

EVOLUTION ADDENDUM
For Chapters 1,8,10,11,12, 26
In the Textbook

BIOLOGY

by
Stephen Nowicki

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Prepared by Charles H. Voss, Jr.
Ph.D.

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Why an Addendum?

An addendum is necessary because the author has written the text around the idea that “*evolution is a unifying theme of biology*” (see pages 11, 30 and 319). It should be remembered that biology is the study of living things. It is not necessary to know about an organism's origin or past to determine: (1) how it functions internally and externally, (2) how it relates to other organisms and (3) to make predictions about other organisms. Origin of and similarity to other organisms, while interesting, is not necessary to understand the detail functioning of a specific organism.

The term evolution leads to many misunderstandings and unsupported conclusions. Sometimes “evolution” means evidence for small-scale changes within species which we can observe in the present day. At other times, claims of “evolution” are based upon extrapolation and speculation about the deep past as is evidenced in the last paragraph of this section on *Unity and Diversity* (p. 11). Evolution is discussed in many instances as both fact and theory. Read the next section below of this addendum for an understanding of the problem.

This presentation will provide additional facts concerning evolution so that the student can clearly see problems not answered by the theory of evolution. This addendum presents facts that the student should consider when judging the soundness of the theory of evolution.

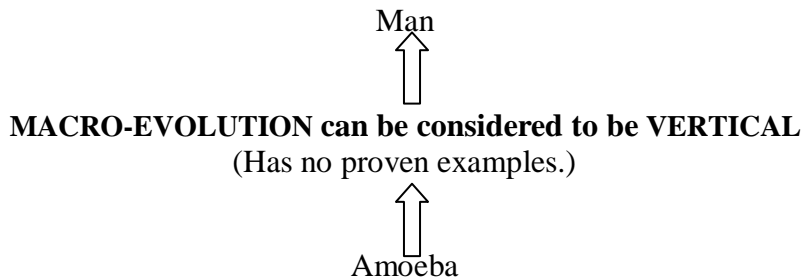
Should the student learn about the theory of evolution? Definitely! It is the dominant thinking of today in the fields related to biology.

This paper presents information **only** on the sections of the text where it is felt that additional information would be helpful. The information is presented as simply and briefly as possible since time is crucial in the classroom. Reference to the textbook will be necessary to completely understand this material.

Chapter 1

1.2 - Evolution explains the unity and diversity of life – p. 10

The textbook author makes the following statement, “*Evolution is the change in living organisms over time.*” Wherein this statement is true it defines evolution to be simply “*change over time.*” By so doing, the author sets up a situation where the reader is and can be misled because it ignores the fact that there are varying degrees of change which are unrelated to each other and which are often spoken of as micro and macro-evolution. Micro-evolution is more properly called a **change or adaptation at the species level** and is what Darwin observed (p. 331). He observed that natural selection was a very strong driving force that could and does cause changes at the species level. On the basis that micro evolution was true he hypothesized that “macro” evolution or “molecules to man” evolution was also true. The textbook does not define macro-evolution. Macro-evolution could be said to occur if a dog became a cat or a dinosaur became a bird. It occurs at the genus or higher level (see text page 520) and implies that all life on Earth descended from a few types of cells that somehow came into being in the past. The diagrams below should help you understand the differences in the two terms



↔ **MICRO-EVOLUTION can be considered to be HORIZONTAL** ↔
It is a change or adaptation at the species level.
(Examples are the number of different types of: cats, dogs, cattle, birds, fish, etc.) .

Another way of comparing the two concepts is given in the Table below.

TWO DEFINITIONS

Micro evolution:		Macro-Evolution:	
Different types of dogs, cats, cattle, birds, etc.		A doglike animal gradually changes into a whale, a dinosaur changes into a bird, etc .	
It is a:	FACT	-----	BELIEF
Evidence:	Yes	-----	No Indirect
Observable:	Yes	-----	No No Direct evidence - It is imagined
Repeatable:	Yes	-----	No No Direct Evidence -It is assumed
Testable:	Yes	-----	No All attempts have failed- Not Testable
Is:	TRUE SCIENCE		PSUEDO-SCIENCE

Based upon these definitions it is easy to see that micro-evolution is true but the truth of macro-evolution has not been established since it has not been observed directly. Using the term "evolution" without specifying which type is being discussed is misleading and unfortunate and has caused much misunderstanding among scientists and the public. The term "macro" (molecules to man) evolution should be used in order to clarify the problem.

8.7 Mutations Page 252

Add this paragraph at the end of this heading.

The statements in this section are misleading in that they imply the phenomena is deceptively simple. Since mutations are supposedly the source of information for evolution it is mandatory to clearly understand exactly what they are and what they are not. Recognize that the definition concerns changes in genetic information but that **meaningful coherent information must be added to the DNA** in order to build complexity in organisms. The question to keep in mind is, **Does the mutation actually increase the information contained in the DNA in a meaningful manner or decrease it.** An increase in information is necessary to claim that microorganisms eventually evolved into higher organisms like humans. It is essential that this need for information be understood. Did the transition from the conventional cars of today to the hybrid cars require additional coherent information or is the hybrid car simply a rearrangement of the information required to build a conventional car? Yes, meaningful information had to be added. The added information needed concerned electrical motors, drives and frame changes.

The last part of section 8.7 discusses different mutation mechanisms and forces that cause

changes in genes. The author is correct in saying that the changes in organisms occur at the **species level**. It must be recognized that just because mutational changes do occur at the species level this does not imply or prove that all organisms descended from a common ancestor. The textbook does not discuss some of the factors that give the reader an understanding of how difficult speciation is and the fact that it **cannot** explain the phenomena of molecules to man or even amoeba to man evolution (macro-evolution).

First of all it must be remembered that the DNA in a living organism contains the complete information necessary to form an identical organism including the instructions of how to make a reader for its own code system. The amount of information stored in the DNA is staggering. Second, the amount of information stored in the DNA of man is 4166 times more than that of the H-39 Mycoplasma - one of the smallest bacteria now called a mollicute.¹ To put this in perspective the mollicute (H-39 mycoplasma) DNA (768,000 base pairs²) has the amount of information contained in the first 170 pages (p. 122 plus the 48 pages of LA) of this text IF every page were covered by nothing but print with **no** spaces, pictures, graphs or headings similar to this typed page. The size of the pages would be the same as in the glossary. The information content in the DNA of man (3.2 billion base pairs³) is the same as 585 books like this text with **nothing but text** on the pages as just described. Some might argue that the above numbers are highly exaggerated because of what some call **junk DNA** but it is now known that the so called **junk DNA** is not junk. It is made up of introns, promoters, operons, terminators and telomeres⁴ which are functional parts of the DNA. A major question is where did all of this additional information come from by random chance happenings to fill the 585 additional books?

To understand the problem consider the following. There is no known mutational mechanism that will increase the information content of DNA in a **meaningful manner**. In other words, transposons, point and frameshift mutations, duplication errors, jumping genes, extra chromosomes do not add **meaningful** information to the DNA. Viral or bacterial invasion may add information but the chances of it being **meaningful is zero if it occurs in a random manner**. Think about this problem with respect to this textbook. Does mixing sentences, letters, paragraphs, errors in copying, mixing up chapters or adding two or more identical chapters add information? The textbook may contain more pages but does it contain more information? A chapter or sentences from another book may be added so that there is more information but is it meaningful information? Is it likely to contribute to the sense of the original book? It is inconceivable that meaningful information can be added to accomplish the bacteria to man requirement of macro-evolution by random chance happenings. It should be recognized that natural selection may decrease the information in DNA but it cannot increase it.

It is hypothesized that these changes in species ultimately lead to changes at the genus level, the family level and on up to the kingdom level. The great complexity and preciseness found in the DNA and the tremendous increases in DNA information content necessary to evolve from **amoeba to man** make the hypothesis unlikely. When duplication errors, favorable mutations rates and the time necessary to establish a trait are considered this becomes apparent.

