

The above spread of genes across branches has been attributed to **horizontal gene transfer**, a mechanism used by microorganisms to pick up new genes in their environment from other kinds of organisms, supposedly giving rise to new species and kinds. Prior to the above studies, this type of transfer was only used as 'a last' resort to excuse phylogenetic inconsistencies. But horizontal transfer has now become an accepted evolutionary process to compensate for the RNA tree's shortcomings and is believed to be the key mechanism in what has now been termed the chimeric theory for the evolution of genomes .

Further apparent support for the chimeric evolution of whole genomes is now being obtained from the comparison of groups of hundreds of genes instead of just single genes. From a comparison of the entire genomes of two eubacteria, *E. coli* and *Synechocystis* (a cyanobacterium), *Methanococcus* (an archaebacterium) and *Saccharomyces* (a yeast eukaryote), genes have been grouped into those involved in processes such as transcription and translation (informational genes) and those needed for cellular 'housekeeping' (operational genes).<sup>5</sup> It was found that eukaryotic operational genes are most related to

*E. coli*, while informational genes were most similar to *Methanococcus*. But it must be noted that this grouping is a result of the comparison of only a few genomes and only one from a eukaryote, and may change when other genomes are elucidated.

Has horizontal transfer then salvaged some evolutionary credibility? To the evolutionist, *The absence of gradual inter gradations and phylogeny have always been a mortifying embarrassment.*<sup>6</sup> The diversity in design observable in the wealth of life forms has always resisted the lineage, or *'recognisable line of ancestry with identifiable ancestors and descendants,*<sup>7</sup> sought for by evolutionists to construct their phylogenies. Diversity, and thus, lack of lineage, is now also evident at the gene level. With this obvious breakdown of phylogeny, horizontal gene transfer — the opposite of evolution, or common ancestry — has been openly embraced. Thus phylogeny was never a *bona fide* prediction of evolution.

## Another threat to the Milankovitch theory quelled?

Michael J. Oard

Two major paradigm changes have transformed geology during the past 75 years: 1) plate tectonics and 2) the Milankovitch theory of the ice age.<sup>1</sup> Geoffrey Boulton, writing of progress in glacial geology during a 50-year period ending in 1987, remarked:

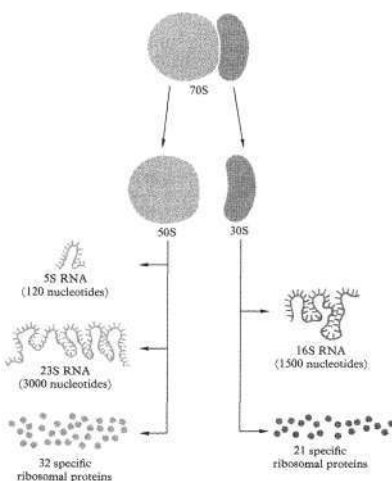
*The demonstration of an insistent pulse of environmental change with frequencies of 40,000 and 100,000 years has been one of the two most important geological discoveries of the last 50 years, the other being the plate-tectonic synthesis of Earth's structural evolution.*<sup>12</sup>

Neither theory was new, and both were once believed impossible. Both were quickly 'verified' by several key pieces of research and are now widely accepted. Since then, in a band-wagon effect, new research must be explained within the context of the paradigm.

For the Milankovitch paradigm, the watershed paper was published in 1976, purporting to correlate mainly oxygen isotopes in deep sea cores with changes in the earth's orbital geometry.<sup>3</sup> Many geological variables have since been correlated to the Milankovitch cycles, in seemingly consistent agreement. William Ruddiman expounds:

*Everything fits together so well that it would have to be a preposterously cruel joke if we were wrong.*<sup>4</sup>

Therefore, it is understandable that a challenge to the Milankovitch theory would be met with great resistance. One such challenge came in 1988 when Isaac Winograd and co-workers reported a supposed global climate chronology for the latest Quaternary Period.<sup>5</sup> Their results were based on uranium-series dating and oxygen isotope analysis of



