> all the fishes of the sea . . . And surely your blood of your lives will I require; at the hand of every man's brother will I require the life of man. (Genesis 9:2,5)

Man's dominion, supported by the fear of man, is threatened if man can be killed with impunity. But only by acknowledging God as governor, ruling by law and justice, is it possible to justify man's authority to rule and to uphold his own place of authority. There is no chain of command, so to speak, if things were not created. Since they were, authority reigns.

Man's power to own property is likewise derived solely from the Divine command to have dominion. Blackstone wrote of the right of dominion as the right of property (Bk. II, Ch. 1), then:

> In the beginning of the world, we are informed by holy writ, that all-bountiful Creator gave to man "dominion over the earth.". . . This is the only true and solid foundation of man's dominion over external things, whatever airy metaphysical notions may have been started by fanciful writers upon this subject.

The rest of the statutes securing man's dominion over all things punish violations of his authority over his wife, his goods, his real property, his good name and his vulnerability to fraud.

### Dominion: Responsibility to Keep Law

Responsibility for keeping this law of God is given to all men living. This is expressly his dominion. Failure to do so is the essence of sin. And while law enforcement, like all things, must be done decently and in order, following the established line of authority in each community, things are so ordered that means are at hand to keep the law even in the face of wicked rulers.

It would seem that one thing required is that which follows inescapably from the work of creation scientists, namely to understand that he who believes in the truth of creation is bound to devote himself to the enforcement of God's law. This is politics.

### References

[1]Kevan, Ernest F. 1965. The grace of law. Baker Book House, Grand Rapids, Michigan. (See in the index of names and topics) (Quotation)
[2]Ibid., page 57. (Quotation)

## PROBLEMS IN THE GLACIAL THEORY

DOUGLAS E. COX *

*The drift phenomena around the world have been interpreted by modern geologists in terms of the Glacial Theory. A great many problems of a fundamental nature are involved in this interpretation. The cause for the ice ages has not been determined. The distribution of the drift has given rise to numerous complicated and unlikely theories of events in the earth's past. Movement of great ice-sheets, necessary for a theory of distribution of the drift by ice-sheets and for the formation of streamlined landforms in a glacial environment, is postulated through some unknown mechanism. Mysteries abound in the glacial explanations for drumlins, kames and eskers, the formation of stratified drift, and ice-disintegration features. Fossils of the Quaternary include mammals not usually associated with cold climate. All of these facts suggest that the reality of the ice ages has not been proved.*

### Evidence Commonly Cited For the Theory

The glacial theory is the presently accepted explanation for the layer of unconsolidated material that covers the solid sedimentary and igneous rocks in the temperate zones of Europe and North America. The material consists of gravel, sand and clay, with many large boulders of variable composition, and innumerable rounded stones and pebbles of all sizes. Often it is hundreds of feet thick. Frequently stratification exists, and it is usually present in the sand in the pattern of cross stratification.

A mantle of unconsolidated material similar to that of Europe and North America also occurs in parts of India, in South Africa, the tropical zones of South America, and in many mountainous areas of the world. Usually referred to as "drift", the material is also known as boulder-clay, diluvium, outwash deposits, glacial moraine, and till.

The surface of the mantle of drift is shaped into a wide variety of structures, that have been invariably associated with a glacial origin. *Kames* are conical mounds usually composed of sandy material, that are thought to have been caused by the dumping of glacial debris when the great ice-sheets of the glacial age melted. *Eskers* are long, winding ridges of gravel and sand, that are explained in the glacial theory as the debris of rivers formed in or on the glaciers, that was let down when the ice melted. Sometimes branching eskers occur. The eskers are known to stretch for great distances, go up and down hills, and disappear and occur again further on.

In the prairie regions of Canada and in the northern states of the United States there are various kinds of *rimmed plateaux*, composed of drift. Often these have central depressions containing clay sediments. The rims are often composed of stony material and contorted drift layers. Some of the rimmed plateaux or prairie mounds are of large size, with areas of several square miles, and may reach as much as 150 feet above the surrounding hummocky and pitted regions.

The rimmed plateaux and prairie mounds are explained in the glacial theory as landforms created during the melting of the great ice-sheets. The glaciers, it is believed, sometimes melted in such a way that isolated blocks of ice were formed, that wasted away and deposited their debris in various kinds of rimmed structures and plateaux.

*Drumlins* and *flutings* are streamlined landforms that are explained as the effects of the movement of the ice in the glacial theory. The ice-sheet flowing across the countryside shaped and moulded the rocks and previously deposited layers of glacial debris into these remarkable streamlined landforms, that occur in swarms sometimes covering thousands of square miles. In drumlin swarms the drumlins all have locally parallel orientation.

Drumlins are hills shaped like the inverted bowl of a spoon. Glacial flutings are similar, elongated parallel ridges

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and troughs. These may stretch for several miles in the prairies of Canada and parts of North Dakota and Montana. Drumlins and flutings are often composed of drift, but many are bedrock or partly bedrock. Some have a mass of bedrock at their upstream ends.

In general the landforms composed of drift have a remarkably fresh appearance. Although they contain loose material, the effects of erosion have been minimal, showing they could not be of great age but must have been formed recently. Geologists believe that the last of the ice disappeared only a few thousand years ago.

*Striations* are frequently present on the surface of the bedrock underlying the layer of drift. In some areas the bare rocks uncovered by drift are also scratched and grooved, as if by movement of stones across them, and this is attributed to the ice-sheets in the glacial theory. As the ice-sheet moved, it is supposed, there were large numbers of stones being carried along in its base, that gouged the bedrock as the ice-sheet went along.

Within the layers of gravel in the drift there are many rocks and boulders that are striated. These are thought to have been transported by ice and abraded in the process.

In the bedrock underneath the drift, and at many places where the bedrock is exposed, there are deep vertical potholes, that are often explained by reference to the glacial theory. These are attributed to glacial "moulins" or waterfalls tumbling down crevasses in the ice, that eroded the bedrock and caused these deep holes. Potholes are usually filled up with the drift material, sand and gravel and large boulders.

Large boulders are found in some regions with a composition quite different from that of the bedrock in the vicinity. In the drift there are stones and pebbles of varying composition and appearance, but most of the rocks reflect the composition of the bedrock underneath. The large boulders of quite different composition are known as "*erratics*", and are considered to have been transported from regions afar by the moving ice-sheets. These may sometimes be as large as houses, and are usually rounded, though some are of irregular shape.