Think Critically: It has been discovered that the largest bacteria *Epulopiscium fishelsoni* has 85,000 copies of one of its genes and contains approximately 25 times as much DNA as a human cell.⁵ Does this confirm the need for added DNA to be meaningful?

1. Smith and Wood, *Cell Biology*. Chapman and Hall, 1996, p. 121.
2. Smith, *Cell Biology*, Academic Press (1971), p. 86.
3. Starr and Taggart, *Biology, The Unity and Diversity of Life*. Wadsworth Group, 2004, p. 254.
4. Campbell, N. A. and Reece, J. B., *Biology*. Benjamin Cummings, 2002 (Sixth Edition), pp. 300-309.
5. Randerson, J., Record Breaker. *New Scientist*, Vol. 174, 8 June 2002, p. 14

For more detailed and convincing information see Appendix 1 on page 17.

Unit 4 EVOLUTION Page 295 Chapters 10 - 12

10.3 Theory of Natural Selection Page 304

Several key insights led to Darwin's idea for natural selection

Unfortunately, the author does not define microevolution until the next chapter (11.2, p.331) At this point it should be pointed out that the only thing that Darwin observed was microevolution.

Natural selection acts on existing variation. Page 308

As the textbook explains Darwin observed adaptations which he called natural selection. It has taken place over the centuries and is an observable fact. Living organisms do adapt to their environment. Natural selection operates only at the species level although there was some thought at one time that it also occurred at the genus level. This was due to misclassification difficulties.

It must be recognized that natural selection has no direct effect upon the DNA. The author makes this clear when he says on page 308 "*Natural selection acts on the phenotypes, or physical traits, rather than on genetic material itself....Natural selection can act only on traits that already exist.*" It simply selects from the existing gene pool. It definitely cannot directly add DNA to that that already exists, a very necessary happening if macro-evolution is to take place. **It only affects microevolution.** Actually, natural selection restricts or may remove information from the gene pool. It acts to stabilize a species and provide for its survival.

10.4 Evidence of Evolution Page 310

Geography

It should be made clear that the discussion of Galapagos Finches (Figure 10.9, page 311) here and under "Changing Environments" from page 308 is only a proof of microevolution. No mention is made of the fact that the population of finches that the Grants were studying returned back to where it was when they first observed it when the environmental conditions returned. Doesn't this indicate that the changes in the finches already existed in the gene pool of the finches?

Anatomy Page 312

Homologous Structures

The textbook makes the statement, "*Some of Darwin's best evidence came from comparing the body parts of different species. Chief among such evidence were homologous structures.*" Obviously, homology is one of the proofs proposed for macro-evolution. The real question is whether things that look similar **necessarily** have the same origin. Carefully examine the bones of the same color in Figure 10.11 (page 312). If you were given all the bones of one of these colors in a bag with no labeling would you consider them to be similar? Upon close examination of the structures presented in the figure the major similarity is that they are located in the same relative location on the limbs. Do they have the same bony heads and size? Examination reveals they are not similar after all. The bone lengths, diameters and knobby protrusion

locations, shape and size are all different. The information in the DNA must be very different to direct the formation of each of these different bone structures.

The textbook also states, “...*Darwin posed a logical question: If each of these groups descended from a different ancestor, why would they share these homologous structures? A simple answer is that they do share a common ancestor.*” The question arises as to exactly what is this common ancestor? Why isn't it expressed if this conclusion is correct? Is it logical that after all these years the common ancestor has not been found? Could it be that this similarity does not mean there was a common ancestor? The author's words imply an identicalness that cannot be justified.

The many differences noted earlier must require many differences in the DNA. Sir Gavin deBeer, Director of the British Museum of Natural History, said back in 1971 that, “*Has Dobzhansky explained it when he stresses that there is no one to one relation between a gene and a trait, that evolution does not consist of independent changes of organs or traits; but what changes is the genetic system. Is this also why organs can be homologous in spite of the genes controlling them being different.*”¹ (emphasis added) This concept has been recently confirmed by research by the University of Toronto in a news release dated May 5, 2010 when they say, “*A single gene region can produce a variety of transcripts by adding, multiplying, or eliminating exons in a process called alternative splicing. For example, three neurexin genes in humans can produce over 3,000 different transcripts.*” This means that just because a structure is serving a similar purpose in different animals **it may NOT have come from an identical gene** and therefore have the same ancestor. Even if the genes were similar it is inconceivable that the many mutations required to produce these differences could have occurred by random chance happenings. For instance, the divisions of the fertilized egg (zygote) up to the stage where a complete sphere is formed (blastula) in reptiles and mammals are so different that it is impossible to conceive of the idea that they descended from the same ancestor even though the forelimbs look similar (homologous)² Also, the fore limbs of the newt, lizard and man develop from different parts of the embryo.³ There are so many instances where similar structures obviously do not mean descent from a common ancestor that biologists call these **analogous structures**. What is it about a structure which determines common ancestry? There is no clearly defined set of guidelines so that, basically, the decision depends upon what the observer is attempting to prove.

Another consideration regarding similarity of structures is whether there is an alternative way to perform a needed function. How many different ways can an appendage like a leg that serves to support an organism be attached to an organism? The requirement that the appendage must have stiffness can only be done in a living organism by bone or cartilage located either in the appendage or on the outside such as insects have. Can you think of another way? Except for the way they are connected together, shouldn't the bones used for support look approximately the same?

Think Critically: If the mutational problems presented earlier are considered is it reasonable that the many differences in DNA could have occurred by random chance happenings? Why isn't this supposed common ancestor named? Does it really exist? Do the last three paragraphs indicate that genetics plays a part in homology?

1. Sir Gavin deBeer, *Homology: An Unsolved Problem*, 1971, p. 16 (from Readings in Genetics and Evolution, No. 8.)

2. Denton, Michael, *Evolution: A Theory in Crisis*, 1986, p. 145 and Figure 5.4.

3. *Ibid.* # 2, p. 146

Structural Patterns are clues to the history of a species. Vestigial structures Page 314 and Figure 10.6 on Page 318

Originally, there were thought to be approximately 180 vestigial organs in man. Slowly over the years the number of organs considered vestigial has been reduced to a handful so that present thinking is that a use will be found for these few remaining organs as science progresses. This makes it obvious that just because an organ appears to have no use does not mean that the use will not be discovered later.

The ostrich pictured in Figure 10-13, page 314, is said to have wings that have become vestigial. The fact that the wings became so useless that the ostrich could survive in that particular environment is a clear example of how natural selection works. The loss of useful wings was brought about through mutations that did not harm the ostrich in the environment it was living in. The total **information in the DNA decreased** so that this is an indication of a micro-evolutionary change, not macro-evolution. This is true of all so called vestigial organs if they can be said to exist. Vestigial organs do **not** support macro-evolution but are an example of de-evolution or evolution in a negative way.

The appendix is given as an example of a vestigial organ but the medical profession has known for some time that it plays a functional role in the immune system. ¹

1. Kawanishi, H., *Immunology*, 1987, Vol.60, p.19-28.

10.5 Evolutionary Biology Today Page 316 Fossils provide a record of evolution.

Interestingly, the author divides this subject into two parts. It is discussed in more detail in Chapter 12.2 page 365.

In the second paragraph the author makes several statements that need to be carefully and thoughtfully read. He says, "*Darwin worried about the lack of transitional fossils between groups of organisms. Since Darwin's time, however, many transitional forms have been discovered between species.*" The two sentences are not talking about the same thing. Darwin talks about transitions at the "groups of organisms" level which implies a higher level of classification such as the family. The author has reference to transitional forms at the species level. He is correct that transitional fossils have been found at the species level but not at the higher levels of classification. One of the major conflict areas is in the huge diversity of animal species occurring at the beginning of the Cambrian period. (page 376 of text) This sudden appearance of most animal phyla in the fossil record is called the Cambrian Explosion.

