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STEREOCHEMICAL DESIGN IN LIPIDS

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Abstract

Creationists have successfully challenged evolutionists with the evidence of clever engineering design in optically active isomers such as the L-amino acids and D-sugars found exclusively in life forms. That these resolved isomers cannot be synthesized or maintained in significant quantities outside of living organisms has been recognized as strong evidence against any spontaneous generation of biopolymers from some primeval broth.

Nevertheless, the evidence found in geometric isomers is largely unknown in spite of the critical role played by this sort of stereoisomerism in living cells. Some biolipids found in cell membranes (phospholipids) are always in the cis —same side— configuration. While this geometry is essential for the proper functioning of cell membranes, it turns out that this cis configuration is not what we would expect to find in nature because it is the higher energy form. The trans —opposite side— configuration is the lower energy form and thus would be expected to be found.

A creationist teleological (planning and purpose apparent in design) explanation seems to be demanded by these facts. It is true that certain low probability molecules can be synthesized in the laboratory, such as certain substituted benzene ring isomers or even cis -polyethylene. However, these only serve to buttress the teleological argument since they require intelligence in planning the synthesis, fabricating and arranging the complex apparatus, environmental control, and in carrying out the stepwise chemical reactions in the presence of highly specific reagents, using controlled (not random) energy sources.

Further, the phyletic distribution of many biolipids may very well follow a mosaic pattern previously alluded to by some creationists.

Introduction

Biochemical synthetic pathways are complex, requiring pre-existing biomolecules such as enzymes, vitamins, high-energy phosphates, and nucleic acids, all of which are at least as highly ordered as the biopolymers whose origin we seek to explain. It is also recognized that intact cellular machinery is required to produce and integrate all cell functions—chromosomes, mitochondria, ribosomes, membrane networks and others.

Organized components do not fall happily together in test tubes (or soups) except in fairy tales and science fiction, Prigogine's dissipative structures notwithstanding.¹

(Ilya Prigogine, winner of a Nobel Prize in 1977, recently coauthored a book in which he claims to show theoretically how order can be generated in far from equilibrium chaotic conditions.) This holds not only for proteins and amino acids, but also for lipids. This paper will emphasize that the kind of geometric isomerism found in certain lipids is important both functionally (as in cell membrane permeability) and energetically (since the less stable form is preferred).

Geometric isomerism is seldom addressed by creationists. S. E. Aw expressed surprise that evolutionary biochemists have also more or less ignored the lipids in abiotic experiments since lipids are a widespread class of biomolecules comprising up to 70 percent dryweight of some cells. He adds that where abiotic syntheses were attempted, the results have almost

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invariably been failures because only minute quantities of lipid-like materials were detected, and even those were too highly branched,^{1, 2} to be considered similar to natural lipids. Perhaps evolutionists have had enough on their hands trying to explain the origin of other classes of compounds for the popular press. I will first describe lipids, review the concepts of isomerism, and finally summarize and discuss geometric isomerism in certain straight-chained biolipids.

Lipids

Lipids may be described as one class of organic molecules which are insoluble in water and extractable from cells by organic solvents of low polarity such as ether or chloroform. They include substances commonly known as waxes, fats and oils, as well as more complex and less well known substances—steroid hormones and phospholipids.

Not only are lipids widely distributed throughout animal, plant, and other kingdoms, but they are also widely distributed within the various tissues such as bone, nerve, blood, liver and adipose tissue of animals. Common waxes include beeswax and the wax coating found on the outside of leaves. Fats, the most abundant lipids, are the main constituents of storage fat cells in plants and animals and are important food reserves as well as biochemical precursors from which more complicated chemicals are built. Being chemically similar, most oils and fats are mixtures of different molecules which share common structural features. Oils can be thought of as fats with relatively low melting points.

Figure 1 represents the formation reaction of a simple lipid. The R group might be a long hydrocarbon chain-like a string of carbon beads with hydrogens off to the side. The R' group is simply another hydrocarbon chain which may or may not be identical to the first R group. The kind of reaction shown is called a condensation reaction in which an ester is formed on the right, by combination of an alcohol (R'OH) and a carboxylic acid (R'COOH) with the elimination of water (H₂O). In Figure 1, the segments destined to form water are reduced for ease of recognition only.

Interestingly enough, significant yield of products from condensation reactions are highly unlikely in the presence of excess water (i.e.; in a primeval soup) because water drives the reaction to the left favoring reactant formation, rather than to the right in favor of products.