### Earlier Interpretations of the Evidence

The layer of drift was once attributed to the flood, rather than ice ages. The term "drift" goes back to the idea that the transported rocks, those with compositions differing greatly from that of the bedrock in the region, were thought to have been rafted about during the flood by icebergs. These rocks, it was supposed, dropped down through the waters when the ice-floes melted.

An American version of the theory that ice-floes transported the drift material during the Noachian deluge was proposed by Peter Dobson of Vernan, Connecticut in 1826. He reached his conclusions from observations of striated boulders found on the surface and at considerable depths in excavations of the drift.[1]

### The Rise of the Glacial Theory

A leading exponent of the diluvial theory of the drift was William Buckland of Oxford, England. He was among the first, however, to abandon this idea in favor of the glacial theory of Louis Agassiz. Buckland supported Agassiz's claim that Britian and much of Europe had been inundated by land-ice after Agassiz visited Scotland and England in 1840. Charles Lyell, however, still favored the iceberg theory for most of the drift.

### The Glacial Theory Accepted, but with Some Opposition

Agassiz came to America in 1846 and energetically proclaimed the glacial theory while teaching at Harvard University. Gradually the theory of a great glacial age gained acceptance, although strong opposition was voiced by geologists such as J. W. Dawson and Sir Henry Howorth. Howorth wrote numerous articles in opposition to the claims of glacialists that appeared in the *Geological Magazine* of London. He also wrote books such as *The Glacial Nightmare and the Flood*, and *Ice or Water*, a two-volume sequel arguing against the glacial interpretations and proposing instead a violent flood as the cause of the drift phenomena.

For many years a controversy raged about the reality of the Ice Ages, but Howorth's arguments were not taken very seriously by geologists who favored the glacial interpretation. His idea of a violent catastrophic origin of the drift was ridiculed. Referring to one of Howorth's books, Warren Upham wrote in 1894:

> The attention and general approval which have been accorded by English and Scottish reviewers to the recent book by Sir Henry H. Howorth, which sets aside the glacial theory, and substitutes for it the debacle theory, earliest thought out and long ago abandoned by geologists, seem suprising to American readers, since a most wonderful and unique but gentle agency of formation of the drift is by these authors discarded in favour of a still more strange and extravagantly violent hypothesis . . . . they seek to revive an old opinion which had its day at the beginning of investigations of the glacial drift, but long ago became entirely obsolete.[2]

### Howorth's Objections Considered Especially

No answer to Howorth's scientific objections to the possibility of the mechanisms involved in the glacial theory seems to have been published, however; and it would seem that the principles he appealed to have not become dulled over the years. Many of the assumptions involved in the glacial theory, Howorth argued, are contrary to physical laws and known facts about the properties of ice.

Howorth believed that the motivation of geologists who favored the glacial theory was their reluctance to accept a catastrophic alternative. He advocated a return to the older view, that the drift layers were the deposits of the Noachian flood, and that these materials had been transported by violent currents. In his book *Ice or Water* he discussed the reluctance of his contempories to accept this alternative:

> This alternative, I have always maintained, exists, and was universally accepted before the world was dazzled by the factitious glamour of Agassiz's rhetoric, and especially by the escape it seemed to offer the fanatical adherents of the theory of uniformity as expounded by the disciples of Lyell, more especially Ramsay and Jukes. Their real inspiration has been the fervent hope embodied in the words with which Sir R. Ball concludes his ill-fated book on the *Glacial Age*. "The appeal to ice," he says, "removed the glacial period from the position of a 'catastrophic' phenomenon. It placed the ice-sheet as an implement at the disposal of the geological uniformitarian." That was the real basis and inspiration of the new theory. That was what gave it its hold upon the geologists of a generation ago. They did not stay to ask whether in their zeal in favour (not of a real doctrine of uniformity, but a bastard one) they were not giving themselves up to a Scholastic figment and appealing to a fic-

titious and imaginary instrument in order to save them from what they deemed the most pestilent of heresies, namely, catastrophism in any form.[3]

### How the Present State of Opinion Arose

Whatever the reasons, most geologists slowly accepted the theory of ice ages and the idea of a world-wide flood was relegated to the limbo of having no geological effects whatsoever. And that is its present status, although there have been some voices in the wilderness all along proclaiming the faults inherent in the Geological Time Scale.

The intellectual climate at the end of the nineteenth century was overcast by the heated debates amongst the scholars about evolution. Intense opposition to Biblical teachings no doubt hindered a really objective attitude to the evidence for or against the glacial theory. There cannot be any doubt that geologists were aware of the many contradictions and seemingly impossible assumptions involved in the postulated ice-sheets.

It was thought that while the whole theory might eventually prove to be wrong, it was still a useful framework for observation. Perhaps because of the unsolved problems in Quaternary geology it has been the most studied of any of the geologic eras, but a progress report of the last century could still aptly apply to the state of affairs today. T. Mellard Reade wrote in 1896:

> The phenomena of the Glacial Period in Britain contain some of the most interesting problems it has yet been the lot of geologists to attempt to solve. It therefore behoves us to approach the subject in a spirit of humility. That such varied explanations have been proffered from time to time, that most contradictory conclusions should be drawn from well-ascertained and generally acknowledged facts, is curious and somewhat depressing. There is, however, this reflection to comfort us: however strange, however contradictory, however devoid of common-sense the various explanations and theories of the Glacial Period appear to the various observers and reasoners upon them, the total effect is, like that of the hypothetical Ice-Sheet, a push forward. Without opposition, observation stagnates, so that the first effect of enthusiasm, even if directed in lines that afterwards prove to be mistaken, is to advance the science we love so well. Even if a theory be utterly false, it may prove of great educational value, for, until every possible line of reasoning has been traversed, secure ground cannot be reached.[4]

With this rather uncertain foundation, the Glacial Theory became the backbone of geological research on the drift phenomena. As the most recent of the geological eras, the Quaternary forms the bridge from hypothetical geologic ages of the past to the present. As can well be expected, textbook writers have not emphasized too much the negative aspects of the theory.

Perhaps the background of doubt in the last century has even resulted in a defensive unanimity amongst geologists, that resists questions and ideas that do not conform to and support the basic framework of the geologic story of the earth's past. Variations within the superstructure are allowed, and these have proliferated. But it is not kosher to seek alternatives, or to deny the faith altogether by resorting to catastrophes.