The Cambrian Explosion Page 377 – Section 12.5

The Cambrian Explosion is still one of the mysteries of geology. More phyla have been discovered in these strata than exist now. The real problem is that these organisms seem to appear suddenly **without any ancestors**. Evolutionist Richard Dawkins, author of *The Blind Watchmaker*, puts it this way, "*...the Cambrian strata of rocks, vintage about 600 million years, are the oldest in which we find most of the major invertebrate groups. And we find many of them already in an advanced state of evolution, the very first time they appear. It is as though they were just planted there, without any evolutionary history.*" ¹ For instance, the trilobite is an extremely complex organism with a segmented body and legs including a complex nervous

system and one of the most complex eyes known. Science News puts it this way regarding trilobite eyes, "...the most sophisticated eye lenses ever produced by nature."² There are trilobites in the pre-Cambrian strata but they show no signs of being related to the Cambrian trilobites. Even Charles Darwin recognized the Cambrian Explosion problem and had this to say on the subject, "*The case at present must remain inexplicable; and may be truly urged as a valid argument against the views here entertained.*"³

Think Critically: Is this what you would expect if macro-evolution were true? Darwin recognized the Cambrian Explosion as a major problem back in his time. Since that problem still has not been resolved what should be our response? Should we agree with Darwin?

1. Dawkins, Richard, *The Blind Watchmaker*. New York: W. W. Norton, 1987, p. 229.
Stephen J. Gould of Harvard agreed. *A Short Way to Big Ends*, Natural History, Vol. 95 #1 (January 1986), p. 18 - 28.
2. Shawver, Lisa J., *Trilobite Eyes: An Impressive Feat of Early Evolution*. Science News, Vol. 105, (2 February, 1974), p. 72.
3. Darwin, Charles, *On the Origin of Species*. Harvard University Press, 1964, p. 308.

Molecular and genetic evidence support fossil and anatomical evidence. Protein comparisons Page 317

The author states in the last paragraph, "*Cells from different species that have the same proteins most likely come from a common ancestor.*" Wherein this argument seemed appropriate several years ago recent findings tend to discount it. The discussion under Homology (page 6 of this addendum) should make this apparent. Genome sequencing projects have revealed that the large number of proteins discovered are hundreds of times more numerous than the number of genes found in the DNA sequence. The project ENCODE which consists of 442 scientists in 22 labs around the world, have discovered that only about 2% of the genome codes for genes and another 80% is actively involved in how much of the gene is turned on and off.¹ On this basis it should be apparent that similar proteins can come from different genes as discussed earlier.

1. Alice Park, "Health and Science." Time, October 22, 2010 see also The Advocate, September 6, 2012, page 2A

Figure 10.16 Evidence of Whale Evolution Page 318

This material is similar to that published by National Geographic in 2001. Much criticism has been offered of the article. The examples cited as proof of whale evolution are not compelling. Pakicetus is now thought of as simply a land animal that probably seldom, if ever, went into water. It was well adapted for running. Ambulocetus did have webbed feet but then there are animals today that have webbed feet such as the Catahoula dog. The small hind appendages on some whales are now known to aid the whale in copulation. They are not vestigial legs.

Evolution unites all fields of biology Page 319

This title and the next paragraph gives a very distorted view of the importance of evolution. There are very misleading statements that simply are not true. Members of the medical and health care professions, veterinarians, the horticultural and agronomy professions are not concerned with whether or not evolution is true. They will and do use biology in their work occasionally but they are concerned with how the organism operates in today's world and not about its past. Dr. Marc Kirschner of Harvard Medical School concurs when he says, "**In fact, over the last 100 years, almost all of biology has proceeded independent of evolution, except evolutionary biology itself. Molecular biology, biochemistry, physiology, have NOT taken evolution into account at all.**"¹ Concurring

with this idea is an article in Forbes Magazine which says, **““It is our knowledge of how these organisms actually operate, not speculations about how they may have arisen millions of years ago, that is essential to doctors, veterinarians, farmers, etc.”²**

1. Dr. Marc Kirschner, chair of the Department of Systems Biology, Harvard Medical School, quoted in Boston Globe, 23, October 2005.
2. Skell, P.S., The Dangers of Overselling Evolution; Focusing on Darwin and his theory doesn't further scientific progress, Forbes Magazine, 23 Feb 2009.

Chapter 11 The Evolution of Populations Page 326

When reading this chapter it should be remembered that the author is discussing microevolution which is defined in section 11.2, page 331. Recognize that the chapter is explaining variations at the species level and different mechanisms that might have occurred to cause speciation.

11.6 Patterns in Evolution

Speciation often occurs in patterns Page 351

Punctuated Equilibrium

The author says, *“Bursts of evolutionary activity are followed by long periods of stability.”* He is saying that they are gaps in the fossil record for which there is no explanation. The problem is that the gaps exist where evolutionary theory and the fossil record demand that there are transitional fossils. The need for an explanation is obvious. The Harvard paleontologist Stephen J. Gould, (now deceased) who along with Niles Eldridge and Steven Stanley originated the punctuated equilibrium hypothesis, said, *“The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology. The evolution trees that adorn our textbooks have data only at the tips and nodes of their branches, the rest is inference, however reasonable, not the evidence of fossils.”*¹

The authors of the punctuated equilibrium hypothesis proposed it to explain the gaps in the fossil record at the **species** level. The basic idea is that one particular species changed into another species so quickly that there is no fossil evidence for the change. This means that the proof of the theory is the lack of evidence or in other words the gaps prove the theory. . Contrary to the punctuated equilibrium author's wishes, some have extended the hypothesis to include the gaps at higher levels.

Two of the major objections to the hypothesis are:

1. The proof is the lack of evidence as established by the gaps. The feeling is that it would be dangerous to let the idea of lack of evidence as proof to get started in science.
2. There is no plausible mechanism or explanation for the genetic changes that occurred.

1. Gould, S. J., *Evolution's Erratic Pace*. Natural History, Vol. 86 (May 1977), p. 14.

Chapter 12 The History of Life Page 358

12.1 The Fossil Record Page 360

There are still some unanswered questions about the fossil record. The four topics that cause the most comment are : The Cambrian explosion, gaps in the fossil record, stasis in the fossil record and out of place fossils. The author does not address any of these except for the Cambrian Explosion which has already been discussed briefly on page 8 of this addendum and the fact that

the gaps still exist. The remaining two topics should make for interesting reports if time permits.

Radiometric dating provides an accurate estimate of a fossils age.

Page 362

An interesting student project would be an investigation into how valid is the above statement. The author states on page 367 that, "*Scientists worked out the entire geologic time scale during the 1800s and early 1900s.*" (see third paragraph below.) Practicing geologists tell this writer that when a sample is brought in for dating an estimate of its age must also be furnished. Shouldn't this requirement be unnecessary if radiometric dating is so accurate?

Critical Thinking: How can the accuracy of this statement be determined? How accurate is the technique? What assumptions must be made in order to accurately date a lava flow?

Chapter 12.2 The Geologic Time scale Page 365

The author states on page 365, "*Index fossils are fossils of organisms that existed only during specific spans of time over large geographic areas.*" The previous section indicated that radiometric dating is the only method of determining the age of these index fossils. How can the age of the fossils be used to determine the age of the strata when one of the dating techniques is to determine the age of the strata by using the age of the fossils?

The geologic time scale, which is given in Figure 12.6 on page 366 of the text, is supposed to be proof of macroevolution. What must be recognized is that the fossil order and geologic time scale are based upon macroevolutionary thinking and **exist only in textbooks** and therefore do not prove macro evolution..

