becomes available. It described how when living coelacanths were found, they were seen to be 100% fish, and so had to be abandoned as a transitional form.

At the end, the program said of *Livoniana*:

> 'It also has one freakish feature: there are seven rows of teeth. It is unlike any other creature we know of. This suggests it must be one of the host of mutants that made this change, just one of which would eventually become our ancestor.'

But multiple rows of teeth are not unusual in *fish*. In a typical supermarket you can usually find fish with multiple rows of teeth. Two well-known fish with multiple rows of teeth are piranhas[7] and sharks.

In summary the claim that *Livoniana* constitutes a 'missing link' between fish and tetrapods is not only false, but highly fanciful.

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'Snowball Earth'—a problem for the supposed origin of multicellular animals

Michael J. Oard

Many uniformitarian scientists believe that about five major periods, and several short periods, of glaciation have occurred on Earth.[1] In the evolutionary time scale, these ice age periods sometimes lasted several hundred million years and extended back 2–3 billion years ago. These supposed ice ages have been interpreted from till-like rocks[2] and other apparent glacial signatures observed within sedimentary rocks around the world (Figure 1). One such ice age is called the Neoproterozoic, or Late Precambrian, and thought to have started about 950 million years ago and ended about 520 million years ago.[3] During this 430 million-year period, according to evolutionary time, there were several long 'glacial' and 'interglacial' periods.

'Snowball Earth' hypothesis

Based on early paleomagnetic studies, evolutionists deduced that most Precambrian 'ice ages', including the one about 2.5–2.2 billion years ago extended as far south as the equator.[4] This radical proposal caused many scientists to question the paleomagnetic results, mainly because it is easy to remagnetize rocks. After many paleomagnetic measurements and several decades (i.e. Sohl, Christie-Blick and Kent[5]), the idea of an equatorial ice sheet, implying a completely glaciated Earth, has become widely accepted. Kerr writes:

> 'And last year, most researchers agreed that one part of the sweeping hypothesis—the claim that glaciers once flowed into ice-covered tropical seas—is correct … .'[6]

This is the 'snowball Earth' hypothesis. John Crowell, one of the chief investigators of supposed ancient ice ages, had been skeptical of the paleomagnetic measurements for several decades, but now has accepted the measurements.

There are several major problems with the idea that ice sheets reached the tropics at low elevation. One problem is that, once ice and snow covered the entire Earth, a frozen Earth would maintain itself indefinitely by ice-albedo positive feedback. Ice and snow have a high albedo, which causes most of the solar radiation to be reflected back to space. Without atmospheric warming, the temperature of the Earth would plummet far below freezing and the frozen condition would become very stable. So, a catastrophic climatic event would be required to melt a 'snowball Earth'.

How could life have survived?

The Cambrian period and its supposed 'explosion' of life occurred around 550 million years ago.[7] This means that the worldwide Neoproterozoic ice age was raging during, or just at the end of, the time when multicellular life exploded over the Earth. The origin of multicellular life would have occurred earlier, at the beginning of the supposed ice age, since some metazoan life occurs between 1,000 and 700 million years ago according to their time scale.[8] The origin of life itself has already been pushed back to over 3 billion years ago. So, it seems that evolutionists now have a serious problem with the supposed evolution of multicellular life. Kerr asks:

> 'How could life have survived … in a world in which the average surface temperature would have hovered around –50°C, not to mention the all-encompassing sea ice that would average a kilometer thick compared to the Arctic Ocean's few metres?'[6]

In a later article, he asks:

> 'How could early life have weathered such a horrendous environmental catastrophe without suffering a mass extinction? … How could algae and perhaps even early

animals have survived 10 million years sealed off by globe-girdling ice?'[9]

Hyde *et al*. reinforce this concern:

'But this period was a critical time in the evolution of multicellular animals, posing the question of how early life survived under such environmental stress.'[8]

It seems like evolutionists are caught in a bind.

The problem of the cap carbonates

Now that most geologists have accepted that the Earth was covered with snow and ice while multicellular life was evolving, another perplexing problem needs to be explained. This is the problem of the cap carbonates, which have a high amount of dolomite. The cap carbonates are interpreted as warm-water rocks because dolomite requires hot water to precipitate from solution. These rocks are very common *directly above* the Neoproterozoic 'ice age' deposits, sometimes with a knife-sharp contact.[10] The textures of the cap carbonates often indicate *rapid* precipitation from warm seas saturated with carbonate.[11] Hoffman and Schrag state the significance of such an abrupt transition to the cap carbonates:

'But the transition from glacial deposits to these "cap" carbonates is abrupt and lacks evidence that significant time passed between when the glaciers dropped their last loads and when the carbonates formed.'[12]

'Snowball Earth' followed by a rapid hothouse is considered doubly bizarre to some geologists.[11] Even more strange is the fact that the hothouse existed before and *during* the 'ice ages' based on the distribution of other carbonates associated with the 'ice age' deposits. Carbonates are located below Late Precambrian 'ice age' deposits, and in Scotland carbonates, including dolomite, are *interlayered within* 'glacial' deposits.[13] Carbon isotope ratios in the cap carbonates also appear to reinforce the idea that practically all life died out during the 'ice age'.[14]

Uniformitarian scientists used to say that the carbonates associated with 'glacial' deposits were 'cold-water' carbonates, citing evidence from patches of biogenetic carbonate that form in cold water today.[15] This was obviously a dodge. Now, they are simply accepting the temperature implications of these cap carbonates at face value and postulating a 'hothouse' immediately after the 'glaciation'.