Structure of Biolipids

Waxes generally follow the reaction pattern shown in Figure 1 where the R and R' groups are usually long even-numbered carbon chains. Fats and oils including lard, butter, olive oil, peanut oil, soybean oil, etc., are generally more complex. They are called triglycerides because they are formed from glycerol which has not one, but three hydroxyl groups (OH), and from long

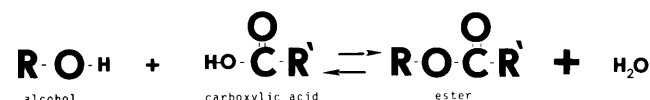


Figure 1. Formation of a simple lipid. Lipids are esters resulting from a reaction between an alcohol and a carboxylic acid.

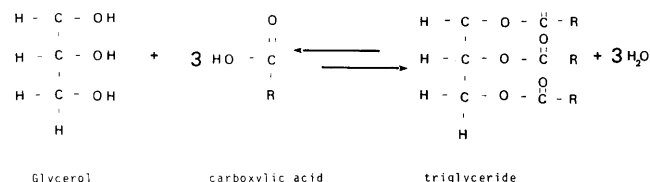


Figure 2a. Formation of triglycerides—typical constituents of fats and oils.

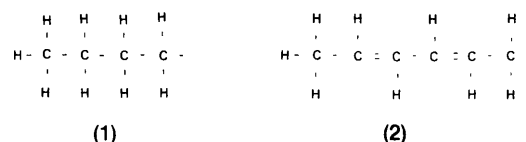


Figure 2b. (1) Configuration of the R group when the fatty acid is saturated. (2) Configuration of the R group when the fatty acid is unsaturated.

chain, fatty, carboxylic acids (COOH). Figure 2a portrays the general case. Figure 2b shows the configurations that the R groups might take depending on which fatty acid is involved.

A saturated fatty acid will have no double-bonded carbons, while an unsaturated fatty acid will contain carbon-carbon double bonds (C=C). Most fats and oils have molecules with various degrees of saturation, that is, they contain mixtures of both saturated and unsaturated fatty acids. As we shall see, only unsaturated fatty acids exhibit geometric or *cis-trans* isomerism since only they contain the carbon-carbon double bond which is necessary for stereoisomerism and for certain reactions (hydrogenation, halogenation, etc.)

As a rule bio-fatty acids are unbranched chains, unlike the products of laboratory abiotic experiments. A typical molecule of cottonseed oil is shown in Figure 3. This kind of mixed fatty acid structure is typical of fats and oils. Cottonseed oil contains many fatty acids. A partial list might be: palmitic, stearic, oleic (see Figure 4) and linoleic. Milk contains such fatty acids as butyric and stearic.

As a result of this mixture of saturated and unsaturated fatty acids in various degrees and proportions, fats and oils can be characterized by their iodine number. The iodine number is a measure of their degree of unsaturation (number of double bonds available to bind iodine), and refers to the number of grams of iodine which add to the double bonds present in 100 grams of lipid. Saturated acids have an iodine number of 0. Vegetable oils tend to have higher iodine numbers than animal fats.

Brain Lipids

Sphingolipids including both sphingomyelin (see Figure 5) and the cerebroside are interesting groups of more complex lipids. In addition to the lipid portion, cerebroside contains a sugar linkage. Both sphingomyelin and the cerebroside are the principal lipids found in the brain and in the myelin sheath of nerve tissue. They are also important constituents of cell membranes.

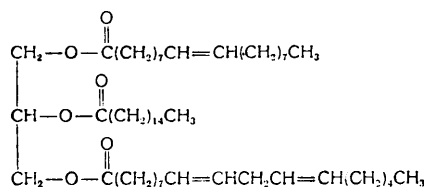


Figure 3. A representation of Cottonseed oil.

Lipid-Based Hormones

Other fascinating lipid groups are cholesterol (another important cyclical membrane lipid) and a host of derivatives of cholesterol such as some of the steroid hormones which are vital in regulating physiology. These lipids are all based on the same four-ring structure shown in Figure 6. Cholesterol is drawn in Figure 7.

Important steroids, which include testosterone (male hormone) and progesterone (female hormone), can be seen in Figure 8. Another crucial cholesterol-type hormone known to laymen and endocrinologists alike is cortisone.