### Difficulties in the Glacial Theory

The layer of drift is the main body of evidence for the glacial theory. When one considers how this material is distributed, considerable difficulties arise in the notion that it has been caused by glaciers. It is not present in many areas where one would expect to find it, and it is present where one would least expect it. Thus in the northernmost parts of Greenland, and in the islands of northern Canada, no drift is present. But it is found in tropical areas such as the Amazon jungles. Regarding the tropics, right at the equator, no less an authority than Louis Agassiz wrote: "There were drift accumulations, and scratched rocks, and erratic boulders, and fluted valleys, and the smooth surface of tillite . . ."[5]

The presence of drift has been reported from such places as British Guinea, equatorial Africa, Madagascar, and India. Wherever the characteristic features of the drift are found, it seems necessary to postulate former glaciers to explain it. The theory of continental drift is partly an attempt to explain how the ice-sheets could have existed in these areas at various periods in the past.

The glaciers of mountain regions and the ice-sheets of the Antarctic and Greenland do not seem to be forming any deposits similar to the layer of drift that has been attributed to ice-sheets of the past. Present glacial moraines contain fragments of angular rocks unlike the boulders in the drift, which are rounded; and the glacial deposits of the present have none of the features of the structure of the drift, but are more aptly described as a heterogeneous muck.

The postulated ice-sheets of North America and Europe are also somewhat lop-sided, and do not conform to the polar regions as one would perhaps expect they should; and accounting for this has been a brain twister for the glacial theorists.

Charles H. Hapgood proposed that the continents were dislocated from time to time from their present relationship with the poles, as the earth's crust shifted over its interior. Hapgood's idea was that the north pole was located in the Yukon 80,000 years ago, shifted to a point northwest of Norway, from there migrated to Hudson Bay, and moved to its present location at the end of the last Ice Age.[6]

One reason why this idea has not been afforded very great favor amongst Quaternary geologists is that the structures composed of drift around the world are all very well preserved, and there does not seem to be good reason for attributing some to a much earlier period than others. All of the drift landforms actually must be quite recent, and of similar age, if the degree of erosion is considered as an indicator of age.

### The Cause of an Ice Age Still Undetermined

The many astronomical theories proposed in the last century to account for the ice ages were discussed and refuted by Sir Henry Howorth in the first volume of *Ice or Water*. Today the problem is still much the same as then, no nearer a solution, and a statement by Coleman in 1929 is still valid:

> Scores of methods of accounting for ice ages have been proposed, and probably no other geological problem has been so seriously discussed, not only by glaciologists, but by meteorologists and biologists; yet no theory is generally accepted. The opinions of those who have written on the subject are hopelessly in contradiction with one another, and good authorities are arrayed on opposite sides . . .[7]

The problem in recent years has been restated. Rather than attempting to discover a cause for glaciation at various places around the world, emphasis should be placed on causes of climate change. On this "fundamental problem"

R. F. Flint wrote in 1971: "Research in the impressively wide field of possibilities has not yet progressed sufficiently far to enable us to choose among the various published theories, many of them conflicting."[8]

Conflict is perhaps all-pervasive in the glacial theory. But it is generally assumed that the ice-sheets in various parts of the world existed, the problem of causes being inconsequential to the evidence that they did not occur. So attention should rightly be directed to the geologic evidence, the drift layer and the landforms composed of drift and other features associated with it, that have been attributed to glacial action; and to the properties of ice.

### Problems About the Motion of the Ice

In considering the layer of drift and its origin, the basic assumption in the glacial theory is that material was formed by ice-sheets, and that rocks and stones from various places were ground up by the movement of the ice, transported in its lower parts and redeposited when the ice-sheets melted. The presence of erratics in the drift, scratched surfaces of the stones and the bedrock underneath, and other facts are considered to be proof of the involvement of ice. Inherent in this assumption is the notion that a great ice-sheet would actually move, and that it could carry along the material it over-rode and deposit the glacial debris in layers like those characteristic of the drift.

The motion of the postulated ice-sheets is a necessary assumption for a glacial explanation of transport of erratic boulders by the ice, and for the streamlining of the surface of the drift into flutings and drumlins. The physics of ice would lead one to expect that ice-sheets of the past would move under the influence of gravity, once the ice had obtained a sufficient thickness; and that the direction of this movement would be from higher to lower ground.

It would be a viscous flow, and would be controlled by topography and the slope of the upper surface of the ice-sheet. This would mean that there would be flow over level country only in the upper layers of the ice, while movement of the base of the ice-sheet should be limited to downhill gradients in the topography underlying the ice.

Movement of the ice-sheets of the past, that are proposed in the glacial theory, does not seem to have obeyed the normal rules, as the erratics are found in areas hundreds of miles from their supposed sources. This would require transport of the base of the ice-sheets over irregular country without any downhill slope indicated by present topography. Writing about the difficulty in explaining the required motion of the ice-sheets of the glacial theory, Howorth commented:

> A more important and far-reaching difficulty which the glacial champions have to face is the proved incapacity of glacier ice, as of any other viscous body, to travel over enormous stretches of level country, and up and down long hills, as it must have done if the glacial theory is to become the final and effective explanation of a large part of the drift phenomena.[9]

To get the debris of the base of the ice-sheets moved over sufficient distances, the idea of sliding of the base of the ice-sheet over the countryside, due to an unknown factor in the ice-sheets has been conceived. It is pointed out that the bases of the ice-sheets and glaciers existing today are rather inaccessible for study, and this has resulted in a lack of understanding of the processes that were involved in former ice-sheets. Flint suggested that basal sliding of these ice-sheets possibly exceeded the flow due to viscosity that would be confined mainly to the upper layers of the ice-sheets. Flint wrote:

> The mechanics of the process is not yet understood, partly because the base of a glacier is far less accessible to study than its upper surface. Apparently the sliding process consists partly of relegation (pressure melting of ice followed by refreezing), in which, therefore, transport of water is involved. In some glaciers, at least at some times, basal sliding may possibly account for most of the motion that occurs.[10]

The need for some mechanism for sliding of the ice-sheets over their beds, sometimes for great distances, up and down irregular country, is indicated by the presence of erratics in areas far from their supposed sources. The erratics, or boulders different in composition from the bedrock of the areas in which they are found, really constitute a minority of the boulders in the drift. Most boulders resemble the bedrock of the vicinity. Flint reported:

> A small proportion of the rock matter picked up does, nevertheless, travel long distances. Stones and boulders from Scandinavia and Finland were carried in the Scandinavian Ice Sheet through hundreds of kilometers to points in Britain, Germany, and Poland, and (1250 km) to Russia. Stones from Ontario were carried by the Laurentide Ice Sheet as much as 1000 km to positions in Missouri. Most such stones consist of durable rock types containing hard, resistant minerals, and with few joints or other surfaces of weakness. They may have survived long-distance travel in the base of the ice at the expense of considerable loss of size by attrition, or may have traveled in englacial positions where there were few other rock fragments to abrade them.[11]

The theory that these stones and boulders have been transported by the sliding of the ice-sheet at its base rests on an assumed process the mechanics of which is not yet understood. It is not known how the movement of the ice was accomplished, but geologists accept as a fact that somehow basal sliding of the ice-sheets over vast distances occurred. Perhaps it is less difficult to attribute unexplained properties to a vanished ice-sheet than to imagine a different explanation for erratic boulders that are obviously real.

