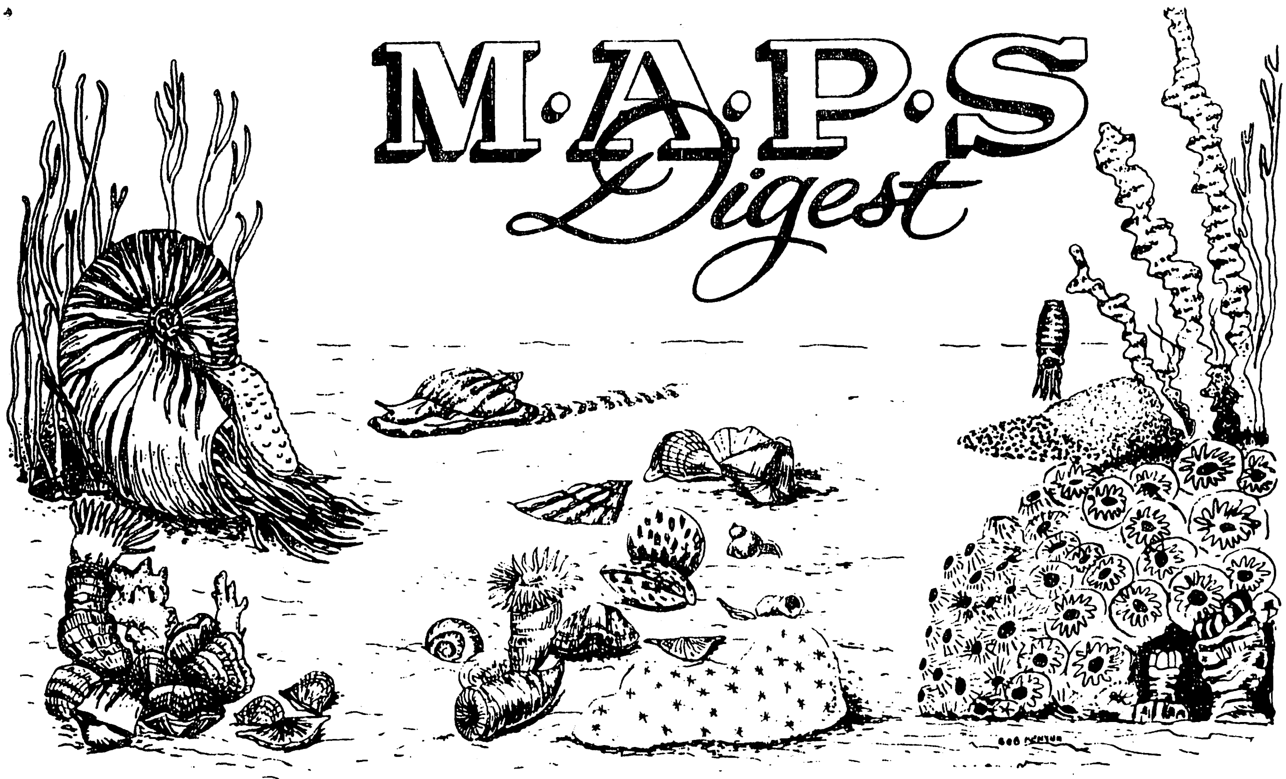
VOLUME 5



NUMBER 2

Official Publication of
Mid-America Paleontology Society

February, 1982

this is the garden: colours come and go,
frail azures fluttering from night's outer wing
strong silent greens serenely lingering,
absolute lights...

This is the garden. Time shall surely reap
and on Death's blade lie many a flower curled,
in other lands where other songs be sung;
yet stand They here enraptured, as among
the slow deep trees perpetual of sleep
some silver-fingered fountain steals the world.

"Tulips & Chimneys," E. E. Cummings
--LIVING CORALS, Faulkner and Chesher

A TIP OF THE HAT TO BOB KENYON

The new MAPS DIGEST masthead is the generous gift of Bob Kenyon. Bob has designed both our mastheads. We refer to him as "our artist in residence." His is a gift from The Man Upstairs and he has generously shared his very special talent with all of us.

Our most sincere thanks, Bob, for a new/old seafloor. May what appears below that ancient sea be equal to your beautiful art work!!

