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DRP - 2

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Birds and Dinosaurs

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Dear Peter:

There is perhaps no greater mystery about prehistoric life than what caused the extinction of dinosaurs. However, the subject has recently been discussed so much I am slightly reluctant to continue in fear that by adding to the present onslaught of theoretical bombardment readers might seccumb in despair. Nevertheless, I am disturbed by the poor quality of a "theory" that over the past several years has received excessive and ill founded attention.

The "theory," as proposed by Walter Alverez and others, suggests that the quietus of the dinosaurs was caused by a wayward comet that slammed into the earth. This is based upon findings of high concentrations of iridium in marine sediments that coincide with the extinction of certain marine organisms at the very end of the Cretaceous. Wether the iridium came from space debris or from within the earth is a moot qestion since the element is common in both places. Regardless the iridium layer is exciting news but what does that have to do with the dinosaurs?

This may seem unrelated to my canopy work but in fact the extinction of the dinosaurs is intimately related to the origin and evolution of today's lowland rain forests, a subject that will be elaborated upon in ensuing reports. Here I will only briefly discuss the recent discoveries, and political backdrop, which have brought this unlikely hypothesis to the foreground. Next month I will continue this essay while reporting on progress in the construction of the canopy research station at Rara Avis.

My desire to write this piece reached a high level after I picked up a then current copy of Discover magazine, in November

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of 1985. In it I found an article by Stephen Gould, a professor at Harvard, entitled "All the news that's fit to print and some opinions that aren't."

Gould had become upset by two New York Times editorials. One reported that a researcher had effectively deflated a claim (by D. Raup and J.J. Sepkoski Jr.) that over the past 200 million years extinctions have occured on a cycle of about 26 million years. Perhaps you heard of this claim when it came to the public cloaked in a hypothesis that our sun has a companion death star, which has brazenly been given the name "Nemesis." Nemesis is postualted to swing around the sun every 26 million years causing asteroids to shift from their normal orbits and ultimately rain on the planet to extinguish much life. Finding that extinctions are ridgidly cyclic would be a stupendous discovery and I am excitedly waiting to hear the results of additional mathematical verification. This problem will soon be resolved and although I do not know which way it will end I would bet that the ridgid cycles and Nemesis do not exist.

I would guess that Gould did not like the editorials not so much because there were some errors but, because editors aired their belief, well founded or not, that the cyclical extinction theory was an aberration.

> "The apparent periodicity of extinctions in the fossil record is probably an accidental by product of the method used to count them. In essence, a high extinction rate was assumed to have occurred during any geological stage with more extinctions than the stages before or after it. But that definition biases the counting toward periodicity, indeed makes likely that one stage in four will at random seem to be a peak of extinctions." (July 7, 1985.) "Terrestrial events, like volcanic activity or changes in climate or sea level, are the most immediate possible cause of mass extinctions. Astronomers should leave to the astrologers the task of seeking the causes of earthly events in the stars." (April 2, 1985.)

Gould responded with as acidic an assualt on the freedom of the press as I've ever read.

> "...the editorial pages of the newspapers are iust not the places to resolve complex scientific issues....Are we to decide intricate factual issues by vote, or by bald marshaling of popular opinon? So c'mon fellas, how about a truce?....I promise not to present my sure-fire solution to the national debt in my next column on insect brains, and you lay off about the facts of mass extinction."

It cheers me to see the collision theory being blasted, because I do not think highly of theories that do not credibly support their claims. If Gould can seriously ask the press to

lay off the facts of mass extinctions then its fair for me to ask that all the statements pro or con, especially pro, that have appeared concerning the collision theory for Cretaceous extinctions be retracted.

Are we entering a period when only "scientists" will be permitted to publish opinions about technical concepts? Will it become impossible for others to popularize theories out of fear of being lambasted by opposing, nihilistic groups of scientists? Scientists need not try and change the habits of the press only because editorials do not support a pet theory. If speculations have merit they will ultimately prevail and I doubt that the popular press will play any role at all, except to occassionaly lift (or dash) the spirits of those whose intellectual pursuits are not currently in vogue.