The author states on page 367 that, "*The geologic time scale, shown in Figure 12.6 is a representation of the history of Earth.*" History reveals that this Geologic Time Scale was essentially in its present form by 1841 when John Phillips published the first global geological time scale. Since then only some minor adjustments to the dates attributed to the various strata have been changed. What this means is that the author's statement in bold print above is speculation based upon the assumption that macroevolution and the assumed dates are true. The Geologic Time Scale concept was in existence long before Darwin and long before much was known about world geology. If macroevolution is accurate then the order presented by geology and many biology books, such as this one, is what would be expected in the fossil record. However, there are facts that tend to nullify this assumption. One of these is that many gaps still exist in the fossil record. Are these gaps real? Darwin was aware of this problem when he wrote, "*Why then is not every geologic formation and stratum full of such intermediate links? Geology assuredly does not reveal any such finely graduated organic change, and this is perhaps the most obvious and serious objection which can be urged against the theory [of macroevolution].*"¹ Professor Stephen J. Gould of Harvard University confirmed Darwin's doubts are still valid when he stated, "*All paleontologists know that the fossil record contains little in the way of intermediate forms; transitions between major groups.*"²

Thinking Critically: In view of the facts just quoted is the statement, "The fossil record tells a Story of Evolution" a reasonable one? Explain.

1. Darwin, Charles R, *The Origin of Species*. Harvard University Press, 1964, p. 280.

2. Gould, Stephen J., *The Return of the Hopeful Monsters*, Natural History, Vol.86, No.6, June-July 1977, p.24.

Chapter 12.3 Origin of Life Page 368

The reader of this section should consider what is actually known versus what is proposed, hypothesized, speculated or suspected to have happened to explain a given fact. This is particularly important in this section because the author presents many unproven ideas as fact and oversimplifies the origin of life concept. By their very nature the facts presented cannot be proven or demonstrated scientifically. The author presents none of the weaknesses and contradicting information and logic concerning the origin of life. Unfortunately, because of this, the information presented in this addendum concerning section 12.3 does not easily integrate into the textbook information and is therefore presented as additional “food for thought.”

In order to bring this discussion of the origin of life into correct perspective several facts must be recognized and kept in mind. The material presented in Appendix 2 on pages 19-20 of this addendum and entitled Nucleic Acids and Proteins (page 47 of the textbook) is very important and indicative that life could not have originated by random chance chemical reactions.

Earth was very different billions of years ago. - Page 368

Think Critically: This section presents a dialogue of the formation of the earth as established fact. How can the truth of these statements be proven? Have they been proven?

In the third paragraph the author gives a list of compounds that supposedly made up the earth's atmosphere. Why didn't he list oxygen? Should it have been listed? Why or why not? The answer appears in the next paragraphs.

It should be noted that the author uses the term organic compounds in his discussion. The definition of an organic compound is one that contains carbon as stated on page 44 of the text and developed further in Appendix 2, page 19 of this addendum.

In the world as it presently exists, life could not have evolved. Why? The presence of oxygen in the atmosphere precludes the formation of amino acids and the formation of polypeptides, proteins, ATP, nucleic acids in DNA and lipids. ² Alexander Oparin in 1924 attempted to solve this problem by proposing that if the atmosphere contained water vapor, hydrogen, methane and ammonia without any oxygen then energy from the sun and lightning would cause amino acids that would drop into the oceans and form a primordial soup from which life might have evolved.

Think Critically: What effect does the L and D molecule problem have on Oparin's hypothesis or the atmosphere proposed by the author or any other proposed atmosphere? Is the formation of a biologic compound more or less probable?

Oparin did not include oxygen as an atmospheric gas because amino acids react readily with oxygen to form non-biologic compounds. His hypothesis led to the Miller-Urey experiments discussed in the next textbook heading and below. There is, however, abundant evidence that oxygen was in the early atmosphere. Miller-Urey did prove by their experiment that the gases Oparin listed (methane, ammonia, hydrogen and water vapor) can be made to form amino acids (see next section). However, most of the amino acids formed were **not biologic** even though they can be classified as organic. This makes the formation of a biologic compound impossible for reasons given below and in Appendix 4, page 22. Some of the problems regarding the origin of life under this hypothesis are:

1. The geologic evidence indicates that the necessary atmosphere **without any oxygen** was **not** present. Many primordial sediments contain red minerals which are metallic compounds of oxygen indicating oxygen was present at the time of their formation. There is geologic evidence that the earliest rocks (dated at 3.7 b.y.) existed in an oxygenic atmosphere¹ so that the formation of amino acids in any significant concentration in the atmosphere and therefore in the ocean was not possible.³
2. Ultraviolet light breaks down water vapor, the third building block of amino acids, into oxygen and hydrogen. The presence of oxygen minimized the formation of any amino acids in the atmosphere.

1. Clemmy & Badham, *Oxygen in the Precambrian Atmosphere: An Evaluation of the Geologic Evidence*, Geology, Vol.10 (1982), p.141
2. Fox, S., & Dose, K., *Molecular Evolution and the Origin of Life*, Freeman and Co.(1972), p.44.
- Miller, *Production of Some Organic Compounds under Possible Primitive Earth Conditions*, Journal of Am. Chemical Society, Vol.77, (1955), pp.2351,1361.
3. Clemmy & Badham, *Oxygen in the Precambrian Atmosphere: An Evaluation of the Geologic Evidence*, Geology, Vol.10 (1982), p.141.

See Appendix 4, Page 22 for more details.

Organic Molecule Hypothesis (Miller Experiment) Page 369

The famous Miller-Urey experiment supposedly proved that life could have evolved. The apparatus is shown in Figure 12-8 on p. 369. One of the problems of this experiment was that the experiment produced both D and L type amino acids plus other non-biologic amino acids and polymers which were capable of reacting with the desirable biologic amino acids to produce non-biologic compounds.¹ Miller had to use a trap to isolate the products of his experiment and keep them from getting back to the original gases since the biologic amino acids formed would react readily with the excess gases and form non-biologic compounds. As necessary as it is, there is no mechanism in nature that can perform this needed isolation.

Their experiment came up with a total of only 10 biologic amino acids and 25 non-biologic amino acids, sugars and other compounds all mixed together. Insulin, one of the smallest of proteins, consists of 51 amino acid bonds and requires 17 different biologic amino acids. This simplest of proteins could not have been formed had there been nothing but the Miller biologic amino acids present. Other scientists² have done similar experiments with other sources of energy and formed many other biologic and non-biologic compounds but with similar results. Still other scientists have devised experiments which have produced still other compounds that appear in living organisms. All of the cited experimenters results still involve L and D amino acids and sugars plus other non-biologic amino acids and sugars so that the peptides formed are **non biologic** and therefore not indicative of life.

A further difficulty of the Miller-Urey experiment is that in the atmosphere ultraviolet light breaks down the gases methane and ammonia, two of the three necessary building blocks of amino acids. The concentrations of these building blocks would have been reduced quickly to such a low level that they could not have played an important part in amino acid formation because the no oxygen hypothesis implies there was no ozone layer to reduce the ultraviolet intensity.

1. Thaxton, Bradley, & Olsen, *The Mystery of Life's Origin: Reassessing Current Theories*, New York: Philosophical Library, (1984), pp. 52-54.
2. Thaxton, Bradley, Olsen, *The Mystery of Life's Origin: Reassessing Current Theories*, New York: Philosophical Library, (1984), pp. 20-39.

Early Cell Structure Hypotheses Page 370

The author cites two different hypotheses about how the first cell membrane might have originated. The steps from micro-bubble to actual cell are beyond comprehension. It should be recognized that the differences between the cell membrane and the micro-bubble membrane is

unbelievably large. The membrane enclosing a cell is much more complex than a shell like structure in that it has openings which allow certain chemicals to pass in and out and reject others, not just water as the micro-bubble might do,. If a cell were placed inside a micro-bubble instead of its own membrane it would not live because there would not be any way to get nutrients into and waste out of the cell. Furthermore, Fox, et al. point out that micro-bubbles (microspheres) ARE readily dissolved with changes in PH, heat and dilution and are easily broken up by agitation.¹ What this means is that microspheres occur under laboratory conditions and are rarely, if ever, found in nature. The author further states, “*These liposomes could then form around a variety of molecules, such as amino acids, fatty acids, sugars, and nucleotides.*” (Second to last sentence under this heading.)