The seafloor is Devonian. By this time coiled ammonoids had evolved from a nautiloid stock. They were to become the dominant invertebrate group of the Mesozoic Era. Even when they first

(continued page 2)

MARK YOUR CALENDARS

6 Feb MAPS Meeting -- Augustana College, Rock Island, IL

1:00 p.m. Board Meeting
2:00 p.m. Program -- Dr. Glenister, The University of Iowa. Topic: "Can Fun In The Florida Sun Help In The Study Of Midwest Fossils?"

2 Apr MAPS NATIONAL FOSSIL EXPOSITION IV
3
4 Western Illinois University
Union Hall
Macomb, Illinois

BOB'S DEVONIAN SEAFLOOR, Cont'd.

appeared, they were distinctive enough to be useful for intercontinental correlation, particularly of upper Devonian strata.

Devonian coral reefs were widespread. A companion to these coral-reef formers was the calcareous sponge Stromotoporoidea group. It, too, formed...Devonian reefs and "gardens," and so was a common rock-former.

The trilobites still were present, and in some facies they are fairly abundant, but are represented by only a few groups.

The very first amphibian made its appearance during the Late Devonian and is called a labyrinthodont (because of the labyrinthine infolding of tooth enamel). It was an awkward model, looking like something a committee put together, its limbs were nothing more than jointed lobed fins; its head and tail were fish-like, too. Nonetheless, it did breathe air...They are of enormous importance as the evolutionary stem of all air-breathing, vertebrate land animals.

Tourists who use the Silver Gate entrance to Yellowstone National Park pass the site of another early land flora. To reach it they climb some thousands of feet by automobile and travel across an ancient and now uncovered sea floor dotted by glacial lakes. Beside one of these rises Beartooth Butte, a cliff of marine strata that range from Cambrian to Devonian in age. Near the top is an early Devonian river channel, worn in older beds while northwestern Wyoming was a lowland crossed by meandering streams.

...Laid down near the mouth of a sluggish stream, these sediments contain eurypterids, ostracoderms, fish, and a variety of land plants. The commonest of these is Psilophyton , a prickly, leafless shrub allied to one of Silurian Australia. Another plant had spore bearing stems resembling those of certain primitive ferns.

Our best record of middle Devonian vegetation comes from Western Europe. There, in what once were sheltered valleys between mountain ranges, grew fungi, rushlike plants, and others that resembled ground pines in shape though not in structure. There were also woody shrubs that reached heights of 8 to 12 feet.

Returning to North America, we find that mountainous areas, probably islands, extended from Georgia to Newfoundland during late Devonian times. Those mountains were moist, with many streams that flowed westward to the retreating sea. Where the streams reached salt water they built up deltas which spread until they formed an almost continuous lowland covered by some of the earth's first forests.

Devonian marine strata suggest warm, shallow, agitated seas by analogy with the restriction of modern reefs to shallow tropical seas. We also find today that the greatest diversity of marine organisms occurs in the warm subtropics and tropics where optimum (though not exclusive) ecologic conditions for many organisms exist.

Devonian land plants are similar the world over suggesting that climate was rather uniform. Wide distribution of richly fossiliferous middle Paleozoic marine carbonate rocks, and especially the great latitudinal spread of fossil reefs suggest subtropical conditions for North America Europe, Siberia, and Australia. It has long been felt that the average climate of the earth through time has been milder and more homogeneous than it is today.

When compared with modern distributions, middle Paleozoic reef and carbonate rock pattern present a serious paleogeographic problem because they are found at 70°N latitude with respect to the present equator, 30° higher than reefs now grow!

By making counts between annual growth lines (a single, very thin layer of lime once a day--diurnal, day-night) on corals Professor John Wells of Cornell University found that a Devonian year had 400 days.