The asteroid theory received immediate attention but not without perpetuating the popular belief that dinosaurs came to an abrupt end. In so doing the theory treaded heavily on the toes of paleontologists some of which were invited to a symposium to discuss the "Geologic Implications of Impacts of Large Asteroids and Comets on the Earth." The paleontologists concluded that there is no fossil evidence supporting a rapid end to the dinosaurs. I quote from a paper delivered by William Clemens.

> "Terminal Cretaceous extinctions within the terrestrial biota [dinosaurs, land plants, and etc.] appear to have occurred over a geologically short but biologically lengthy period and to be the results of multiple, interrelated changes in physical and biological factors."

These pronouncements should have extinguished the comet theory yet the evidence has been swept aside in the excitement of imagining ecosystems withering under asteroid bombardment.

In the same symposium Norman Newall suggested that the asteroid theory provides more insight into what people prefer to discuss rather than explaining the dinosaur's dilemma.

> "The concept of world-wide catastrophe, death and destruction appeals to the imagination and is firmly rooted in Western traditions [and religion]."

But it is not just tradition that makes us interested in cataclysms. Nuclear warfare and an ensuing "nuclear winter" have presented us with some very real threats. The asteroid theory has been making political mileage as another vehicle for keeping the need for disarmament in the news. A subtle example of this is an article written by Natalie Angier for an October, 1985, issue of Time magazine.

> "The stupefying force of the impact, estimated at 100 million megatons, would have generated an enormous 3,000 degree F fireball that would have spread outward

> at the speed of sound, igniting forest fires from North America to Asia. Several hundred billion tons of plants and animals would have been incinerated, sending great scarves of black smoke to join the impact dust in the stratosphere and circulate around the globe. What is more, because soot does not rain out as easily as dust, the PROTONUCLEAR [my caps] winter would have lasted much longer than obscuring dust alone. Most plants and large animals that survived the blast, the fire and the lethal clouds of carbon monoxide would have succumbed to the climatic changes. But smaller creatures could have slipped into caves and hibernated until sunlight returned and they emerged to repopulate the earth."

The story is unbeatable, bone chilling rhetoric and if it moves countries to start burying their swords we will all benefit.

The theory, however, reminds me of a monster from a horror film where no amount of deadly ammunition has any effect. In general, theories about fossil life are much like monsters because once they have been proposed they resist death. A good example is an hypothesis that helped get us into this mess to begin with; the one which claims mammals caused the end of giant reptiles by eating all their eggs. There is is absolutely no supporting evidence for this hypothesis, yet because a more "colorful" theory was not around the egg-eating hypothesis has remained in force.

The fact that mammals survived the Cretaceous and then evolved to fill most niches has led to an unjustified belief that mammals were superior to the dinosaurs and drove them to extinction. If so, then one would have to wonder why mammals "peacefully" coexisted alongside the dinosaurs for more than one hundred million years before dinosaurs finally went extinct. This is one of the greatest puzzels of mammalian evolution. It would appear that mammals could not out-compete dinosaurs and had to wait for an outside event, not necessarily a colliding asteroid, before they could come to dominance. This leads to some interesting biological questions that have not been answered very well. What was the world like when mammals and dinosaurs lived together? What were the ecological needs of both groups?

We will never know for certain the answers to these questions, but that is hardly the point. Theories about fossil organisms mirror the beliefs and knowledge of the theorists. And it is my view that the best and most probable theories about past extinctions will grow from the knowledge we have about living organisms.

There are sound ecological reasons why mammals did not compete with dinosaurs for survival. Still these won't convince proponents of the asteroid hypothesis. But, remember that a protonuclear winter descended on all the earth's species. There

was no food, no light, and everywhere it was cold for a long, long time. If this were the case then any biologist could determine which animals would survive the blast. This is the point where the collision theory again becomes shoddy. It is so poorly constructed that it collapses from biological ignorance.