Howorth claimed that the movement of ice-sheets is viscous flow and that there could be no "unknown" or mysterious properties in the ice of the glacial theory, that could cause movement in ways not evident in the ice known today. In this he appealed to true uniformity, and causes in line with those existing at the present time.

To postulate that causes in the past were different to those of present experience is quite contrary to the principle of uniformity that geologists claim to uphold. Regarding the possibility of a basal motion of the ice-sheets, apart from the viscous flow of the upper layers, Howorth wrote:

> If there be any such motion *en masse* it cannot be great, nor can it exceed a certain amount without the force inducing it becoming dissipated. This seems plain, as I showed before from some simple considerations. Every solid known to us will crush and disintegrate under a sufficient pressure, and it does not matter whether this pressure is applied perpendicularly downwards, or laterally. It follows, therefore, that if a solid be so heavy and so big that it requires more than a certain force to move it, it will crush rather than move, that is to say, the whole thrust will be dissipated by the object being reduced to pulp, or

even liquid, which will flow away rather than move *en masse.*

This argument applies to all solids, and notably to what is almost a solid, i.e., to ice. The crushing point of ice has been roughly ascertained. It enables us positively to say that a mass of ice which is longer than (according to Oldham in his paper on the modulus of ice) about seven miles cannot be moved *en bloc* along a flat surface without crushing. If the ice has to move up-hill, and therefore to overcome gravity, the difficulty of moving it *en masse* will, *a fortiori,* be increased, and the length of the column of ice capable of being moved will be proportionately lessened. If it is on a slope and gravity gives its assistance, this motion will be reversed, and the greater the slope the greater the distance to which the mass can be moved. This is of course treating the problem apart from friction. There is also evidence that when glaciers reach level ground their motion, however caused, rapidly ceases.[12]

Not only is it necessary to assume that the base of the ice in the great ice-sheets of the glacial period was capable of moving for great distances, over irregular country, and frequently uphill, but the boulders it transported are thought to have been lifted upwards by the ice, so that now they are often found at altitudes much higher than those of the source beds from which the erratics are supposed to have been derived. See, for instance, Figure 1.

Flint provides a table of some examples of uplifted erratics, citing the following examples: (1) In Maine, erratics on Mount Katahdin have been transported at least 18 km and uplifted 1000 meters. (2) Erratics in the Adirondack Mountains, New York, have been transported at least 100 km and uplifted 900 meters. (3) On the Allegheny Plateau, central New York, rocks are supposed to have been moved 160 km and lifted 500 meters vertically. (4) On Killington Peak, Green Mountains, Vermont, rocks have been transported possibly 80 km and lifted 900 meters, apparently, by the ice. (5) In the Rocky Mountains of Alberta rocks have been moved a distance of 1,300 km and uplifted 1,300 meters. Other similar examples are cited from Alberta, Manitoba, Northwest Territories, and from Eire, Wales and Northern Germany.[13]

These erratics perched higher than their sources, if they are to be attributed to ice, would require that the direction of the flow of the ice was opposite to the slope of the land. Flint suggested that the stones were carried in the base of the ice, which flowed uphill, rather than that they somehow migrated upwards through the ice.

Discussing the notion that stones have been transported upwards by glaciers, Howorth accused the glacialists of departing from the principles of physics and appealing to "transcendental causes". Howorth wrote:

> The question is one of mechanics, to be dealt with by mechanical arguments, and it seems to me to be the height of rashness for geologists who are quite guiltless of any training or knowledge as physicists to appeal to transcendental causes, whose potency they have not tested, and which are treated as contrary to the laws of physics by those specially familiar with the latter.
>
> They habitually argue in a circle. Finding a big stone on a mountain many hundreds of feet above its bed rock, *and having made up their minds,* a priori, *like the schoolmen in the dark ages, that* their *deus ex machina,* ice and ice alone, did it all, they have to attribute to ice qualities which it not only does not possess, but which are contrary to the very elementary laws of matter.[14]

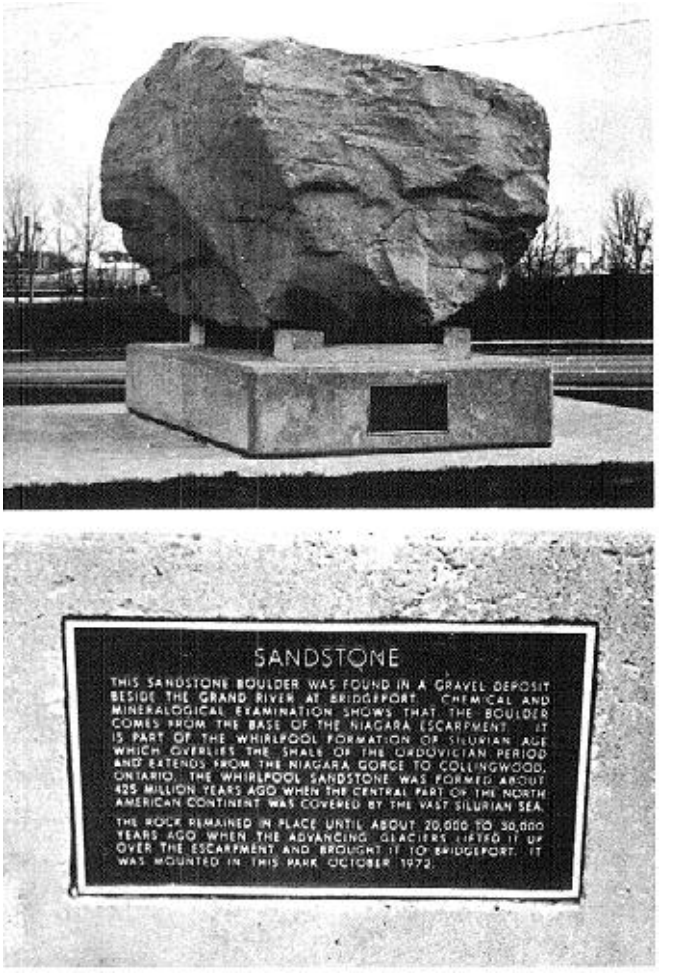


**Figure 1. The upper part shows a boulder in Gzowski Park, at the corner of Westmount Road and Chopin Drive, Kitchener, Ontario. The lower part is a plaque on the boulder.**

**The boulder shows cross stratification, with small iron ore concretions, arranged in planes that cross the pattern of cross stratification. It is suggested that the boulder was not carried up hill from below the Niagara Escarpment at all, but was formed *in situ* from the local bedrock.**

### How Could the Ice Move Uphill?

Far from actually proving the reality of ice ages, erratic boulders in fact pose a perplexing problem for this theory to explain. The ice not only has to be capable of basal movement over very great distances, it also has to move uphill for distances of hundreds of miles, which is contrary to any experience we have of glaciers and ice-sheets today.

