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The Moon: Time of Appearance and Nearest Approach to Earth

Cloud, in his recent article "Atmospheric and hydrospheric evolution on the primitive earth" (*1*), cites my report (*2*) as suggesting that sedimentary textures in younger rocks call for lunar origin in more recent times (times more recent than 2 aeons). This is a misinterpretation not only of my views but of Gerstenkorn's (*3*) capture mechanism on which they were based. This should be corrected, since there is no basic conflict between Cloud's conclusion that lunar tides appeared in the geologic record more than 2 aeons ago and my conclusion that the closest approach of the moon to the earth took place 0.7 aeon ago. According to Gerstenkorn's theory the moon in this interval of time was in retrograde orbit and was gradually approaching the earth. This is illustrated graphically in an article by MacDonald (*4*, Fig. 4) which is cited by Cloud.

The beginning of the Proterozoic about 2.5 aeons ago appears to be the most probable time for the capture of the moon. Pettijohn (*5*) notes the first appearance of the platform facies in the sedimentary record at this time, which involves the deposition of high-energy sediments. Gill (*6*) considers the change from graywacke and argillite to quartzose sedimentation at the Archean-Proterozoic boundary to be a real geologic event. This change indicates the appearance of a new source of energy in the oceans, with a worldwide increase in the amplitude of tides and currents. The amplitudes of stromatolites noted by Cloud give additional confirmation. The capture of the moon at this time affords a logical explanation for these observations.

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I did indeed misinterpret Olson's views in the sense that he (*1*) did not specify that the moon first appeared in orbit more recently than 2 aeons ago. He said only that it probably made its closest approach during the "Lipalian interval," seemingly interpreted by him as around 0.6 to 1 aeon ago. I took this to imply a belief that the moon appeared at about the same time (*2*), simply because it seems to follow from any capture mechanism that the difference in time between first appearance and nearest approach would be within limits too brief for geochronological resolution (*3*). If we assume, however, that a moon captured 2.5 aeons ago could delay its nearest approach to the earth until 0.7 aeon ago, as Olson now specifies, what would be the geological consequences?

If the moon approached the earth to within 2.89 earth radii, as Gerstenkorn suggests (*4*) and Olson seems to accept, very high temperatures would have been generated by tidal friction (*3*). Such temperatures, if they did not vaporize earth and moon, would probably have caused the extensive or complete loss of any then existing atmosphere and hydrosphere from the earth's gravity field. In any case, it is highly unlikely that life could have persisted. Such events would be visible in the geological record; but I, at least, am unable to see them in rocks younger than 3.5 aeons. If either the atmosphere or life (or even oxygen-releasing photosynthesis) started anew 0.6 to 1 aeon ago, we should see geochemical and paleontological evidence of a return to anoxygenous conditions, and then a new episode of evolution of oxygen in the atmosphere in more recent times. The geologic record shows nothing like this. It implies instead a continuous (though fluctuating) addition of oxygen to the atmosphere from about 2 aeons ago until now.

To me it is simply unbelievable that there were "tides with amplitudes of thousands of feet" (*1*, p. 461), called for by a very near approach of the moon, during any part of earth history for which we have a record in the form of either sedimentary rocks or erosion surfaces. Moreover, the presence of thick and extensive Molasse-type sandstones and conglomerates in the upper part of the Swaziland System (*4*), which is more than 3 aeons old, means that, by Olson's own criteria, the moon could not have been acquired as recently even as 2.5 aeons ago.

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Green Monkey Agent of Disease

With regard to our report on the agent of disease contracted from African green monkeys (*1*), we regret that prior to our publication we were not aware of a publication by Siegert *et al.* (*2*) in which these authors describe certain properties of an agent (which they call Marburg virus) isolated by them from patients suffering from the disease in question.

Their observations of the morphology and ether sensitivity of the agent are similar to ours. They also point out the possible relation of Marburg virus to the members of the stomatoviridae group. With the aid of immunofluorescence, they were able to demonstrate replication of the Marburg virus in Vero cells. It would appear that Siegert's group and ours at the National Communicable Disease Center are working with the same organism.

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