed common ancestry	151
III. Chapter Summary.	
Chapter Ten - EOCENE TO MIOCENE APES AND MONKEYS	152
I. Basic beliefs of Initial Complexity vs. Initial Disorganization	
A. Contradictory explanations for similar features	
1. Initial complexity: Common design	
2. Initial disorganization: Common ancestry or convergent evolution	153
a. Parallel beneficial mutations	

b. Large amount of initial genetic information	154
B. Contrasting explanations of the rock strata	
1. Initial complexity - strata represent ecological communities	
2. Initial disorganization - strata represent time periods	
C. Explanations for lower primate fossil record	155
1. Initial complexity: catastrophic fossilization	
2. Initial disorganization: gradual fossilization	
II. Eocene and Oligocene higher primates	
A. Lack of Eocene apes	156
B. Oligocene apes	
III. Miocene higher primates (monkeys and apes)	157
A. Hominoids, cercopithecoids, and hominids	158
B. Miocene monkeys and possible lesser apes	
1. <i>Alophia metios</i>	
2. <i>Dionysopithecus</i>	159
3. <i>Pliopithecus</i> / <i>Epipliopithecus</i>	
4. Dendropithecoids: <i>Dendropithecus</i> / <i>Simiolus</i> / <i>Micropithecus</i>	
5. <i>Victoriapithecus</i> / <i>Prohylobates</i>	160
6. <i>Afropithecus turkanensis</i>	
7. Lesser apes: <i>Pliobates</i> / <i>Hylobates</i>	161
8. <i>Mesopithecus</i>	
C. Miocene apes commonly considered hominids or ancestors	162
1. Dryopithecines.	
a. <i>Dryopithecus</i> / <i>Rudapithecus</i>	163
b. <i>Proconsul</i> / <i>Ekembo</i> / <i>Ugandapithecus</i>	164
c. <i>Danuvius</i>	166
d. <i>Ouranopithecus</i>	
e. <i>Hispanopithecus</i>	167
f. <i>Limnopithecus</i> / <i>Dendropithecus</i>	
g. <i>Oreopithecus</i>	
h. <i>Pierolapithecus</i>	168
i. <i>Griphopithecus</i>	169
j. <i>Kenyapithecus</i>	
k. <i>Equatorius</i>	
2. Sivapithecines.	170
a. <i>Ramapithecus</i>	
b. <i>Sivapithecus</i>	
c. <i>Gigantopithecus</i>	171
D. Miocene fossils of less certain affinity	172
1. <i>Morotopithecus</i>	
2. <i>Nacholapithecus</i>	173
3. <i>Kapi ramnagarensis</i>	174
4. <i>Khoratpithecus</i>	
5. <i>Lufengpithecus</i>	
6. <i>Ankarapithecus</i>	
7. <i>Chororapithecus</i>	175
8. <i>Lufengpithecus</i>	

8. <i>Nakalipithecus</i>	176
9. <i>Samburupithecus</i>	
10. <i>Sahelanthropus</i>	
11. <i>Laccopithecus</i>	177
12. <i>Orrorin tugenensis</i>	173
13. <i>Ardipithecus</i>	
IV. Chapter Summary.	178

## Chapter Eleven - GEOGRAPHIC VARIATION AND NATURAL SELECTION

- I. Lumpers vs. splitters
- II. Species and speciation
  - A. Selective breeding (artificial selection)
    - 1. Fruit flies
    - 2. Tuskless African elephants
  - B. Natural selection
  - C. How specialization could occur in nature
    - 1. Simplified hypothetical example
    - 2. Realistic example

## Chapter Twelve - PLIOCENE AND PLEISTOCENE HIGHER PRIMATES

- I. Lack of transitions from apes to humans.
  - A. Percentage of difference incorrect
  - B. Irrelevance of similarity in number of nucleotides
  - C. Number of genetic differences