Schematic representation of the *E. coli* ribosome and breakdown of its components. The ribosome is made up of approximately 65 % RNA and 35 % protein (from Stent & Calendar).<sup>8</sup>

a thick calcite coating on the walls of a water-filled fault crack. The crack, called Devil's Hole, is located in the desert 115 km west-northwest of Las Vegas, Nevada, U.S.A. (Figure 1). The researchers later extended their chronology for 500,000 years of supposed geologic time.<sup>67</sup> They claim their U-series dates of the calcite are ten times more accurate than any other U-series dates, including the U-series dates of raised coral reefs that indirectly provided the dates for oxygen isotope fluctuations in deep-sea cores. Winograd and colleague's chronology conflicts with the Milankovitch theory.<sup>8</sup>

Winograd and co-worker's oxygen isotope curve superficially appears similar to the Milankovitch radiational time series for high latitudes of the Northern Hemisphere (Figure 2). However, a closer look reveals a number of serious discrepancies. Mainly that the termination of the 'next to the last ice age' was about 140,000 years ago (supposed geological time), while the Milankovitch theory predicts it should be 123,000 years ago. But the timing difference is even greater because of the lag in ground water that flows to Devil's Hole. The time it takes precipitation to filter through the ground to Devil's Hole is supposedly anywhere from a few thousand to 20,000 years. This lag would push the

Devil's Hole 'ice age' termination back from 140,000 to 150,000 years or so. Therefore, the oxygen isotope curve from Devil's Hole is out of phase with the Milankovitch radiational curve at 60 °N — ice ages would melt during cool temperatures and develop during warm temperatures. A further challenge from the Devil's Hole chronology is that the oxygen isotope fluctuations ranged from 80,000 to 130,000 years and did not display the neat 100,000 year periodicity predicted.

Since 1988, there have been many attempts to discredit the Devil's Hole chronology. One of the latest attempted to show that the Devil's Hole chronology was related to Milankovitch radiational changes at latitudes other than 60 °N and seasons other than summer.<sup>9</sup> If such a correlation were possible with the out-of-phase Devil's Hole chronology, the Milankovitch theory would be plastic indeed! All these attacks on the Devil's Hole chronology seem to have been adequately addressed by Winograd and co-workers.

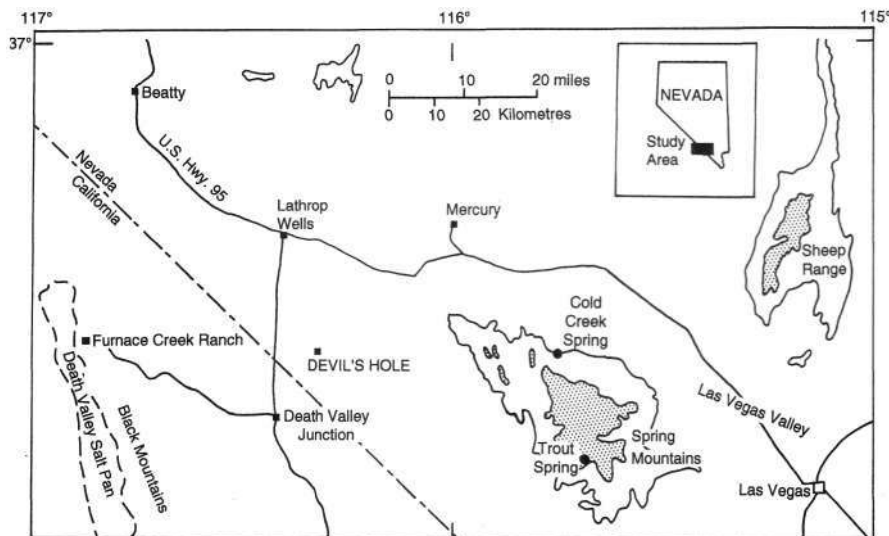
Recently, it was claimed that the challenge from the Devil's Hole oxygen isotope chronology on the Milankovitch theory had been quelled. Edwards and associates 'redated' Barbados coral terraces that were presumably formed during interglacial

high sea level stands. The terraces were one of the main original methods which were used to indirectly date oxygen isotope curves in deep sea cores. The Milankovitch theory was not totally based on the dated terraces, but partially so. Using the <sup>231</sup>Pa/<sup>235</sup>U method (one of the U-series methods), but with ten times the previous accuracy, they supposedly vindicated the Milankovitch theory, because they obtained similar dates to the original work.<sup>10</sup> Breathing a sigh of relief, Richard Kerr expounds:

*'For a while, it looked as if a water-filled crack in the Nevada desert might doom the accepted explanation of the ice ages ...If the Devil's Hole chronology was a true record of the world's ice ages, researchers would have to dump the astronomical mechanism and look for something new.'*<sup>11</sup>

Unfortunately, Edwards and colleagues by the same dating method also **verified** the Devil's Hole chronology! They could find nothing wrong with it. So both contradictory chronologies are deemed correct! Since Milankovitch is confirmed to be correct and Winograd is too, there must be some other explanation for the Devil's Hole chronology. At least researchers can now concentrate their attention on the challenge to climatic change, instead of errors in U-series dating. However, climatic hypotheses to explain the discrepancy at Devil's Hole have nearly been exhausted.

Winograd is not impressed with the new results of Edwards and colleagues, stating that they have simply reanalyzed coral samples that have already been used to support the Milankovitch theory. Interestingly, Edwards and colleagues discovered in the process a few large errors in previous dating.<sup>12</sup> Winograd also suggests Edwards and co-workers have neglected coral reefs from other locations that may not support the Milankovitch theory due to older dates.<sup>13</sup> Winograd does not believe the discrepancy between Devil's Hole and the Milankovitch theory has been solved,<sup>14</sup> but believes the Devil's Hole



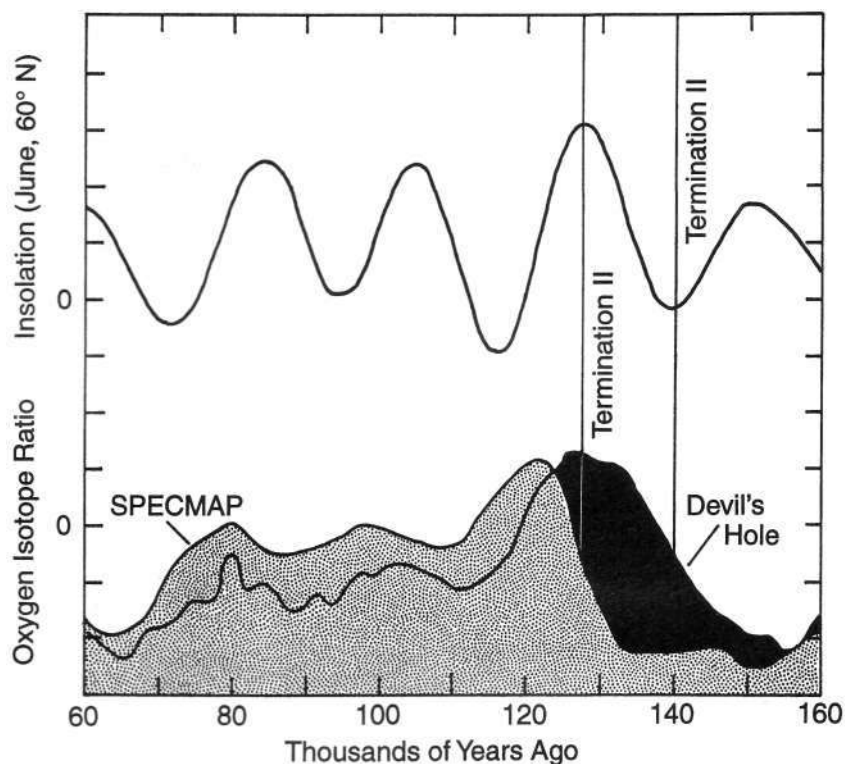
**Figure 1.** Location of the Devil's Hole in Nevada. Major mountains with contours of 2400 and 3600 m are shaded. Major roads are shown.

chronology is recording true global climatic changes, just like the Milankovitch chronology, and not just local climate fluctuations as some researchers have claimed.<sup>15</sup> Most scientists, however, still favour the Milankovitch paradigm.