Which animals would have survived? This is a problem of energetics. The animals that used up their stores of energy most quickly would have died. Relative to mammals, the dinosaurs had a distinct advantage, as do all reptiles. A dinosaur that was the same size as a mammal needs only a small fraction the amount of food to survive. Also dinosaurs, like mammals, would have been able to hibernate as soon as they got cold. There would have been a large number of small and medium-sized dinosaurs that could have been as likely or even more likely to survive a "protonuclear" winter as mammals.

The coup de grace for the collision hypothesis is that it totally fails at predicting what would have happened to birds. Birds are animals that are literally teetering on the brink of death. Every day they need large amounts of food relative to their body size just to survive, they don't hibernate and they forage in the daytime. Within a week after the cosmic blast birds would have been totally extinct, yet nearly all major groups of birds survived the Cretaceous and rapidly proliferated. The collision theory makes the very existence of birds a far bigger mystery than the extinction of the dinosaurs. Those winged, warmblooded reptiles which populate our yards prove absolutely that there could not have been a "protonuclear" winter during the last one hundred million years, which in turn means a comet could not have caused widespread and general extinction of any of the planet's recent life. A different sort of event must have finished off the dinosaurs. This will be a topic of an upcoming report.

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On February 7, 1986, the day after arriving in Costa Rica, I was transported to finca La Selva, a lowland rain forest research station owned by the Organization for Tropical Studies. There I learned that the tree holding up my research platform had been dropping limbs. In November of 1982 I had noticed plate fungi growing from the lower trunk and anticipated problems though not quite so soon.

The extent of the tree's problems became more noticable in July of 1985 when a huge limb in the central part of the crown collapsed. Notably this was a limb unassociated with the platform, and one which supported a large Clusia, an arboreal bush having considerable weight. Now just eight months later the situation is acute. Many more limbs have fallen, bringing down numerous smaller trees directly underneath. A large light gap has opened and my platform is precariously perched amid a

mass of ailing limbs - these trees regularly shed limbs.

Not all limbs reached the ground. One was suspended from my web, which was remarkable in that the rope system has not totally degenerated from being exposed to full tropical sun for nearly the whole period since 1979. My job, which I dreaded, was to climb to the platform and cut the web rope to allow the limb to fall. My first first climb to the platform in three and a half years was poorly executed. 70 feet above the ground I heard a sharp cracking sound -- the limb I was hanging from broke. It fell a few feet before being caught by another branch. Even this limb could have been weak, so with my heart in my throat, I connected to descent equipment and cautiously slid back to the ground. (I have since removed the limb and found another site for a platform in the same tree.)

As the GEO film crew left La Selva Amos Bien, Mike Grayum, a plant taxonomist from the Missouri Botanical Gardens, and his wife Pam arrived to take me to Rara Avis. From the road head we hiked forty-five minutes to El Pastico a farm house (shack) that would be our base camp for two nights. The house itself was a two-story, gray-wood, structure with living and dining quarters above and storage below. It seemed to stand proudly, if insecurely, at the top of a hill in a small pasture. Its porch looked up the mountain onto the forest of Rara Avis, while its back was turned against the weather of the Caribbean lowlands. By leaning off the sagging stairs -- a few aging timbers had decayed and were in need of repair -- one could see the seemingly endless lowland plain where La Selva was lost amid a quilt of farms, pasture and residual forest. Air rising up the slope was cool and refreshing and as night fell twinkling lights of lowland settlements dotted the road to Rio Frio. I was taken by the tremendous beauty of El Plastico and it acted as a narcotic to drive away thoughts of the ominous specter of deforestation.

In the morning Amos and I hiked to the future site of his birdwatching retreat, Rara Avis. It was adjacent to a waterfall that seemed out of an advertising brochure. We made our way up river, hopping from boulder to boulder, beneath limbs festooned with epiphytes. We turned into the forest and climbed the steep canyon wall at the top of which I hoped to find a good vantage point. After many hours of forcing our way through dense undergrowth I gave up. It was useless to hunt for a site from the ground. Amos agreed and the next morning we returned to San Jose to rent a small airplane which would save several months work.

The weather became foul making aerial reconnaissance impossible. I am still "waiting" as this report comes due.

Sincerely,

Don

Don Perry

Received in Hanover 3/6/86