Hormone Distribution—Accepted Theory

The phyletic distribution of steroid hormones based on the same basic four-ring structure is worth noting because it supports the concept of special creation. Steroid distribution seems to demonstrate both economy and fixity of design, and a mosaic pattern throughout the animal kingdom. Turner and Bagnara state:

There is much evidence to support the view that a pituitary-adrenal axis operates in all vertebrates, and that the steroidogenic tissue of the adrenal secretes similar hormones from fishes to mammals. . . . In searching for generalizations about the biochemistry of the adrenal cortex, it is striking to find such a uniformity of pattern. The existence of the same or similar corticosteroid hormones in groups which are unrelated from the point of view of taxonomy or physiology suggests that the evolution of adrenal steroids met with early success.⁴

Early is right! Being committed to evolution and the mutation/selection framework, these authors suggest that the reason why steroids have such an unpredictable distribution by evolutionary theory is that, unlike peptide hormones which they claim would be directly affected by mutations via transcription-translation and protein synthesis, steroids could only be indirectly affected by mutation because they are not directly in the transcription-protein synthesis loop (not being proteins). Rather, they propose that since the enzymes responsible for steroid synthesis are protein in nature, mutations could directly affect the enzymes which in turn would alter the function, rather than the structure of the steroids.

This reasoning is reminiscent of the strained special pleading that pervaded most of Darwin's *Origin of Species*. In the absence of the assumption that one phyletic group evolved from another, there is no need or logic to such speculation.



Figure 4. This fatty acid is found in many oils, including Cottonseed Oil.

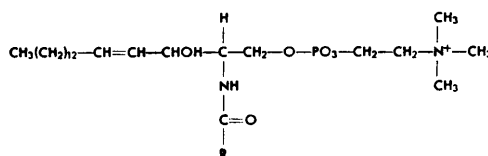


Figure 5. One of the brain lipids.

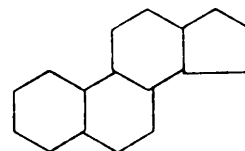


Figure 6. Typical four-ring base structure found in the cholesterol-based lipids such as steroids.

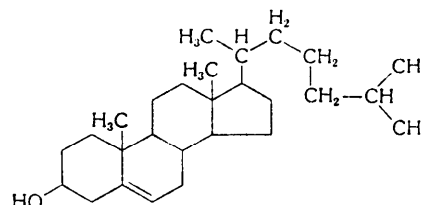
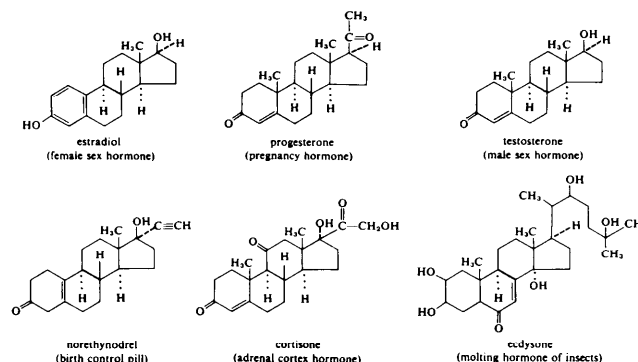


Figure 7. Cholesterol—the principal group common among steroid hormones.

Figure 8. Common Steroid Hormones (based on C. N. Wu, 1979, *Modern Organic Chemistry* Vol. 2, p. 587).

Hormone Distribution—The Facts

When we look at which groups of vertebrates (fish, amphibians, reptiles, mammals, birds) utilize which type of steroid hormone, we find no hierarchy. There is no indication of evolution from "simplest" forms, early fishes, to the "more complex" forms, mammals and man. Instead a uniform, perhaps mosaic distribution is found throughout the vertebrata.

Creationists have every right, as scientists, to reiterate the famous question posed by Morris and Gish to thousands of people for over a decade: "Which model fits the data best?" Even if one were a committed Darwinist, the explanation offered above should be recognized as being weak. It is difficult to believe, for example, that random mutations for a basic enzyme would not disrupt the complex biosynthetic pathway maybe to the point of aborting or halting the process. Surely many medicines are nothing more than chemicals which mimic the natural enzyme of an infecting microorganism, but which are different enough to kill it by disrupting metabolic pathways.

Even harder to accept is the idea that changing the function of hormones as cosmopolitan as steroids, without simultaneously changing receptor sites in target tissues, would result in anything but disaster, because steroids act in concert with other hormones and body chemicals. They regulate form, function and physiology as vital links in a variety of feedback loops. Functional deviations, especially at critical times in the life cycle, would cause havoc.