--EVOLUTION OF THE EARTH, Dott, Jr. & Batten
--THE FOSSIL BOOK, Fenton and Fenton

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THE PROFESSIONAL'S CORNER --

MOSTLY ABOUT INVERTEBRATE FOSSILS

H. L. Strimple
904 Bowery
Iowa City, IA 52240

Section 5 -- The Concept of Pentameral Symmetry

Crinoids are said to reflect pentameral symmetry and in a broad sense this may be true, that is, there may be five infrabasals, five radials, five orals, five arms, or multiples of five (commonly), etc., but true symmetry is rare. In the drawing of an inadunate crinoid which I prepared, the symmetry is broken by three small anal plates in the cup between C and D radials which is known as the CD interray (the basal plate is CD basal) and/or the posterior interray. In orienting a specimen the posterior interray is toward the viewer and the opposite side is the anterior or A ray. Clockwise the ray to the right of A is B ray and so around the clock to C-D and E (which is to the left of A ray). In the not too distant past the rays to the right were called "right anterior"; to the left they were called "left anterior." But back to the symmetry problem.

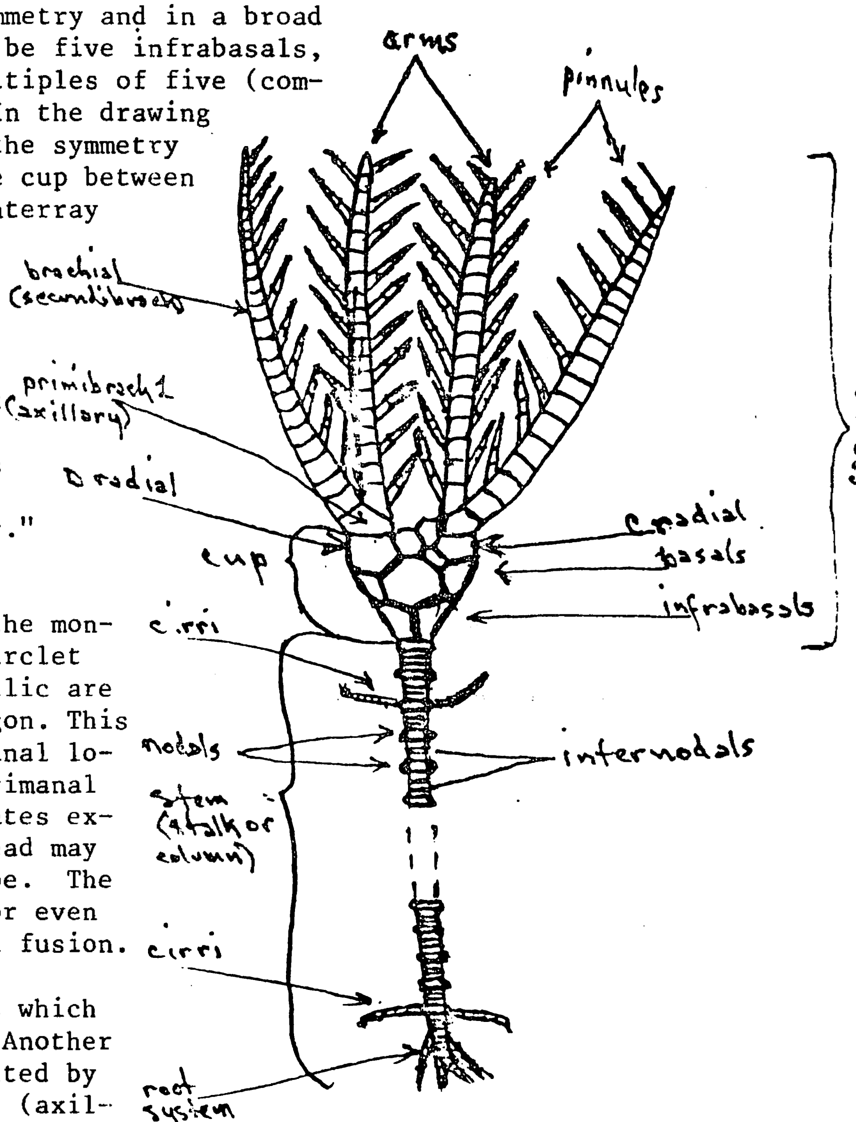

Figure 1. Rough drawing of a dicyclic inadunate crinoid illustrating various parts.