Miller and Orgel comment, “*the microsphere’s membranes ... ‘are not biological-like membranes since they do not contain lipids or carry out any of the functions of biological membranes. ... It seems unlikely ...that the division of microspheres is related to the origin of cell division.’”*² The other factor is that the contents within the cell membrane is much more complex than that of the microsphere.³ It should be recognized that the microsphere experiments are carried out in laboratories under carefully controlled circumstances rather than the random chance environment found in nature and so are not the ancestors of any kind of life forms. The authors acknowledge this in the first sentence of the next section.

Thinking critically: If a person puts together ten pieces of a 1,000 piece jig-saw puzzle is it reasonable to assume that the rest of the puzzle will eventually assemble itself if not touched? Is there a similarity between the jig-saw puzzle example and the first living cell from the microsphere example cited in the textbook?

1. Fox, Harada, Krampitz, Mueller, *Chemical Engineering News*. June 22, 1970, p.80.
2. Miller, Stanley L. and Orgewl, Leslie E., *The Origins of Life on the Earth*. Prentice Hall, 1974, p.144.
3. Thaxton, Charles, Bradley, Walter, Olsen, Roger, *The Mystery of Life’s Origin*. Philosophical Library, 1984, pp172-176.

RNA as Early Genetic Material Page 370

As discussed earlier RNA and DNA nucleotides consist of a base, a phosphate and a ribose sugar. The sugar can be in either the “L” or “D” form which considerably complicates the problem because only “D” or right handed sugars are present in living organisms. If a left handed ribose sugar appears in the chain then the RNA or DNA chain that might be formed is non-biologic. RNA chains have been observed to form as reported in the text but the real question is whether the initial conditions of the experiment truly represent conditions that would actually occur in a real life situation. It should also be recognized that chains of RNA that may be able to make copies of themselves are of no use unless they are able to make a biologic protein. The formation of a biologic polypeptide is of no consequence compared to the complexity of the first living organism. It should also be recognized that even if a protein is made nothing will be accomplished by repeatedly copying this protein. It takes many different types of proteins to make a living organism.

When considering the validity of this subject attention should be paid to the number of hedge words used in the summary paragraph. Almost every sentence contains at least one hedge word. Does this provide much confidence in the conclusion that the section is proposing? Does it support macroevolution?

12.4 Early Single-Celled Organisms Page 372.

The evolution of sexual reproduction led to increased diversity. Page 374

The last sentence of this heading states, "*Thus, sexual reproduction may have been the first step in the evolution of multicellular life.*"

The author is correct when he uses the word "may" in this sentence because this statement is not backed up by the fossil record and is therefore an assumption. There is a wide diversity of single celled life forms but no known 2, 3, 4, or 5 celled life forms although parasites are known to exist containing 6 to 20 cells. Doesn't logic dictate that there should be non-parasitic life forms having 2 to 5 cells if multicellular organisms came about through evolution? Based upon what you have already learned would you expect to find these intermediates?

12.5 Radiation of Multicellular Life Page 376

The author continues his dialogue from an assumed molecules to man evolutionary viewpoint and therefore makes many statements as fact, not theory. Rather than address each one of these instances individually it is hoped that the information brought out in this addendum has convinced the reader that the case for macroevolution is basically nonexistent or very weak at best. With this in mind it is believed that the reader can determine the assumption in the second sentence of this opening section that says, "*As multicellular organisms evolved, the new environment produced new ecological opportunities for organisms.*" The assumption is that multicellular life evolved. As brought out earlier the fossil record does not support this assumption. It is arrived at by assuming that macro-evolution is a fact.

There are at least five statements besides the one concerning Cambrian fossils on page 376, at least two on page 377 and three on page 378 that are assumptions based upon the assumption that macro-evolution is true. Can you name them?

12.6 Primate Evolution Pages 379-383

The textbook author states on page 379 that "*The common ancestor of all primates probably arose before the mass extinction that closed the Cretaceous period 65 million years ago.*" Much of the discussion in this section is devoted to pointing out similarities between humans and other primates. Just because two animals look somewhat alike and have similar characteristics does not necessarily mean they came from a common ancestor. Please review the argument concerning homology to understand that this assumption is not valid.

Figure 12.18 clearly indicates that the author believes that man and chimpanzees have a common ancestor. Consider the following facts in deciding whether or not man and chimpanzee evolved from a common ancestor. A recent article in the Proceedings of the National Academy of Sciences suggests that there is approximately a 5% difference between the DNA of chimpanzees and humans.¹ This information was obtained by comparing approximately 1% of the genome and considered substitutions, insertions and deletions. As more of the genome is considered the difference has risen to 7.7%² and 13.3%. It has even been estimated to be as high as 20%.³ The much publicized number of 1.4% was obtained by considering only substitutions.

Even the 5% difference amounts to a staggering amount of information in the DNA. If the human and chimpanzee genomes are considered to have the same number of base pairs, (3,200,000,000) in spite of the chimp having 2 more chromosomes than the human and 10% more DNA,⁴ the 5% amounts to 150,000,000 bases. This is the amount of information contained in a book whose thickness is equivalent to about 30 books such as this textbook if it contained nothing but full pages of print from cover to cover. If this much information difference exists in the DNA between the chimpanzee and the human the difference between man's ancestor and

man **must be much larger**. It is completely inconceivable that this much coherent information could have been accidentally changed in the DNA of a member of the ape family to get man when the mutational problems discussed earlier are considered. If the transition from ape to man is to be accomplished by mutations, it is apparent that there should be plenty of fossil evidence. Where is the fossil evidence?

Think Critically: If the chimp has 10% more DNA than a human how can it be said that there is only a 5% difference? Which of the differences given above is the most reasonable?

1. Britten, R.J., *Divergence Between Samples of Chimpanzee and Human DNA Sequences Is 5% Counting Indels*. Proceedings of the National Academy of Sciences, USA, Vol. 99, 2002, pp. 13633-13635.
2. Watanabe, H. et al, *DNA Sequence and Comparative Analysis of Chimpanzee Chromosome 22*. Nature, Vol. 429, 27 May 2004, pp. 382-388.
3. Weissenbach, Jane, *Differences With Relatives*. Nature, Vol, 429, 27 May 2004, pp. 353-354.
4. Hacia, J. G., *Genome of the Apes*. Trends in Genetics, Vol.17 #11, 2001, pp. 637-645.

Birds evolved from theropod dinosaurs. Page 798

The author says on page 798, “*Most paleontologists agree that birds are the descendants of one group of theropod dinosaurs.*” There is much disagreement on this subject for several very good reason. Two of the modern textbooks that disagree are given below in the references.^{1,2} Bird expert Alan Feduccia of Chairman of the Biology Department at the University of North Carolina says, “*Paleontologists have tried to turn Archaeopteryx into an earth-bound, feathered dinosaur. But it’s not. It is a bird, a perching bird. And no amount of ‘paleobabble’ is going to change that.*”³

There are two interesting facts that must be justified. One is that theropod hands have only 3 fingers whereas bird hands (wings) have 5 fingers. How did a dinosaur hand evolve into a bird hand.⁴ The other fact is covered by the author but in a different context – bird lungs (page 801). How did a bird lung evolve from a lung like all other animals?