Not one, but many concurrent genetic changes would be required, all of which would have to be beneficial simultaneously. The probability of this event occurring is so remote as to be beyond credibility. Further, there is no experimental evidence that either hormones or receptors can be generated spontaneously, or even that reasonable precursors for them could be formed under the evolutionary set of primitive abiotic conditions.

Gower reminds us that steroids are hormones found not only in vertebrates but also among invertebrates. For instance, starfish have corticosterone, cortisol (hormones regulating glucose and protein metabolism), testosterone (which usually regulates male secondary sexual characters and male organs), and estradiol-17B (the most potent among estrogen hormones regulating female sexual development). The electric ray fish contains all of these hormones and more, as do other invertebrates, fish, reptiles, amphibians, mammals and man.

Having carefully examined the distribution of steroids throughout the various animal forms, Gower concludes:

Contrary to the expectation of general evolutionary theory, molecular structures and associated types of biosynthetic modification of steroid hormones do not display significant patterns of development in the animal kingdom. Rather the impression obtained from recent study is that steroid hormones are universal biomolecules present at all phylogenetic levels.⁵

The Teleological Approach

Economy of design typical of chemical engineering is a better explanation of the distribution of steroids. We should not recoil from the teleological explanation when it is so obvious and apropos. Today there are marvelous examples of this sort of chemical designing.

Consider all the different man-made polymers based on monomers like styrene, isoprene, or propylene. Polymers with desired characteristics are carefully synthesized from these basic monomers under rigorously controlled conditions—temperature, pressure, concentration, reagents and catalysts.

Samples are examined and tested during the polymerization process and adjustments in any or all of the above may be required to obtain the desired product. Formula sheets (similar to recipes) are followed meticulously.

If all this teleonomy (thoughtful, planned know-how) and effort are required to produce relatively simple molecules, how much more teleonomy was required to design and produce the first biomolecules which are far more complex, longer-chained and stereo-specific in many cases? How much more teleonomy was required to develop and maintain the requisite

biomachinery to regulate, synthesize, store, and utilize such chemicals, and to distribute them across wide varieties of animals?

Consider the complex neuro-endocrine, humoral, and metabolic regulations associated with most biomolecules like lipids. Materialism simply cannot explain the origin of all this harmony and complexity. Rather than becoming antiquated by the details of modern biochemistry, the first chapter of Romans is repeatedly validated.

Biosynthesis of Lipids

Long-chained biolipids are found almost exclusively in the *cis* geometry. However, this is not to say that all biolipids are so configured. For instance, some cyclical biolipids are not, but then their function is not the same as linear lipid molecules. Natural chemical reactions (left to themselves) would not form *cis*-lipids in linear chains. But they are not left to themselves.

There is evidence of deliberate manipulation of these processes using catalysts, enzymes and reactions which take place in a controlled specified order. Chemists do the same thing today. What is astounding is that the very machinery which is designed to form *cis*-biolipids is itself dependent on *cis*-biolipids in the first place! It is only operational under the controlled environmental milieu afforded it by the living cell, surrounded by a lipo-protein membrane network.

Neither is biosynthesis a simple process. On the contrary, lipid biosynthesis is a complex series of reactions involving highly specific enzymes, vitamins and carrier proteins. (The interested reader should refer to any recent textbook of biochemistry for a thorough treatment.) More incredible is that the formation is not simply the reverse of lipid breakdown following digestion. Lipid catabolism is not the reverse of lipid anabolism.

The biosynthesis of long-chain fatty acids in animal tissues, plants and microorganisms is not a direct reversal of fatty acid oxidation, although acetyl Co A is the starting material. Instead, acetyl Co A is carboxylated to form malonyl Co A in the presence of the enzyme coenzyme A carboxylase in a reaction dependent on the presence of ATP and the vitamin biotin.⁶

Acetyl Co A refers to acetyl coenzyme A carboxylase, another molecule that finds extensive use in living cells. I might add that another biomolecule, well known to students of cell biochemistry, NADPH, is also required and that there is more than one route that biosynthesis of lipids can take depending on where it is taking place. The point is that we see requirements for an extremely complex biosynthetic apparatus without which the whole synthesis is not possible.

That mammals have biosynthetic pathways for most fatty acids except perhaps linolenic and linoleic, may prove to be the result of universal degradation (which may be traceable to the fall of man and the curse). On the other hand, it could also point to ecological interdependence in nature since we can obtain these essential fatty acids from a variety of natural food sources.