Throughout this decade-long controversy, one learns that U-series dating on corals has not really been that accurate, in spite of claims to the contrary. There are processes that disturb the chronology, such as the diagenesis of calcite. Despite all the claimed successes throughout the years, we now find that, 'Getting accurate dates for the ancient reefs has always been a challenge...'.<sup>16</sup> Another interesting fact is that, beyond the range of carbon-14 dating, deep-sea sediments are **indirectly** dated.<sup>17</sup> These indirect dates are mainly from U-series dates of coral terraces, such as at Barbados; paleomagnetic reversals in the sediments, the first marker being about 780,000 years ago (the Brunhes-Matuyama reversal); and by simply assuming the Milankovitch theory is true and tuning the chronology to the theory, a form of circular reasoning. When you think about it, such methods are a rather shaky foundation for such a major paradigm change.

The Devil's Hole chronology has one mysterious feature that currently has no solution, which may hint that there are some unrecognized problems with the U-series dating method. The 500,000 year chronology begins 60,000 years ago and ends about 556,000 years ago (supposed geologic time). There has been no calcite precipitation on the outside of the deposit for 60,000 years! Researchers can find no environmental reason for such a change; the water is still supersaturated with respect to carbon dioxide.

One also wonders why so much research on so many aspects of Quaternary earth sciences over the years **fits** so well the Milankovitch range of frequencies, despite the theories many lapses.



**Figure 2.** An ice age 'out of synch'? Whether the end of the penultimate ice age (Termination II) fell at a sunshine minimum or maximum depends on which record is preferred — SPECMAP or Devil's Hole. (The vertical scale shows standard deviation units.)

### References

1. Locke, W., 1997. Letter to editor. *Science News*, 151:260.
2. Boulton, G.S., 1987. Progress in glacial geology during the last fifty years. *Journal of Glaciology*, Special Issue, p. 25.
3. Hays, J.D., Imbrie, J. and Shackleton, N.J., 1976. Variation in the earth's orbit: pacemaker of the ice ages. *Science*, 194:1121-1132.
4. Kerr, R.A., 1990. Marking the ice ages in coral instead of mud. *Science*, 248:32.
5. Winograd, I.J., Szabo, B.J., Coplen, T.B. and Riggs, A.C., 1988. A 250,000-year climatic record from Great Basin vein calcite: implications for Milankovitch theory. *Science*, 242:1275-1280.
6. Winograd, I.J., Coplen, T.B., Landwehr, J.M., Riggs, A.C., Ludwig, K.R., Szabo B.J., Kolesar, P.T. and Revesz, K.M., 1992. Continuous 500,000-year climate record from vein calcite in Devil's Hole, Nevada. *Science*, 258:255-260.
7. Ludwig, K.R., Simmons, K.R., Szabo, B.J., Winograd, I.J., Landwehr, J.M., Riggs, A.C. and Hoffman, R. J., 1992. Mass-spectrometric <sup>230</sup>Th-<sup>234</sup>U-<sup>238</sup>U dating of the Devil's Hole calcite vein. *Science*, 258:284-287.
8. Kerr, R.A., 1992. A revisionist timetable for the ice ages. *Science*, 258:220-221.
9. Shaffer, J.A., Cerveny, R.S. and Dorn, R.I., 1996. Radiation windows as indicators of an astronomical influence on the Devil's Hole chronology. *Geology*, 24:1017-1020.
10. Edwards, R.L., Cheng, H., Murrell, M.T. and Goldstein, S.J., 1997. Protactinium-231 dating of carbonates by thermal ionization mass spectrometry: implications for Quaternary climate change. *Science*, 276:782-786.
11. Kerr, R.A., 1997. Second clock supports orbital pacing of the ice ages. *Science*, 276:680-681.
12. Monastersky, R., 1997. Debate smolders over cause of ice ages. *Science News*, 151:327.
13. Kerr, Ref. 11, p. 681.
14. Hecht, J., 1997. Global wobbling may melt the ice. *New Scientist*, 154(2081):22.
15. Kerr, Ref. 11, p. 681.
16. Kerr, Ref. 8, p. 221.
17. Imbrie, J., Mix, A.C. and Martinson, D.G., 1993. Milankovitch theory viewed from Devil's Hole. *Nature*, 363:531-533.