Ice-sheets that are known from present experience tend to obtain a fairly uniform slope at which they are in equilibrium. The thicker they are the more quickly this equilibrium will be obtained. The ice will spread and thin out, by viscous flow confined to its upper layers, as long as thickness is sufficient to cause a flow.

No cause for upwards sliding of the base of ice-sheets is apparent from the study of present-day ice-sheets. No reason for the motion of ice over great distance is known. Yet this movement of the ice is a basic assumption of the glacial theory, and it must be supposed that ice in the past would act in the same way that ice acts today.

Any other ice will not do; the properties of ice that we know from experience set bounds and limits to scientific hypotheses about the ice of the glacial theory. If a transcendental ice is appealed to, such as is not observed today, then the glacial theory should be relegated to philosophy, and placed in the category of the celestial spheres of the astronomers of antiquity.

As Sir Henry Howorth insisted, ice as we know it moves downhill, under the influence of gravity. Motion of the base of the ice has no foundation in present day experience, particularly uphill motion, such as the glacial theory requires for the explanation of the distribution of the drift. Howorth complained:

> It is, however, I know, useless to quote glaciers to the ice men. They repudiate glaciers as tests altogether, just as they repudiate laboratory experiments upon ice. With them all inductive methods and arguments fail, since they always reply that the ice they appeal to is something entirely different to the ice of glaciers. It is ice-sheets they rely upon, portentous ice-sheets, such as no longer exist anywhere. A Saturnian postulate, in fact, is their platform, and not a mundane one. Yet it ought to be a condition even of such a transcendental postulate as this that the ice in an ice-sheet should act in accordance with, and not contrary to, the nature and the physical qualities of ice. If it does not, the appeal ceases to be a scientific appeal, and it is, in fact, very largely an unscientific appeal which is continually being made by this noisy, clamorous school of writers, who never verify their premises and make assumptions as readily as they abandon them.
>
> An ice-sheet is only a great mass of ice after all; a mass of ice which, instead of lying on a mountain slope or being embayed in a valley or on a plane surface, is supposed to have smothered and covered a stretch of uneven country and swathed it in a continuous mantle. Such a mass of ice cannot acquire properties not possessed by other ice. If it moves it must move according to the mechanics of ice, and, as we have seen, ice moves in no other fashion than by the influence of gravity.[15]

Basal movement of the ice-sheets is also a necessary assumption in the glacial explanation of the formation of drumlins and flutings. Again, the cause for all this motion is a mystery. The drumlins are streamlined, their form giving a clear indication of the direction of the streamlined flow that formed them. Paradoxically, this flow must have been frequently uphill.

In northern New York the drumlins are oriented north-south and the direction of flow was uphill from Lake Ontario; and in Northern Ireland, the pattern of the drumlins in one region indicates the flow was from out of the sea in Belfast Lough, and overland to Dundrum Bay.

If the drumlins were shaped by ice, the flow would have to be uphill, requiring a cause that is quite outside the forces of present experience. In an attempt to explain the nature of the forces that caused an ice-sheet to flow uphill in the New York region, Fairchild wrote:

> The drumlins were shaped by the sliding movement of the lowest ice, that in contact with the land surface. This fact implies that the whole thickness of the ice-sheet participated in the motion. Such motion was not due to gravitational stress on the ice over the drumlin area, but to effective thrust on the marginal ice by the gravitational pressure of the rearward mass. As the margin of the ice-sheet thinned by ablation, there came a time when the drift-loaded ice in contact with the ground was subjected to less vertical pressure by the deep ice in the rear, and was pushed forward bodily. In this fact is believed to lie the key to drumlin formation.[16]

It is postulated that "gravitational pressure of the rearward mass" caused the ice to flow uphill, but why would this presumably thicker mass of ice not have simply spread in the upper layers, instead of pushing the southward ice bodily and forcing it to slide over its bed, across high hills of rock? The trends in the shape of the New York drumlins do not confirm a theory of pushing bodily from the north, for the drumlins at higher altitudes to the south become more intricately streamlined, smaller and having steep sides and narrow crests.

Drumlins in the vicinity of Lake Ontario are large, flat topped and poorly streamlined.[17] Trends in the form of the drumlins indicate that streamlined flow of the agent that caused them was faster at higher altitudes to the south, and so a bodily push from the north, which could only cause motion as fast as the ice-mass causing the pressure, is incompetent as a cause.

### More Mechanical Difficulties: Ice not Strong Enough

Sir Henry Howorth pointed out that there is a limit to the size of an ice mass that could be pushed bodily. If the extent of the ice-sheets were greater than seven miles, he claimed, the ice would crush and dissipate the forces causing the horizontal push.

The ice-sheet causing the New York drumlins must have extended at least 50 miles from the shores of Lake Ontario, while the drumlins of the region were being formed. That they were formed contemporaneously is proved by the patterns of orientation over wide areas. A cause for the uphill movement of the ice-sheets is once again a missing ingredient of the glacial theory.

When one considers the pattern of the drumlins over broad areas of the North American continent, the vast areas over which streamlining occurs precludes the transfer of a force within the ice-sheet that could cause movement of its base over the countryside. Howorth wrote:

> . . . . it is not possible to pile up a mass of ice to an indefinite height, or to force a mass of ice of greater length than about seven miles along a level surface by any pressure, however obtained, without its crushing, and without, therefore, the thrusting force being dissipated.[18]

Not only is the cause for the movement of the ice-sheets over vast areas of irregular and uphill country unexplained, but the streamlined landforms are frequently composed of drift, which is supposed to have been deposited when the ice-sheets melted. Streamlining of the surface of the drift requires the existence of moving ice after it had melted!

This seems to be a contradiction within the glacial theory, and one that requires the utmost of ingenuity to explain away. Drumlins and flutings are thought to have been formed by movement of the ice, that over-rode the material left behind when the ice-sheets melted.