The freeze-fry model

Evolutionists are back to the drawing board in trying to explain how life supposedly blossomed while such overpowering catastrophes were taking place. Hoffman and Schrag[12] have proposed a radical hypothesis that they believe explains the oscillating freeze-fry climate, as well as the mystery of the origin and evolution of multicellular life. Hoffman and Schrag agree that 'snowball Earth' would have been an ice age catastrophe of monumental proportions:

'Dramatic as it may seem, this extreme climate change [Late Cenozoic ice age] pales in comparison to the catastrophic events that some of our earliest microscopic ancestors endured around 600 million years ago. Just before the appearance of recognizable animal life, in a time period known as the Neoproterozoic, an ice age prevailed with such intensity that even the tropics froze over.'[16]

They say only geothermal heat kept the oceans from freezing clear to the bottom, leaving all but a tiny fraction of the planet's microscopic organisms to die. The heat near hydrothermal vents kept only patches of life going. Hoffman and Schrag grudgingly agree to the necessity of a hothouse immediately following this catastrophe:

'To confound matters, rocks known to form in warm water seem to have accumulated just after the glaciers receded.'[17]

They then propose an hypothesis that produces the 'snowball Earth' followed by its rapid reversal to a hothouse. It is this hothouse that subsequently *caused* the rapid diversification of multicellular life. Suddenly, the bizarre sequence of events is now 'expected'.[18] This is just one example out of hundreds of the incredible plasticity and unfalsifiability of the evolutionary/uniformitarian paradigm.

How does Earth transform from a snowball into a steam bath? In story-

Figure 1. *Close up of an outcrop from the supposed Neoproterozoic 'ice age', 8 km east of Pocatello, Idaho. Notice the larger rocks 'floating' in a fine-grained matrix.*

telling suspense, typical of evolutionary scenarios, Hoffman and Schrag[12] explain that volcanoes popped through the ice and belched life-saving carbon dioxide. The extra carbon dioxide in the atmosphere supposedly caused a super greenhouse effect. But, another problem arises, as the hothouse is also precarious to life: 'Any creatures that survived the icehouse must now endure a hothouse'.[16] If one such freeze-fry episode seems fantastic, this scenario supposedly repeated itself four times during the Late Precambrian and at least once during the Mid Precambrian.[4]

Origin of banded-iron formations

The freeze-fry model is also supposed to solve another great mystery of geology—the origin of banded-iron formations.[11,19] In the freeze-fry story, millions of years of ice cover would deprive the oceans of oxygen, causing iron from hydrothermal vents to become soluble in the ocean water. Once the ice melted, oxygen would mix into the ocean and cause the iron to precipitate. However, if the oceans lost their oxygen, how could life survive around those deep-sea vents? Another problem with attempting to solve this puzzle is that banded-iron formations not only follow 'ice ages', as predicted by the theory, but are also mixed down into the 'glacial' deposits.[13] Complicating the issue even more, there are no banded-iron formations after the Late Precambrian 'ice age'.

Expanding their theory, Hoffman and Schrag apply the freeze-fry model to future climates by predicting dire consequences of global warming that is assumed to result from increased carbon dioxide today:

> 'Certainly during the next several hundred years, we will be more concerned with humanity's effects on climate as the earth heats up in response to carbon dioxide emissions … but could a frozen world be in our more distant future?'[20]

Forced models

Climate modellers used to pay no attention to the snowball Earth hypothesis. However, now that they believe it is 'proved', they have attempted to model it by computer climate simulations. Interestingly, many of the modelling efforts are having problems coming up with a totally glaciated Earth.[9] For instance, the model of Hyde *et al*. failed to produce a 'snowball Earth'.[8] However, their model does provide *hope* for multicellular life in another way—by keeping areas of open water at the equator. However, Scrag and Hoffman[21] do not believe that the 'slushball earth' model of Hyde *et al*. agrees with the geologic and paleontologic data. The geological record supposedly indicates that the oceans were completely sealed off or close to it, say the proponents of 'snowball Earth'.[9] Neither do Hyde *et al*. agree with 'snowball' Earth, pointing out many serious problems.[22]