More importantly is a discovery in 2000 reported in USA Today. The author, John Tuohy, states, “*Archaeologists say a birdlike creature they have discovered is so old that they believe it cripples the theory that birds evolved from dinosaurs..... ‘Longisquama insignis, a feathered, four legged, 10-inch long primitive reptile, was capable of gliding, probably from tree to tree, 220 million years ago,’ the scientists say.....The unusual ‘ARCHOSAUR’ is 70 million years older than the most ancient known bird, ARCHAEOPTERYX, and it predates dinosaurs with birdlike features by 100 million years.....The researchers say that makes it nearly impossible to conclude that birds descended from dinosaurs..... ‘Just as you can’t be your own grandmother, birds can’t have come from dinosaurs because the timeline is all wrong,’ says lead researcher Alan Feduccia, professor and chairman of biology at the University of North Carolina-Chapel Hill.*”⁴

1. *Modern Biology*. Holt, Rinehart and Winston, 2002, p.862.
2. Miller, K.R. and Levine, J., “*Biology*.” Prentice Hall, 2002, p.807.
3. Feduccia, A.; cited in: V. Morell, *Archaeopteryx: Early Bird Catches a Can of Worms*, *Science* 259(5096):764–65, 5 February 1993.
4. USA Today, John Tuohy, June 23, 2000.

Conclusions

What has been covered in this addendum should be kept in mind as one reads through this textbook. As stated at the beginning of this addendum the textbook author assumes that

macro-evolution is true and uses this assumption to make unsubstantiated statements addressing the origin of different organisms. The reader should always keep in mind that macroevolution cannot happen unless a change increases the information content of the DNA in a meaningful manner. This will help a person to determine whether or not a change is reasonable and/or possible.

Now that the end of this addendum has been reached several conclusions should be obvious such as:

1. It is misleading to use the term evolution without specifying whether it is micro or macro-evolution being discussed.
2. Adaptation or microevolution occurs at the species level and is provable using conventional scientific tests and principles. It is a fact.
3. The fact that adaptation of species (microevolution) is true does not imply or prove that molecules to man evolution (macroevolution) occurs any more than the first cool days of October imply or prove that an ice age is beginning or because a person learns something from watching PBS for an hour imply or prove that watching PBS continuously will produce a genius. The major problems that Darwin recognized with his hypothesis are still true plus new ones as science has advanced. Some of these are:

Gaps in the fossil record.

Cambrian explosion

The fossilization process demands catastrophic happenings more violent than what we see today.

Similar genes do not necessarily produce similar structures.

How new meaningful information can be added to the DNA by random chance happenings.

Optical isomers preclude life evolving.

4. Other explanations for what is observed on earth should be examined.

At the end of Darwin's book he wrote, "For I am well aware that scarcely a single point is discussed in this volume on which facts cannot be adduced, often apparently leading to conclusions directly opposite to those at which I have arrived. A fair result can be obtained only by fully stating and balancing the facts and arguments on both sides of each question." I encourage you to follow his advice.

Appendix 1

Mutations - Section 8.7 - continued from p. 6

The following is not considered lecture material and may be beyond the level of the text.

It is known that duplication (replication) errors are extremely rare as the authors state. The textbook *Biology: The Dynamics of Life* by Biggs, Kapicka and Lundgren (Glencoe, 1995) further complicates the problem when it makes the following statements, "*Sometimes, there is no effect on an organism, but often mistakes in DNA can cause serious consequences for individual organisms*(p.324). *This textbook's authors agree on page 414. "Sometimes, the errors caused by point mutations don't interfere with protein function, but often the effect is disastrous. (p.325) Proteins that are produced as a result of frameshift mutations seldom function properly. (p.325) Few chromosome mutations are passed on to the next generation because the zygote (several cells beyond conception) usually dies. (p.326) Mutations often result in sterility or the lack of normal development in an organism. (p.328)* Other authors comment that only about one in

1000 mutations "might" be beneficial.¹ Generally it takes about 5 mutations to make a significant physical change in an organism.¹ Note that this does not mean a new species has been formed. Many more than five mutations at a time have been caused on fruit flies [*Drosophila melanogaster*] with only a deformed fruit fly as a result. Dodson proposes that it takes over 300,000 generations for a slightly beneficial recessive gene to increase in frequency from 1 in 1,000,000 to 2 in 1,000,000.² **It must also be remembered that a mutation in any cell other than the reproducing cell does not have any influence on succeeding generations.** When all of these probabilities are combined, the question must be asked, "How can macro evolution occur from processes that produce many more negative results than positive results?"

The previous paragraph reads so easily that most people do not realize that these apparently simple statements mean that **amoeba to man** evolution is extremely unlikely. To get an appreciation of this let us examine these probabilities in more detail.

First, consider the two statements that "*Many random mutations are harmful. (only one in one thousand is beneficial)*" and that "*it takes five mutations to cause a significant change in an organism.*" For the sake of discussion assume that information content can be increased by mutations (a false assumption as previously discussed). The question is, "Can progress be made up the evolutionary ladder of increasing complexity with odds that give predominately negative results?" To illustrate the point, use two pairs of dice to perform the following experiment. If a roll of the dice produces four ones, assume this represents a favorable mutation. The odds of doing this are one in 1295. This is about the same as the odds mentioned above for a beneficial mutation. All other combinations on the dice represent unfavorable or neutral mutations. The textbook indicates that **a majority of mutations are fatal** so assume that any time four of any number, other than one, comes up on the dice the organism dies instantly. This means that only five out of the 1296 (far less than a majority) mutations are considered to be instantly fatal. Compared to the textbook statements this is a very generous assumption. The rest of the combinations represent unfavorable or neutral mutations which do not normally kill the organism but if enough of these mutations do occur then the organism will be weakened and die. Assume twenty unfavorable or neutral mutations will kill the organism so that if twenty rolls of the dice do not yield four ones or four of a kind then the organism dies and the evolutionary process must be started over. To keep track of your progress use the line below. The point A represents the original organism and point B represents the organism after 5 mutations. Remember that arriving at point B does not signify a new species.

A-----x-----x-----x-----x-----B

Do you think that you can ever get to point B? Try it! You will quickly convince yourself that it is essentially impossible. The odds of getting to the first x is one in 1295 and for getting between points A and B the odds are one in 3600 trillion if done in 5 *consecutive* dice rolls. The odds of winning the Power Ball Lottery are much better than this. Remember that even if you do feel you could get to point B this does not prove evolution because this has to happen **many** times to get a new species. If twenty mutations were necessary to have a new species there is only one chance in

100,000 of having it happen. Winning the Power Ball Lottery six consecutive times has about the same odds. When only these two facts are considered it should be apparent that amoeba to man evolution is unlikely, if not impossible.

Next, let us reconsider the statement that "*This proofreading prevents most errors in DNA replication. Indeed, only one error in 1,000,000,000 nucleotides typically occurs.*"³ (see also page 238 of this text.) It must also be recognized that unless the mutation occurs in a

sexually reproductive cell (gamete) that has been fertilized the change in information will **not** be passed on. The mutation must occur in an egg, sperm, seed, pollen, etc. Even in one of the smallest organisms like the H-39 mycoplasma, a bacterium now called a mollicute) the odds of this happening are unbelievably small. Consider the following: A mollicute (H-39 mycoplasma) contains about 256,000 amino acid bondings in a particular order (human has about one billion) to make 640 proteins having an average of 400 amino acid bondings each.⁴ Since there must also be DNA if the mycoplasma is to replicate there must be 1,536,000 bases in the DNA (human has 6,400,000,000 bases). There is also a sugar and a phosphate for each base. A mutation in the amino acids, sugars or phosphates will not be passed on since the mutation must be in the bases of the DNA to be passed on. So the odds of having a mutation occurring in the "right place" is much less than one in 1,536,000. Add to this the fact that only one mutation in one thousand is beneficial and it becomes clear that duplication errors do not provide an abundant source of mutations for evolutionary change.

Another factor that must be considered is the amount of time necessary to establish a trait after it has evolved. For instance, apes are all flat footed. If enough mutations occur at one time to make an ape with an arch like humans have, how long will it take to establish a small population of apes with arched feet? This ape will mate with one who does not have the same gene and, according to Mendel's laws of heredity, probably will not have an offspring with the same characteristic. It will be quite a few generations of inbreeding before this trait will begin to show up with any regularity unless the apes with the arched feet gene only mate with each other. This is very unlikely. If a mutation could become dominant in 10 years (an actual impossibility for members of the ape family) and there are 150,000,000 mutations required to result in man (see section on Human Evolution on page 23 of this addendum) then 300 million years would be needed under very unusual and unique conditions for man to have come from the ape family. Not nearly enough time has elapsed to have established a small population of man under this condition since evolutionist's claim that the supposed ancestor of modern man came on the scene about 4 million years before man. If the number of mutations, the small probability of a beneficial mutation and the difficulty of establishing a population are all considered, it is inconceivable that man could have evolved from an apelike ancestor.