### How Could the Ice Have Melted, and Still be at Work?

How could the ice carve the surface of the drift, after it had melted? Somehow the ice must have returned to do its mysterious work of streamlining the drift, and when this resurgence of ice melted, it failed to deposit any debris. The streamlined surfaces are undisturbed by deposits of this last ice-sheet. Even drumlins and flutings that are explained

by erosion, bedrock drumlins and those containing stratified material, evidently contributed no debris to the glacier. For when the ice disappeared no layer of debris was left behind on the streamlined topography.

These are paradoxical facts inherent in the glacial explanation of the drumlins, and streamlined landforms do not in any way support the idea that ice ages have occurred. They are actually objections to the idea of great ice-sheets, that ought to have planed off the country they over-rode rather than moulding it into streamlined forms. This was admitted by Warren Upham, who wrote:

> Instead of amassing the till in such prominent accumulations, we should expect that the ice-sheet would tend constantly to wear away the hill tops and leave thick deposits of subglacial drift only in depressions of the country and on low or nearly level land.[19]

Both the drift phenomena and the glacial theory would indicate that the possibility of ice eroding drumlins from drift deposits and bedrock alike is doubtful. The moving ice would have destroyed every trace of stratification in the material it over-rode, especially when this was unconsolidated sandy material.

Yet drumlins are composed of sand and gravel with the pattern of cross stratification in an excellent state of preservation, as well as other types of drift such as clay and till. How could moving ice have carved these drumlins, without even disturbing the delicate patterns in the material comprising them?

Erosion of the surface of the drift by an advancing glacier has been proposed by Gravenor as the explanation for drumlins. He supposed that if the glacier advanced in an irregular fashion, halting and starting up again, the drift could have been deposited just prior to its streamlining by the advancing glacier. In effect, the glacier laid down for itself a carpet of drift in its path, which became streamlined as the glacier advanced. Grovenor wrote:

> Since some drumlins are made of pre-existing materials, it is known that erosion can produce a drumlin. It is believed that halts or a slow advance during the forward movement of a glacier can give rise to a wide irregular surface of drift which would be shaped into drumlins by the advancing ice.[20]

In this environment of drumlin formation the layer of drift is assumed to have been deposited during the advance of the ice-sheet, and if this were so there must have been a growth of the ice-sheet at the same time that it was being melted. One would expect, however, that the time of advance of the ice-sheets could hardly be the time of melting and deposition of their drift load.

If drift was deposited even while the glacier was advancing, how much more should we expect to find a thick accumulation of drift above the streamlined surface that could have resulted from the ice-sheets' melting! But no layer of drift occurs above the streamlined surface. In order to account for drumlins with internal stratification the glacial theory requires numerous conflicting and unlikely hypotheses.

Equally improbable is the idea that bedrock drumlins and flutings that occur in rocks harder than ice could have been eroded by the ice-sheets. On the one hand the great ice-sheets are supposed to have carved drumlins from loose drift materials without disturbing the pattern of stratification evident in the sand, and in other regions the same ice-sheet became much more competent than rocks of the hardest varieties; and shaped them into hills of the same dimensions.

In the process the ice-sheets apparently failed to accumulate a load of debris that had to be deposited on the drumlinized surface as the ice melted. What happened to the debris contained in the ice-sheet that eroded the drumlins? Rather than confirming the reality of the ice-sheets, the drumlins have so far proved inexplicable in terms of the glacial theory.

### Could Ice Have Carved the Rocks?

According to the glacial theory the layer of drift on the continents was formed during the melting of the ice-sheets. The gravel and stratified sand in the drift was deposited by "outwash" streams flowing from the melting ice. The unstratified material, known as "till", is thought to be the direct deposit of the ice. Till materials became stratified as they were transported and redeposited by the outwash streams, according to the glacial theory.

These conditions are considered sufficient to explain the characteristics of the stratified sand and gravel of the drift, with the pattern of cross stratification, rounded stones and pebbles and "sharp" sand. The stones of different composition are thought to have originated from widely separated source areas.

The ice flowing over various kinds of bedrock broke off bits of bedrock as it went along, which became embedded in the base of the glacier. As it passed over other territory, and areas where different kinds of bedrock predominated, it broke off other rocks that became embedded in the ice, and mixed in with other varieties of stones. Sir Henry Howorth objected to the assumption that the ice-sheets could have broken up their beds as they moved. He wrote:

> Ice is much softer and more easily crushed than the great majority of rocks, and would itself be crushed and reduced to slush by its own pressure long before the rock upon which it stands could itself be broken . . . We must always remember the kinds of materials upon which the supposed crushing was effected. These are not lumps of soft rock showing crushed outlines, but clean broken and shattered masses with their surfaces still raw and unhealed, consisting of the hardest crystalline rocks such as granites, syenites, porphyries, etc., as well as limestones, sandstones and chalk, and we are asked to believe that the same ice-sheets which thus shattered such intractable materials *in situ* after passing on a few yards travelled over beds of laminated and stratified sand and loam with such a gentle touch as not to disturb the laminations . . . .
>
> The word impossible is not a favourite one of mine, but I am bound to say that, if it is to be applied to any physical operation, I know of none where it seems so applicable as to the process appealed to by the ultraglacialists for the manufacture of drift by an ice-sheet smashing its own bed.[21]

If it is admitted that an ice-sheet could have moved over sufficient distances to accumulate a load of drift of variable composition, and broken up underlying rock by some process, would these conditions cause the surfaces of the stones to become rounded and smooth? The glacial theory requires that the stones, once broken off from the bedrock, would be rounded by abrasion in the process of transportation in the ice or in the streams that flowed from the ice when it melted.

Of course it is unlikely that stones would be mobile enough while embedded in the ice for them to have been rounded very much. But when we examine the till, the unstratified drift gravel and so forth, the stones are rounded.

Supposedly these must have been rounded by a previous erosional environment before they became embedded in the ice.

### Effects of Contemporary Glaciers Different

In mountain glaciers today there are examples of stones and boulders being deposited after transportation from their source areas by moving ice. These mountain glaciers form end moraines and lateral moraines composed of this debris once embedded in the ice or lying on top of it.

In glacial moraines of mountain areas, the fragments are angular in shape. They are not rounded and smooth like the stones and boulders of the drift on the continental lowlands. The glacial theory must assume once again that conditions in the past were quite different, contrary to the principle of uniformity.