Isomers in General

By definition, isomers are compounds having identical molecular formulas but different structural ar-

rangements. Therefore isomers are different forms of the same molecules. (Isomers are not to be confused with isotopes which are different forms of the same atom having the same number of protons but a different number of neutrons.) Isomers differ not in the number nor in the kinds of atoms present, but in the spatial orientation (arrangement in three-dimensional space) of these atoms.

Stereoisomers

Working with solutions of tartaric acid crystals in 1815, the creationist Louis Pasteur laid the foundations of biological stereoisomerism. Giulio Natta received the Nobel Prize for work in the area of atactic, isotactic, and syndiotactic stereochemistry in 1964.

In most organic compounds, isomerism arises out of the fact that the carbon atom is tetravalent. That is, it can bond to four other groups or atoms. If the groups are identical as in methane, CH_4 which has four bonded hydrogens, or carbon tetrachloride CCl_4 with four chlorines, there is complete symmetry in the compound. On the other hand, if one of the groups is different then molecular symmetry is destroyed although the general tetrahedral geometry of the molecule is maintained. The various isomers which are possible in the presence of unsymmetrical groups are called stereoisomers.

Non-Biological Stereoisomerism

Typically, in relatively simple polymers with only one unsymmetrical group [such as a methyl (CH_3) group] instead of a hydrogen on a polyethylene chain, there are three possible descriptions:

atactic—where the unsymmetrical group is randomly arranged.

isotactic—where the unsymmetrical groups are all lined up on the same side of the main chain, and

syndiotactic—where the unsymmetrical groups are placed on both sides of the main carbon chain in an alternating pattern.

These types of stereoisomers are generally associated with laboratory polymerizations of relatively simple non-biological polymers, nevertheless the different forms have radically different properties which are very important to the plastics and related technologies. For instance, the atactic forms may be gummy while the syndiotactic forms tend to be more rigid.

Other isomers of more interest biologically are the structural isomers such as the various forms of propanol. Rubbing alcohol (2-propanol) has slightly different physical properties than 1-propanol just because the alcohol group (OH) is attached onto the middle carbon in 2-propanol rather than onto one of the end carbons as in 1-propanol.

Biological Stereoisomerism

In contrast to the structural isomers of propanol and to the non-biological stereoisomers, there are two basic kinds of stereoisomers of biochemical import,—optical isomers, and geometric isomers.

Optical Isomers

Optical isomers as the name suggests are identified with reference to optics and light. Normally light

beams propagate in all directions and in all planes—x, y, and z. However, when special polarizing filters intercept light beams they can be redirected so that only the rays from one plane can pass, the rest being either absorbed or reflected. Polarized sunglasses perform this filtering function to a degree.

Optical isomers are identified by the fact that they rotate plane polarized light. Being identical in all other properties, optical isomers of the same compound rotate plane polarized light equally in magnitude but in opposite directions.

If two optical isomers can be superimposed one upon the other, as is the case with L- and D-amino acids then we call them enantiomers. They can be thought of as being analogous to right and left gloves because each isomer is a mirror image of the other. Enantiomers arise because of chirality (handedness). A carbon with four different substituents has chirality. Such a carbon known as a chiral carbon is shown in schematic form in Figure 9a.

L-Amino Acid Isomers—Impact on Origins

While it is true that optical isomers have been found in many families of chemicals, the amino acids have drawn most attention because of their role as building blocks for proteins of which our bodies are composed. However the biosynthesis of amino acids yields exclusively L forms—the D configuration being biologically inactive or perhaps even lethal. On the other hand, laboratory syntheses in the absence of special optically active reagents yield a mixture of both the L and D forms, called a racemic modification.

In light of these facts, scientists of the creationist school ask: "How could proteins with 100 percent L-amino acid building blocks evolve from chance molecular reactions when the chemical and thermodynamic laws which govern such reactions all preclude stereospecific amino acid formation?"⁷⁻¹²

Evolutionists have attempted all kinds of exotic experiments to 'explain' this puzzle, most admitting that it is an unsolved problem.^{13,14} They, of course, refuse to consider the teleological implications regardless of the apparent purpose of the design. Such conditions as polarized light, bentonite clays and metallic cobalt complexes have been postulated by materialists as causal agents, but none of them provide adequate explanations regarding the origin, propagation, or maintenance of optical specificity.