Each one of the arguments discussed in the previous paragraphs indicates the amoeba to man evolution of man is not likely to have taken place. When all three are considered at the same time it should be apparent that molecules to man evolution (macro-evolution) is an impossible scenario.

Examples of mutational changes are particularly instructive when it comes to the evolutionary concept. Mice living at the Chernobyl reactor show mutational changes but they and their offspring are still mice. With all the thousands of mutational experiments carried out on the fruit fly (*Drosophila melanogaster*), where the mutational rate was increased by 15,000 percent,⁵ none have produced a better fruit fly nor anything other than a fruit fly that survived and reproduced. In fact, an interesting experiment was carried out in 1948 by Ernst Mayr and reported by J. Rifkin⁶ that revealed mutations can cause only a limited variation in a species (micro-evolution). Starting with a parent stock that had 36 bristles the fruit fly was selectively bred (not a random event) in an attempt to have a fruit fly with no bristles. After 30 generations the number of bristles was lowered to 25 but then the line became sterile and died out. A second experiment was carried out to increase the number of bristles. Once again sterility set in when the number of bristles reached 56. Mayr concludes "*The most frequent correlated response of one-sided selection is a drop in general fitness. This plagues virtually every breeding experiment.*" This addendum's author can confirm this from his experience in raising peaches commercially. The peach trees that produce the prettiest and largest peaches will quickly die if not cared for. This is in direct contrast to wild trees that are seen flourishing around an old

abandoned house for years without care. The selective crossbreeding of trees for large fruit with good flavor weakens the ability of the tree to survive. What does all of this mean? It means that when man deliberately introduces mutational changes into the DNA, the probable result is an organism that is not as environmentally adept at coping with the environment as it could originally. Why should an organism be stronger when undergoing random mutations if "controlled" mutations do not do the job?

1. Ambrose, E., *The Nature and Origin of the Biological World*, (1982), p. 120-121.
 2. Dodson, E., *Evolution: Process and Product*, (1960), p. 225.
 3. Johnson & Raven, *Biology, Principles & Explorations*. Holt, Rinehart and Winston, 2001, p. 197.
 4. Smith, *Cell Biology*, Academic Press (1971), p. 86.
- 5,610,11. Rifkin, Jeremy, *Algeny*. (1983), p. 134.

Appendix 2

Nucleic Acids and Proteins- -p. 47

In order to clearly understand some of the problems inherent in the origin of life (Chapter 12) and mutations (Chapter 8) it is important to recognize that the sugars that are part of DNA and RNA and the amino acids that make up proteins are optical isomers called chiral molecules. These are compounds with the same chemical formula but differ in structure. Compounds that have the same chemical formula but different three-dimensional structures are called isomers. Sugars and amino acids are a special kind of isomer called an **optical isomer**. This means that they have two structural forms which are mirror images of each other like our hands. They are referred to as dextro-rotary (D type or right handed) and laevo-rotary (L type or left handed) molecules depending upon which direction they deflect polarized light. The astounding thing is that these molecules occur naturally in nature *in equal numbers* but **living organisms use only one or the other** of these molecules. In organisms *amino acids are always L type and sugars occur only as D type molecules* and only these types are considered as biologic. In other words, D type amino acids and L sugars are non-biologic molecules and do not appear in living organisms even though they have exactly the same chemical equation. To further complicate the problem there is no known method of separating these molecules in nature and the L and D molecules *show no preference* in joining with each other. If a L and D type of amino acid or sugar join together the isomer is not functional from a biologic view point. When these facts are considered and the fact that there are thousands of different amino acids besides the 20 biologic ones it should be apparent that the origin of life from purely random chance happenings is impossible.

A more detailed and convincing explanation of its impossibility is presented in The next Appendix below.

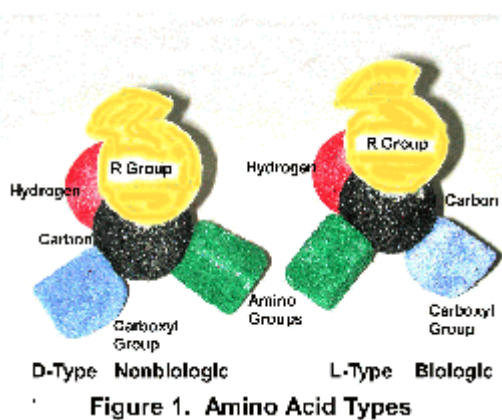
Appendix 3

Expansion of material in Appendix 2

In order to clearly understand some of the problems inherent in the origin of life (Chapter 17) and mutations (Chapter 12) it is important to recognize that the sugars that are part of DNA and RNA and the amino acids that make up proteins are optical isomers called chiral molecules. An isomer is a molecule that has more than one three-dimensional form even though the chemical formula is the same. It is important that this fact be clearly understood when discussing both sugars and proteins. The protein is used for illustration purposes because it is easier to understand. The basic facts that must be recognized and kept in mind are:

(1) A carbon atom, an essential part of an amino acid, has four bonding sites. In forming an amino acid four different elements or compounds join to a central carbon atom as shown in Figure 1¹ - a Hydrogen atom, a Carboxyl Group (COOH), an Amino Group (NH₂) and an R Group which is a carboxyl/hydrogen based unit (see Figure 2-16, page 47 of the text). The composition of the "R Group" determines the particular characteristics of the amino acid and therefore its name. Note that the R Groups are **very rarely** symmetrical about an axis. The mock up shown in Figure 1 shows this. The number of compounds that can join to the carbon atom at this spot is much larger than the twenty present in living organisms. Estimates are as high as several thousand. In each case the result is called an amino acid. Of all the possible amino acids occurring naturally only 20 are found in living organisms and are called biologic amino acids. This means that the vast majority of amino acids are classified as non-biologic. If one of the non-biologic amino acids joins with one of the 20 biologic amino acids, the result is a compound that is not useful for biologic purposes.

(2) To further complicate the situation, the exact order in which the Hydrogen atom, the Amino Group, the Carboxyl Group and the R Group join to the central carbon atom determines whether the amino acid formed can be used in forming a biologic protein. Amino acids are optical isomers or chiral molecules which fall into two structural types --- dextro-rotary (D type) and laevo-rotary (L type). The L and D type molecules are identical chemically but are mirror images of each other just as our hands are. Notice that if the R Group and the H atom are taken as a reference by putting the H atom farthest from the observer as shown in Figure 1 there are only two different ways the Amino and Carboxyl Groups can join the carbon atom - the Amino Group is either on the left or right of the reference. Only the order shown on the right of Figure



1 (Amino Group to the left of the line proposed above) is used in forming a biologic protein. Very rarely are D amino acids found in living organisms.²

(3) It is important to recognize that the L and D amino acids like that shown in Figure 1 above occur in equal numbers in nature but no known life forms use both types of amino acids.³ In forming a polypeptide the amino acids join to each other by the Amino Group joining the Carboxyl Group. Since these are common to all amino acids this means that there are no preferential connections of biologic versus non-biologic amino acids in forming polypeptides (chains of amino acids). As shown above,

the difference between the L and D molecules is that the Carboxyl Group and the Amino Group swap places on the central carbon atom. In each resultant molecule the chemical equation is the same even though the shapes of the molecule are different unless the R group is symmetrical. This is most easily understood by looking at Figure 1 and connecting the Carboxyl and Amino Groups together. This makes the R Groups point in the opposite directions with respect to the polypeptide chain so that the shapes are different.