The sand in which the stones of the drift are often embedded is explained in the glacial theory as originating in the environment of the melting of the ice at the end of the ice ages. However, in contrast with the stones of the gravel, the sand is composed of tiny grains of angular shape. Describing the characteristics of this sand, Reineck and Singh wrote:

> An important feature of glacial sediments is the presence of numerous labile minerals, e.g. feldspar, ferromagnesium minerals as unaltered, angular grains even in silt and clay-sized fractions. The sand fraction is characterized by extremely angular sediment grains . . . Sand grains of glacial sediments show characteristic surface features if studied by the electron microscope. Such surfaces show abundantly conchoidal fractures, minor striations, imbricate breakage blocks, and small-scale indentations.[22]

The presence of the fragile particles in the sand and clay of the drift has been interpreted by glacial geologists as evidence that the ice-sheet eroded fresh rock rather than decomposed or weathered material. The angular shape of the particles is interpreted as evidence of crushing and shattering processes at the ice-bedrock contact.

These fragile particles could not have been transported in outwash streams for any great distance, since they would be easily broken apart. The disintegrated boulders in the drift likewise cannot have been rolled great distances.

On the one hand, particles of fine size are thought to have been deposited quickly, while on the other, large stones with composition much different from that of the bedrock are thought to have been abraded and striated, moved great distances and finally deposited in swift-flowing outwash streams. Paradoxically, conditions of sedimentation would lead one to expect the opposite effects: the larger stones ought to have been deposited *before* the finer sized particles.

### Why is the Sand so Different from the Stones?

The contrast between angular sand grains and rounded stones and boulders, referred to as "clasts", in the drift is problematic for the environment proposed for its deposition in the glacial theory. In conditions where rocks can be rounded by abrasion it would seem that sand particles also would become rounded and the fragile particles disintegrated.

### Problems Concerning Cross Stratification

Stratified material in the drift usually exhibits the pattern of cross stratification, regarded as evidence for sedimentary deposition in rivers. However, a sedimentary environment for the formation of cross stratification has not been demonstrated by experiment. In the cross stratified materials stones and boulders are embedded in such a way that bedding does not wrap around them. No turbulence effects are present that could indicate currents aided in depositing the stones.

The direction of inclination of the strata in the pattern of cross stratification is variable, making the actual mechanism of formation of the stratified drift a mystery. However, in the glacial theory the drift is assumed to have been formed in a glacial environment.

### Difficulties About Kames and Eskers

Another enigmatic topic in the glacial theory is the origin of kames and eskers. According to the glacial theory the eskers were formerly river courses in the ice-sheets, and these may have been either surface rivers or rivers flowing in tunnels underneath the ice. The river beds became chock full of sand and gravel, that was deposited when the ice disappeared.

Kames are thought to be related structures, since they frequently occur in association with eskers. They are interpreted in the glacial theory as accumulations of debris from the melting ice-sheets, at the perimeter of the ice or in crevasses. They are composed of stratified drift, usually with abundant sand and gravel, and form irregular or conical mounds of various sizes.

Kames and eskers are apparently confined to thick accumulations of drift, and have not been reported from areas where a cover of unconsolidated material is absent. In a glacial environment, it would seem that rivers may have been present in the ice even where the ice over-rode bedrock, and one would expect that kames and eskers may have been deposited on all kinds of terrain, whether or not a layer of drift was present.

Since the eskers wind over irregular country, going up and down slopes, it is thought that they have been formed by accumulations of debris on the surface of the ice-sheets or in tunnels within the ice. But how the gravel could have migrated upwards in the ice, to become part of the beds of these rivers is not clear. If the eskers have in fact been formed by rivers in the ice, rather than rivers underneath it, there should be an easily discernable boundary underneath them, but such a boundary has not been reported in the literature.

A difficulty with the idea of glacial rivers forming eskers is the fact that the height of the drift on either side may vary considerably, which is not consistent with a glacial river concept. The layers of drift in the vicinity of eskers also appear to be continuous with the material in eskers, indicating that eskers and the drift of the region are of the same age. Sometimes the eskers occur in regions where drumlins are present.

To account for the drumlins, the ice is postulated to have been moving in the glacial theory, and yet the eskers are thought to have been formed during the melting of the ice. The drift of the drumlins appears to be continuous with the material comprising the eskers. The eskers have not been let down on top of the drift that has been streamlined, but appear to be continuous with the drift of the vicinity.

Studies of the internal structure of eskers have not clarified the problems of accounting for them in the glacial theory. Some contain vertical clay walls parallel to the axis of the esker. The direction of inclination of the cross stratification within eskers has led some investigators to the conclusion that the river that formed one esker flowed sideways, across the axis of the esker![23]

Flint suggested that most eskers have been formed in tunnels underneath the ice, or in open canals near the perimeter of the ice-sheet. The ice was stagnant and the ice-sheet was thin. Meltwaters flowing from the surface of the glacier sought the lowest channels, and thus topography influenced the course of the esker. Flint wrote:

> Most large eskers do not trend indiscriminately across country, as they should do if superposed from upon or within the ice. They are highly selective, following valleys through long distances and crossing divides at conspicuous low points. This could happen only if they were built on the ground, under the guidance of the local topography. Indeed the englacial hypothesis is an attempt at a compromise by keeping the ice tunnel close enough to the ground to be influenced by the terrain.[24]

However, the difficulty of the eskers following courses that go up and down hills is unexplained. It seems that for the common phenomenon of a sinuous ridge winding over the countryside many different theories are required, including (1) squeezing up of the drift by weight of the ice on either side, (2) deposition of sediments in crevasses, (3) deposition from rivers flowing in tunnels underneath, (4) deposition from rivers flowing in tunnels within the glacier, and (5) dumping of debris at the glaciers' snout as it melted away. Eskers are actually enigmas in the glacial theory, as the variety of hypotheses proposed to account for them shows.

### Prairie Mounds and Related Structures

Prairie mounds, rimmed plateaux, and a wide variety of landforms known as "ice disintegration features" are interpreted in the glacial theory as the effects of stagnating ice during the melting of the ice-sheets. According to the glacial theory ice sheets sometimes disintegrated in isolated blocks, that wasted away in place. In some regions these caused hollows such as kettles, and in other places raised mounds and plateaux resulted.

One of the most complex areas of investigation in the glacial theory involves the interpretation of events at the close of the ice ages in places where ice disintegration features predominate. The wide variety of these structures that may be present has given rise to conflicting interpretations for many areas. Quaternary geologists argue about how the ice melted, whether the debris was deposited underneath the ice, or on top of it with the ice buried underneath, or if rivers in the ice were responsible for intersecting ridges, etc.

In general the basic assumption that ice would disintegrate in isolated blocks, rather than the ice-sheet melting at its perimeter and gradually shrinking, seems essential for the glacial interpretation of the vast numbers of mounds, hollows and plateaux over the Great Plains of Canada. Yet this assumption is not confirmed by present experience with ice in glaciers and ice-sheets.