Helmick states that the teleonomic approach to biochemical origins leads to the most satisfactory model because only pre-existing stereospecific precursors are known to produce exclusively stereospecific products,

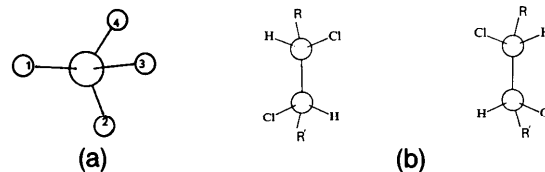


Figure 9. (a) Schematic model showing four groups attached to the tetravalent central carbon atom. When all four groups are identical, as in methane (CH_4) and carbon tetrachloride (CCl_4), symmetry is maintained. When one or more groups are different as in some amino acids, the symmetry is destroyed. When all four groups are different the central carbon is described as being chiral. (b) Molecules containing two chiral carbons.

and furthermore resolved amino acids (L form only) represent the highest degree of order possible in a universe subject to spontaneous decreases in order.¹⁵

It appears that we have experimental evidence which contradicts the notion that optically active biological molecules (L-amino acids) could have somehow been spontaneously separated following abiotic synthesis. These enantiomers cannot be separated by ordinary chemical means in the laboratory. Special optically active reagents are required. If spontaneous separation (resolution) cannot happen now, why postulate that it must have happened in the unknowable past? Rather, accept at face value the evidence of sophisticated and purposeful chemical engineering performed by a competent chemist. This is the teleological view based on apparent purpose in design and based on intelligent know-how (teleonomy).

Whenever one pure enantiomer is purposely prepared using a preexisting optically active reagent, it slowly but inevitably spontaneously isomerizes to form a mixture containing equal concentrations of both enantiomers (racemic modifications). An identical phenomenon takes place in living tissues after the death of an organism when the systems of the cells are no longer functioning to maintain amino acids in the L form only. Hence as proteins age, their building blocks, the amino acids, spontaneously tend towards equilibrium. This is the basis of one of the lesser known dating methods for estimating the age of fossilized proteins, amino acid racemization dating. (Like most methods of dating substances from the past, it suffers from extrapolated assumptions which may not stand up to reasonable scrutiny namely, temperature and pH constancy.)¹⁶

Diastereomers

Stereoisomers which do not have a mirror image relationship are called diastereomers. An example is shown in Figure 9b. Both of the carbon atoms may rotate freely about the carbon-carbon single bond at room temperature. The energy barrier to this rotation is only about 3 kcal/mole which is considered to be relatively low.

However, if the carbon-carbon bond were double instead of single like the one shown in Figure 10, then we are dealing with the second form of biologically important stereoisomerism known as geometric or *cis-trans* isomerism. (*Cis* and *trans* isomers are also important to nonbiological polymers, especially dienes such as 1,4-polyisoprene where natural rubber is the long irregular *cis* form and the *trans* form is a hard tough polymer.)

Geometric Isomerism

Geometric isomerism is contingent upon the existence of different groups bonded to the carbons, and to the presence of carbon-carbon double bonds. Geometric isomers exist as a result of hindered rotation about carbon-carbon double bonds. For free rotation to take place, a 70 kcal/mole energy barrier must be overcome and this generally does not happen at ambient conditions. In order to distinguish between the *cis* and *trans* forms like those in Figure 10, we define the *cis*- isomer as the molecule with like substituent groups (for instance Cl and Cl or H and H) on the same side of the double bonded carbons, whereas *trans* denotes that the groups are on opposite sides of the double bond.

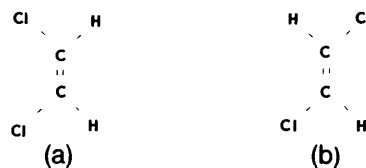


Figure 10. Geometric isomers— diastereomers including double-bonded carbons.

Geometric isomers contain the same functional groups, but they may react with the same reagents at different rates and possess slightly dissimilar melting points, boiling points, and solubilities thus making isomer separation possible. It is this geometric isomerism that is found in membrane biolipids.

Energetically, the *trans* form is the most stable. It contains fewer kcal/mole energy (as determined by heats of hydrogenation). One reason for this is steric. That is, the functional groups are farther apart in the *trans* geometry and therefore subject to lower molecular forces (van der Waals strain). It is the *trans* form then, that we would expect to be most likely to form under natural conditions. Nevertheless, the *cis* form predominates.

Geometric Isomers in Lipids

Many lipids of biological interest are composed of long chains of three to twenty-one carbon units (like beads on a necklace) built up of *cis*- fatty acids. Morrison and Boyd state: "The configuration about these double bonds is almost invariably *cis*, rather than the more stable *trans*."¹⁷

Texts dealing with biochemistry concur. Yet if biolipids evolved as a result of natural chemical laws, the laws which characterize observable chemical interactions today, we would expect to see the *trans*- isomer almost invariably.