## Appendix A - COMMON BIOLOGICAL MISCONCEPTIONS A-1

- I. The mechanism of evolution
  - A. Lamarckianism - Use and disuse of body parts (Lamarckianism)
  - B. Neo-Darwinism - natural selection operating on mutations.
- II. Embryonic recapitulation. A-3
- III. Vestigial and nascent organs. A-4
  - A. Initial Disorganization
  - B. Initial complexity
  - C. Actual observation
- IV. Evolution vs. descent with modification
  - A. Initial Disorganization
  - B. Initial complexity A-5
- V. Evolution vs. adaptation to the environment
- VI. Natural selection vs. selective breeding A-6
  - A. Reduced viability A-6
  - B. Instability
  - C. Limits to variation
- VII. Antibiotic resistance in bacteria and insects A-7
- VIII. Industrial melanism - the peppered moth A-7
- IX. "Pseudogenes" A-8
  - A. Cell differentiation
  - B. Regulatory functions. A-9

C. Three dimensional structure of DNA.	
D. Hidden information encoded in DNA.	
X. Geographic distribution (Biogeography) - one of the pillars of evolution	
Appendix A References	A-12
Appendix B - CRITIQUE OF RADIOMETRIC DATING METHODS	
I. General principles of radioactivity	B-1
A. Structure of the atom	
B. Types of radioactive decay	
II. Use of radioactivity in dating	
III. Uncertainties of radiometric dating	B-2
A. Initial ratio of parent to daughter	
1. Origin of radioactive elements	
2. Imperfect mixing	
3. The early environment	B-3
B. Constant rate of decay	
C. No parent or daughter added or removed	B-4
D. Problems with commonly used dating methods	B-5
1. Potassium-Argon dating	
2. Isochron dating	
a. Rationale of isochron dating	B-6
b. Fatal flaws in the method	
3. Carbon-14 dating	B-7
a. Loss of carbon content	B-8
b. Environment	
c. Atmospheric C-12/C-14 ratio	
d. Short half-life	
e. External factors	
f. Initial concentration of C-14 in the organism	
4. Recent carbon dating results	B-9
3. Other reasons fossils are not radiometrically dated	
E. Examples of erroneous radiometric dates	
Appendix B References	B-11
Appendix C - CORRELATION OF THE BIBLICAL FLOOD WITH GEOLOGIC STRATA	
I. Biome succession	C-1
II. Factors contributing to stratification	
A. Mud flows / mudslides	
B. Effects of tectonics and tides	C-2
III. Biblical timeline of the Flood	C-3
IV. Possible correlation of the Flood with sedimentary layers	
A. Archaeozoic Era	B-4
B. Paleozoic era	
1. Cambrian, Ordovician, Silurian	
2. Devonian	B-5
3. Carboniferous (Pennsylvanian and Mississippian)	
4. Permian	

## PREFACE

Scientific methodology has been developing for many centuries. In general, science has been understood to deal with things that can be tested. That is, empirical science has to do with things that can be observed, tested, and repeated.

Visual  
# 1-1

In recent years there has been a shift in science education so that many things that cannot be tested are now included as part of the curriculum. The so-called “historical sciences” such as evolutionary biology and historical geology do not have to do with how things operate in the present, but instead with hypotheses about how they reached their present condition due to processes in the unobservable past. They are usually presented without any indication that they could possibly be false. For instance, in many schools students are told that evolutionary stories such as humans evolving from apes are absolutely correct and may not be questioned. They are taught that only one mode of thinking is acceptable.

This book is written from a different perspective. Though the author’s bias may be evident, the purpose of the material is not to make students believe the Biblical account of creation. Instead, its purpose is to show them that they should question everything presented to them in the name of science, in particular, the arguments for both creation and evolution. If they do, the author believes that they will come to view creation as a reasonable alternative that is worthy of their consideration. Even if they do not, they should be inspired to look beyond what their textbooks say as they become lifelong learners in search of truth.

There are many good classroom resources that deal with such empirical topics as chemistry and classical mechanics. However, there do not seem to be many resources to supplement the material presented concerning the historical sciences. In particular, few resources point out the problems in the material presented to students. This book is presented as such a resource. It is not intended to replace present classroom materials, but to supplement them. The focus will primarily be:

1. Whether life could have arisen from nonliving chemicals.
2. Whether the processes operating in cells could have arisen by random mutations/
3. Whether the fossil record shows that fish evolved into amphibians,
4. Whether the fossil record shows that amphibians evolved into reptiles.
5. Whether dinosaur fossils show anything about evolution.
6. Whether the fossil record shows that reptiles evolved into mammals.
7. Whether the fossil record shows that some sort of lower primates evolved into humans.