One difficulty computer modellers encounter is to generate enough carbon dioxide to melt the ice as demonstrated by Hoffman and Schrag.[14] In order to reverse the 'snowball Earth', the concentration of carbon dioxide in the atmosphere would need to be 350 times the current atmospheric concentration.[23] This is a tough challenge for volcanoes, which are more likely to cause cooling by volcanic ash and aerosols than warming by carbon dioxide.[24] Models of course are imperfect,[9] so proponents of 'snowball Earth' believe the models are wrong and need to be adjusted. Kirschvink *et al*.[25] claim some models do predict runaway glaciation with pack ice becoming 500–1,500 m thick, at least for the supposed ice age that occurred about 2.4 billion years ago. They also believe the melting of the ice in the Late Precambrian supplied the 'trigger' for evolution of multicellular organisms.[26]

Painted into a corner

It seems as though evolutionists have painted themselves into a corner with their 'snowball Earth' hypothesis. They have several near-impossible problems to solve—all at a time when supposedly multicellular life was exploding just before or during the Cambrian explosion. This time, they have two catastrophes to work into their scenario. But evolutionists always seem to have another hypothesis to add when boxed into a corner. If they only realized that the solution to the crazy freeze-fry idea is to challenge the glacial interpretation of the particular rocks. However, mainstream scientists have been unable to abandon their ancient ice age story, so they are stuck with their 'weird and bizarre' freeze-fry world, terms used by Kerr.[6] For creationists, the rocks and their associated 'glacial diagnostic features' can be explained very easily. They are the result of gigantic submarine landslides in a warm ocean that was precipitating carbonates in the early part of the Genesis Flood.[15]

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Sugars from space? Do they prove evolution?

Jonathan Sarfati

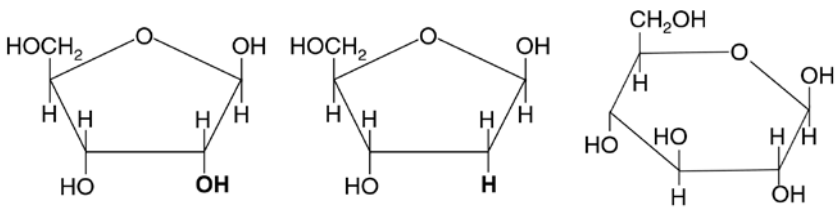
To a chemist, a sugar is not just that sweet crystal added to coffee and tea. Rather, sugars are one family of chemicals containing lots of hydroxyl groups (OH) attached to a carbon skeleton (*polyols*). Sugars are vital components of life, e.g. the 5-carbon (5C) sugars ribose and deoxyribose are part of the skeletons of our information storage molecules, RNA and DNA respectively. Ribose is also an essential component of the energy currency of life, adenosine triphosphate (ATP). The 6C sugar glucose is a basic energy source for plants and animals, and they are joined in chains to form the cellulose of plant cell walls, as well as the energy storage molecules starch (plants) and glycogen (animals). Common sugar, sucrose, found in sugar cane and to a lesser extent in sugar beet, is actually a combination of two 6C sugars, glucose and fructose.

The ultimate origin of sugars is a huge problem for those who believe in *abiogenesis*, the idea that non-living chemicals evolved into living cells without any intelligent input.[1] Abiogenesis has been such a difficult problem for the materialistic world view that various antitheists, such as Eugenie Scott of the so-called National Center for Science Education;[2] and Richard Hutton, the producer of the *Evolution* series shown on PBS(USA) and SBS(Australia); try not to answer tough questions about abiogenesis. Instead, they claim it is not part of evolution, which is simply not true, given its common name 'chemical evolution'. It has also been included as a part of the 'General Theory of Evolution', defined by the evolutionist Kerkut as 'the theory that all the living forms in the world have arisen from a single source which itself came from an inorganic form'.[3]

But according to some recent headlines, abiogenesis has virtually been solved by the discovery of sugars in meteorites. Supposedly this shows that sugars could be produced in space, then rained down on Earth to be incorporated into the first organisms. But what is the correct story?

What was found?

Researchers led by Dr George Cooper of the NASA Ames Research Center in California analysed the much-studied Murchison meteorite and the less-well-known Murray meteorite.[4,5] Both are a type of meteorite called *carbonaceous chondrites*, because they contain small nodules called *chondrules*. They are claimed to be the most primitive objects in the solar system, and the most likely to have organic (carbon-containing) molecules. They used a reliable technique called gas chromatography–mass spectrometry (GC–MS) to detect the different molecules, in the form of compounds with large silicon/carbon groups. They also studied the ratios of carbon and hydrogen *isotopes*, i.e. different forms of the same element. They found that they were enriched in the heavier isotopes ^{13}C and ^{2}H, which is consistent with an extraterrestrial origin for most of the molecules, rather



Sugars are vital components of life. The 5-carbon (5C) sugars ribose and deoxyribose (left and middle) are part of the skeletons of our information storage molecules. Glucose (right) is an important energy source for plants and animals.