From Where Did the *Cis* Form Come?

The question which must be answered relative to origins is; "How did the all *cis* form of biolipids arise in the first place?" And secondly "How do we account for the a-teleonomic guidance of this arrangement so that the more probable *trans* form was prevented from participating in biolipid formation?" (I am not discussing some of the cyclic, cholesterol based lipids, just the relatively long chained variety.) Did early biomonomers, alleged to exist by pure materialists, use first the predominant *trans* geometry and then progress to both *cis* and *trans*, and finally to the exclusive incorporation of *cis*? If so, where is the record? Where do we see this kind of unearthly chemistry taking place spontaneously now?

Cis from the Beginning

As we shall see, biological membranes which are vital to all life forms, except perhaps the virus, seem to have always been dependent on *cis*- lipids from the very beginning. The fact that there is a perfectly logical reason (purpose) for using *cis*- isomers now, stands as an argument in favor of teleonomy rather than against it. One cannot deduce the end purpose of *cis*- lipids in membranes by purely materialistic chemical reasoning for the simple reason that such reasoning leads us in the opposite direction, towards an original *trans*- lipid geometry which would not confer biological fitness because it will not work. This is an excellent opportunity to invoke teleonomy in order to make sense out of the facts and propose a reasonable explanation.

An Attempt at Materialistic Speculation

I am not saying that evolutionists cannot possibly imagine or invent a scenario wherein *trans*- isomers and trace quantities of *cis*- isomers competed for integration into a protomembrane(?) and further in our chemical fairy-tale, the *cis* begin to statistically out-compete the *trans* by increasing the fitness of little almost-cells(?) as a function of more efficient membrane selective permeability, etc., etc. But just because we can imagine all this does not make it any more plausible, and certainly does not mean that it actually happened.

One may be tempted to postulate that the *cis* configuration is found in these lipids because only *cis*-fatty acids were available on the primitive earth at that time. The question then becomes; "Why were *trans*- fatty acids (the easiest to form) not formed in the first place? An alternative which should be popular with Darwinists might involve the struggle for survival. *Trans*- isomers would form rigid, crystalline lipids with high melting points. Therefore cells incorporating these isomers would be selected against. In this scenario, only cells using the *cis*- isomers would survive. Again we are embarking on wild speculation and there is no evidence to support any of this.

Teleology— More Sensible

A teleological explanation is superior because the facts and the laws of chemistry are taken at face value and we deduce that biolipids could not have naturally assumed this critical geometry on their own. More likely, they were supernaturally designed to be synthesized by cells in the *cis* configuration because the *cis* arrangement exactly meets the need. In much the same way modern chemists incorporate the *cis* configuration into laboratory syntheses of linear polyethylene. They use catalytic chemicals and substrates which took years to develop in order to obtain desired properties for the polymer.¹⁸

Teleology— More Useful

In an excellent review of the reality and validity of teleology in modern science, Gordon E. Barnes demonstrated that:

1. Despite public disdain of it, biologists continue to privately chat in blatantly teleological terms.
2. When on their best behavior, scientists formally masquerade adaptive and selective terminology which amount to teleology anyway.
3. Legitimate, even objective uses of teleological explanations can be found in nature where correlations exist between the apparent process and the suspected goal, (homeostasis and morphogenic adjustments).
4. Both causal (descriptive cause and effect), and teleological explanations (acknowledging apparent purpose as real information), apply in cases where the functioning of parts is related to the functioning of a whole, (coordination of the beat of the heart with the timing of the opening and closing of heart valves).
5. Many cases exist where causal (materialistic) explanations are empty and significant progress in understanding will come only when teleology is invoked, (migration of baby seals into the sea after being born on land).
6. Teleological questions both guide and stimulate research with inquiries such as: "What is the function of this tissue or this gland— i.e.: the pineal?"¹⁹

I would add that *cis*- isomers in biolipids are candidates for teleological as well as causal (descriptive) explanation. The burden of proof that *cis*- lipids were ever any other way, than we observe them to be at present, is upon the evolutionists, and they have been unusually silent on this issue.

Significance of Cis- biolipids

Given what we find in terms of biolipid geometry, we might try only to causally describe how *cis*-biolipids are formed using this pathway and that enzyme and how the molecules align themselves *et-cetera*, but teleologically we are stimulated to probe with research type questions such as: "What is the purpose and function of the *cis* configuration." The materialist will ask the same question in disguise saying: "What is the adaptive significance of this arrangement?"