(4) If only L amino acids are connected in a chain they form a helix as shown by line “A” in Figure 2. If a single D amino acid is connected into a chain of L amino acids the resultant protein changes shape and becomes non-biologic. Note that not only is the R Group (yellow color) and the opposite direction from that of the L molecules but the shape of the polypeptide has also changed from the closed circular pattern of an all L chain to the shape shown by line “B”. If a single D type molecule gets into the chain of “L”s the shape of the molecule has changed even though the chemical equation is the same. It is very important to recognize that

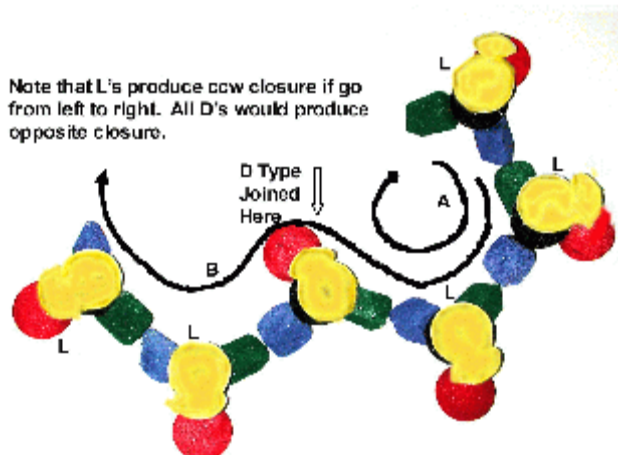


Figure 2. Effect of introducing a D molecule into an L molecule chain..

the shape of a molecule determines how it will interact with other molecules. It is the shape of the molecule that determines what kind of protein it is. Dr. Mader points this out in her Biology textbook when she says, “Shape is very important in determining how molecules interact with one another” and “Once a protein loses its normal shape it is no longer able to perform its usual function.”⁴

If a L type sugar were introduced into a chain of D sugars in the DNA strand it would not be able to coil without causing a tangle as illustrated by line “B”.. This would be a fatal mistake.

(5) It is also known that nucleotides (DNA) are formed from a deoxyribose sugar molecule bonded to a phosphate molecule and a nitrogen base. RNA has ribose sugars in the place of deoxyribose sugars. The sugars in these nucleotides also occur in L and D type molecules. The arrangement of the sugars in the DNA ladder is shown below in Figure 3. (More details are given in the chapter on DNA.) Two different bases join to form a base pair and make a ladder rung.

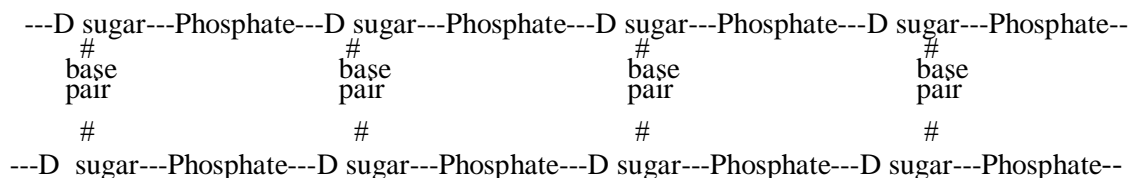


Figure 3. DNA Structure

How proteins formed originally with only L type amino acids and how sugars in the nucleotides (DNA and RNA) formed originally with only D type sugars is an unanswered question. This is particularly puzzling when it is recognized L and D type sugars occur in equal numbers naturally and show no preference when uniting with phosphates. The same holds true for amino acids. A human chromosome consists of about 69 million base pairs on average which means that there are 130 million D type sugars in the DNA of one chromosome. The human genome contains 6,400,000,000 D type sugars.. Logically, half of these should be L type sugars but there are none. How could this have come about?

Think Critically: What do the L and D type molecules and the great number of possible amino acids do to the complexity of life concept?

1. Idea suggested by Figure 2-16 (p.44) of G.J. Tortora, B.R. Funke, C.L. Case, *Microbiology: An Introduction*. Benjamin Cummings, 1989, Third Edition.
2. Tortora, G.J., Funke, B.R., Case, C.L., *Microbiology: An Introduction*. Benjamin/Cummings, 1989, Third edition, p. 44.
3. Cohen, J. "Getting All Turned Around Over the Origins of Life on Earth." *Science*, Vol. 267 (1995), pp. 1265-1266
- Bonner, W., "Origins of Life." 1991,21, pp.59-111.
4. Mader, S.S., *Biology*. McGraw Hill, Seventh Edition, 2001, p. 37 and 47.

Appendix 4

Earth was very different billions of years ago – from p.12

These first two problems point out that any significant amino acid concentration in water could not come from the reaction of gases in the atmosphere. Even if amino acids could somehow be formed in a pool, lake or sea there are factors such as those listed below that make the formation of life unlikely. Consider the following problem areas:

1. There are two structural types of amino acids and sugars as discussed earlier--- dextro- rotary (D type) and laevo-rotary (L type). Whenever amino acids and sugars are being formed these two types are formed in equal numbers. No known life forms use both types of amino acids¹ and sugars. Both types of molecules will easily combine chemically with each other but only one of the wrong type of amino acid in a protein or sugar in the DNA or RNA will make it biologically useless from a functional viewpoint as pointed out earlier (pages 2-4 of this addendum). The proteins of living organisms are made up of L type amino acids and the DNA and RNA strands from D type sugars. The duplication process of the cell assures use of only the right type of molecule. There is no other known process for separating and isolating L and D molecules in the natural environment. DNA produces tRNA which promotes the synthesis of L type proteins. There is no evidence that such a separating mechanism was ever present. Replicating life forms are the only known L and D separating mechanisms that occur naturally.
2. Water is a diluting and reacting agent so the question must be answered as to how the amino acids can be concentrated to form polypeptides (chains of amino acids), proteins and, ultimately, organisms when the reaction itself produces more water. The evaporating pool hypothesis, that evaporation will concentrate the amino acids, has the problem that some of the compounds necessary for protein synthesis evaporate² along with the water. Insulin, the smallest protein, requires fifty one L type amino acids (17 different types). It is inconceivable that this many amino acids could be assembled on a molecular basis without the detrimental effects of water, D type or other type of amino acids or other non-biologic compounds interacting. Even if insulin is obtained this does not verify that evolution could take place because many more proteins are needed to have even the simplest living organism.
3. Natural selection only takes place in living organisms.
4. Amino acids are quick to combine with other compounds, including those from which they were formed, to form non-biologic compounds.
5. When two or more amino acids unite by the addition of energy to form a polypeptide, a water molecule is produced. This water molecule must be removed immediately because it will unite with the polypeptide. This means that the polypeptide is not stable unless the water is removed.³ How can the water be removed when everything is in water. Ferris states this scientifically as,⁴ *"But it has not proved possible to synthesize plausibly pre-biotic polymers this long (30 to 60 monomers) by condensation in aqueous*

solution, because hydrolysis competes with polymerization."

6. Biochemical compounds tend to break down (decay) when not combined within a living organism. When living organisms die they decompose back into their simplest molecular components. The chemical tendency is away from life.⁵ Thus even if a protein were formed it would not have been stable and would not have waited around for a spontaneous combination at some later time with other proteins.

1. Cohen, J. *Getting All Turned Around Over the Origins of Life on Earth*. Science, Vol. 267 (1995), pp. 1265-1266
2. Horowitz & Hubbard, *The Origin of Life*, Annuals of Genetics, 8 (1974),p.393.
3. Thaxton, Bradley, & Olsen, *The Mystery of Life's Origin: Reassessing Current Theories*,New York: Philosophical Library,(1984), p.56.
7. Ferris, etal., *Synthesis of Long Prebiotic Oligomers on Mineral Surfaces*, Nature, Vol. 381, 2 May 1996, p. 59.
5. Abelson, *Chemical Events on the Primitive Earth*, Proc. National Academy of Sciences, Vol.55 (1966), pp. 1365, 1369.