Actually melting ice influences the temperature of the environment in such a way that isolation of various blocks would be most unlikely. The glaciers melt at their perimeters, and one would expect that an ice-sheet would do the same. Studies of the so-called ice disintegration features only add to the mysteries of the glacial theory.

### Anomalous Fossils in Supposed Glacial Deposits

Another area of difficulty in the glacial theory involves the types of fossils that occur in the drift. If the Quaternary was a time of glaciers, one should expect that the fossils of the period would be restricted to life forms associated with cold climate.

A wide variety of life forms seem to have been present at the time of the deposition of the drift, which is interpreted as the material deposited during the melting of the ice-sheets, and which has been modified at its surface by the melting and movement of the ice.

The remains of the Cohoes mastodon were discovered in 1866 in the Pleistocene deposits of New York. Woolly mammoth and woolly rhinocerous bones have been found in many parts of the United States. A cave lion, one third bigger than the African lion of today, is representative of the middle Pleistocene of Europe. The strata containing abundant fossils of the Quaternary are interpreted as Interglacial deposits in the glacial theory.

Multiple ice-sheets are required for the interpretation of the fossils contained in the drift. In some instances these fossils seem to be more tropical than representative of cold climate. The kinds of fossils present do not really provide confirmation of an Arctic environment. Describing the variety of fossils present in the Quaternary of Alaska, Flint wrote:

> The extensive silty alluvium, now frozen, in central Alaska contains a numerous mammal fauna. The stratigraphic position of the alluvium is not well known, although $C^{14}$ dates show that the sediment antedates, at least in part, the Late Wisconsin drift. Freezing has preserved the skin and tissue of some of the mammals. The faunal list includes dog, wolf, fox, badger, wolverine, a large cat, lynx, woolly mammoth, mastadon, horses, camel, saiga antelope, bison, caribou, moose, stag-moose, elk, mountain sheep, musk-ox, musk-ox and yak types, ground sloth, beaver, and other rodents. The number of individuals is so great that the assemblage as a whole must represent a rather long time. The large cats and the ground sloth may seem suprising in a cold country, but their significance must remain unexplained until their stratigraphic significance is better known. The general rarity of fossil mammals in glaciated as compared with nonglaciated North America suggests that the rich Alaskan faunas are probably interglacial.[25]

Certainly the list of mammals does not confirm the idea that the Quaternary was really a time of cold climate. As with the many other topics involved in the glacial theory, unsolved problems, contradictions and mystery surrounds the question of the fossils of the glacial period.

### Is it Time for a New Explanation?

Inconsistencies in scientific theory, and poor correlation between theory and observational data, sometimes are indicative of a wrong approach or a fundamental error in assumptions. Perhaps the data that have been interpreted in terms of the effects of ice ages can actually be explained in a completely different way.

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# A CREATION MODEL FOR NATURAL PROCESSES

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*The author here proposes a creationist model for natural processes. In summary: natural processes act to conserve or to degenerate. Improvement by spontaneous natural processes acting without intelligent direction is impossible. Nature could be viewed as a battleground for the struggle between processes of conservation and of degeneration. It is necessary to be careful in studying these; for processes of conservation are often mistaken for improvement.*

## I. Types of Natural Processes

An irreducible classification of natural processes* would include three types:

1. Improvement processes—things get better and become more complex
2. Conservation processes—things stay the same
3. Degeneration processes—things get worse, fall apart, and disorder

Assuming all natural processes can be placed into one or two of the above categories,** a logical scientific question to ask is, "Are all of these types of processes possible?" It has been ascertained particularly in the science of thermodynamics that catagories 2 and 3 are definitely possible and observable. The interested reader should consult the papers listed in References 1-4 for a technical exposition of the first and second laws of thermodynamics as related to natural processes.

Supposed evolutionary processes fall into category 1. They are impossible and unobservable. This paper is not primarily intended to be a polemic against the philosophy of evolutionary progress.*** The bibliography in Reference 1 may be consulted for such an argument.

## II. Evolution as History

Many evolutionists admit that the so-called natural process of evolution is not going on now. It occurred supposedly once in the far past, but being irreversible it cannot now be demonstrated, for it is history. Obviously such an imagined sequence of steps required by evolutionary philosophy (molecules-to-man) cannot fall within the pale of science.

History cannot be subjected to scientific investigation for the reason that the *exact* condition of an event cannot be duplicated. The arrow of time, among other things, prevents this. Another requirement of the scientific method, repeatability, cannot be satisfied by historical events. Evolution, therefore, is unscientific.

Many evolutionists are aware of this limitation of their philosophy. Some evolutionary scientists are trying through research to outline the *supposed* conditions under with evolution, particularly chemical evolution, could have occurred. Any forced improvement processes generated by such experiments are automatically rejected by creationists because they are not spontaneous, are conducted under artificial conditions, are carefully guided by intelligence, and have no necessary relationship to any possible primeval natural condition.[6]

Even if a logical sequence of painfully sensitive improvement processes from molecules-to-men could be developed by scientists, no one could guarantee that it has ever occurred; thus it would not pass the test of observation.

## III. Creation as History

The creationist accepts the creation account in Genesis 1 and 2 as historical fact. It is obvious that the creation account, like evolution, cannot be subjected to scientific investigation. It offers, moreover an additional difficulty to an investigator: it is supernatural.**** Supernatural events are beyond scientific investigation.[7]

The physical creation at the end of the six-day creative period was in a state of perfection as deduced from Genesis 1:31—"and God saw everything that He had made and it was very good." Perfection is characteristic of everything done by the perfect, holy God, Whose personality is revealed in Scripture. Immediately after the creative period no improvement process would be possible since nature was in a state of perfection. Thus improvement processes have no place in a creationist model.

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*A natural process is defined as a spontaneous change occurring in nature in a sequence of steps over a period of time.

**A natural process possibly could be a combination of categories, such as 1 and 2, or 2 and 3, but not 1 and 3.

***Natural evolution fits into the general philosophy of progress that is deeply ingrained in human thought and can be traced very easily back to Greek thought. Consider this comment on Aristotle's metaphysical theory.

> Everything in the cosmos, from stones, animals, and people up to heavenly bodies, goes through its natural process of change and development in order to approach the perfection, the immutability, of the Unmoved Mover.[5]

****However as Dr. John N. Moore has pointed out since molecules-to-man evolution cannot thrive on strictly natural processes, evolutionists must appeal to *supra*natural processes for the improvement they imagine.