Causal Explanations— Mere Descriptions

Causal reasoning is attempted by Morrison and Boyd in their textbook discussion of the observed preference for *cis* isomers in straight chained biolipids:

Unsaturation with this particular stereochemistry has an effect that is seemingly trivial but is actually of vital biological significance: it lowers the melting point. In the solid phase, the molecules of a fat fit together as best they can; the closer the fit, the stronger the intermolecular forces, and the higher the melting point. Saturated acid chains are extended in a linear fashion— with, of course the zig-zag due to the tetrahedral bond angles— and fit together rather well. *Trans*- unsaturated acid chains can be similarly extended to linear conformations that match saturated chains rather well. But *cis*- unsaturated acid chains have a bend at the double bond and fit each other and saturated chains- badly. The net result is that *cis*-unsaturation lowers the melting point of fat.²⁰

Again their causal explanation of the lowered melting point is driven home a few pages later where they explain how ionic regulation and semipermeability are necessary properties of cell membranes. Protein transport molecules must carry critical ions across the phospholipid bilayer of the membrane and into the cell.

Now, if the transport protein is to do its job, it must be free to move within the membrane. The molecules of the bilayer, while necessarily aligned, must not be locked into a rigid crystalline lattice— as they would be if all the fatty acid chains were saturated. Actually, some of the chains in the membrane phospholipids are unsaturated and these, with their *cis*-stereochemistry and the accompanying bend disrupt the alignment enough to make the membrane semiliquid at physiological temperatures.²¹

As much as the authors tried to stick to causality, the teleological message came through, because the most satisfactory explanation seems to be that *cis* isomers are deliberately chosen for the purpose of making membranes semipermeable so that chemicals which are critical to life can be transported through the membrane barrier into the protoplasm of the cell and others can be transported outward.

Materialism's Paradox— No Problem for Creation

We arrive at another chicken-egg paradox. Which came first, the cell which must have the phospholipid

membrane to survive, or the phospholipid which is only synthesized by the machinery found in intact cells already possessing fully functional membranes?

Inside my thermostat in the living room, is a piece of metal. It is not just any old piece of metal and it is not in any old configuration. It is coiled in such a way that as it cools it unwinds and, depending on how I set the level, it causes a contact switch to turn on the gas and electric fan to my furnace which in turn heats the house. If we take it apart, find the coiled metal, and ask the heating engineer why it is in this form, he is likely to reply that it has a purpose—to make or break a contact connection in response to fluctuations in ambient temperature. Membrane lipid geometry clearly has an analogous, intelligently planned, purpose.

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PANORAMA OF SCIENCE

Panorama of Science Editor Conducts Research



Dr. E. Norbert Smith, editor Panorama Science section, inspects a green sea turtle.

One of our board members and Director of the Grasslands Experiment Station, E. Norbert Smith, Ph.D., recently had the opportunity to study thermoregulation of green sea turtles, *Chelonia Mydas*, at the Cayman Island Turtle Farm, Ltd., on Grand Cayman Island, British West Indies. His findings have been accepted for publication in the *Journal of Herpetology*, an international, peer reviewed scientific journal. Dr. Smith has published numerous scientific papers dealing with behavioral and physiological thermoregulation of reptiles and sees strong evidence of design. Indeed, the alleged evolution of endothermic (or "warm-blooded") animals from ectothermic ("cold-

blooded") animals is a serious problem for the evolutionist because anatomical physiological requirements for endothermy are often opposite those for ectothermy. For example ectothermic animals must not have an insulating layer of fat under the skin yet this is essential for endothermic animals (see *CRSQ* 12:54-58 for additional information).

Dr. Smith found green sea turtles to be excellent physiological thermoregulators. They are able to warm faster and cool slower than any other similar sized reptile in the world. In support of this it has the largest difference in warming and cooling heart rate of any other reptile. (The heart beats fast during warming in order to supply an abundant supply of blood to the animal's periphery to hasten warming.) In fact cooling heart rate was virtually independent from body temperature—something not previously described for any vertebrate.

Work such as this, by creationists, does much to discredit the claims made by many vocal evolutionists that all reputable scientists embrace evolution. Such oft repeated remarks simply are not supported by the evidence.

A Reevaluation of the English Peppered Moth's Use as an Example of Evolution in Progress (Osborne)

Introduction

An excellent review of the literature on the English peppered moth, *Biston betularia* L. is presented in this thesis. Also suggestions for possible creationist research projects are listed. The conclusions of the study are quoted directly.