Among the camerate crinoids, particularly the monocyclic ones, the lower-most or proximal circlet of cup plates (which in the case of monocyclic are basals) form a hexagon rather than a pentagon. This is to accommodate an element called a primanal located in the posterior interradius. The primanal is very similar in appearance to radial plates except it does not support any arms but instead may support an anal opening or a small anal tube. The basal circlet may have two to five basals or even a single element in rare instances of total fusion.

There are a considerable number of crinoids which favor three infrabasals rather than five. Another trend toward triameral conditions is exhibited by some forms with rather long first brachials (axillary primibrachs 1). Often these elements in the C, D, and A rays are longer than the same elements in B and E rays. This condition is readily observed in young specimens of Apographiocrinus and Erisocrinus of Pennsylvanian age (see Strimple, 1938). This was one of my earliest scientific observations and there has been nothing to discount it to date. To carry the idea further it is my belief that many inadunates (probably not all) have arms which are "mirror pairs," that is, C and D are the "primary rays" and are paired, A ray is probably next which creates a "triameral condition" and the pair B and E are perhaps branches off the C D ambulacral system. In species or genera where certain rays cease to bear arms (e.g., Indocrinus or Tribrachiocrinus) it is usually the "weak" pair (B and E) in which the arms cease to develop.

Perhaps the most telling blow against the concept of pentameral symmetry is afforded by Calceocrinidae. This major group of inadunate crinoids flourished from Ordovician into Osagean (mid-Mississippian, or Lower Carboniferous) time and exhibit dramatic asymmetry.

Pentameral symmetry is a fine general concept which can be applied to echinoderms in general so long as one realizes it is not universal. There actually are some fossil crinoids which display true pentameral symmetry. A few that come to mind are the camerate crinoid Maquoketacrinus and among the inadunates Erisocrinus, Pontotococrinus, the strange Cupressocrinites, Encrinus and a few others, but they are rare.

Remarks. I have not attempted to document (or give specific references) to all statements or observations because that would create unwieldy reference lists. Most of what I have said or will say can be found in the literature but is not necessarily easy to find or without controversy. Some will be personal observation, as I usually note at the time. I could not resist the opportunity to give reference here to an "original observation" made back in 1938.

Reference Strimple, H. L., 1938. A group of crinoids from the Pennsylvanian of northeastern Oklahoma: Bartlesville, Oklahoma: 14 p.,

THE SEARCH FOR FOSSILS --

N. Gary Lane
Geology Department
Indiana University
Bloomington, IN 47405

One of the more frequent questions that is asked of the professional paleontologist is, "How do you know where to look for fossils?" There isn't a short, easy answer to that question. In the first place, a paleontologist rarely goes into the field just to collect fossils. He almost always has a definite goal in mind, a problem to be solved, or a question to be answered. Let's take a hypothetical situation.

A paleontologist is studying a particular evolutionary sequence of species in a brachiopod genus that ranges from the Upper Mississippian to the Upper Pennsylvanian. He has specimens from many horizons except one rather long interval in the middle part of the Pennsylvanian and he wants to fill that gap if at all possible. Fossiliferous marine middle Pennsylvanian rocks are known from various areas in Indiana, Illinois, Missouri and Kansas. Using the library, he consults the bibliographic indexes of North American geology. These list all papers on the geology of North America from the late 1970's. They are arranged both by author and by subject. He notes down all references he can find on Middle Pennsylvanian fossils or stratigraphy that might include mention of such fossils. He does not ignore such references as "Geology of Grundy County", for instance, if that county occurs where Pennsylvanian rocks are shown on, for instance, the geologic map of Illinois. He then goes through these references looking for mention of fossiliferous localities that might include his brachiopod. If he is lucky someone may have a list of identified fossils from a locale that includes the fossil of interest. He would take into account the date of the publication. The older the reference the more likely that the locality is no longer collectable. He would also consider how precisely the spot was located. A vague locality can result in several days of fruitless search in the field. In the end he would end up with a selection of a few localities that seem most promising that are closest to hand, and were available not too many years ago.

He would then arm himself with the appropriate USGS topographic maps, not only those on which the site is situated but adjacent ones as well. You can get lost 10 miles from a locality just as easily as you can close to it. He would then set off for the field, having done his homework and made a judgement about which spots seemed to offer best chance of success. This almost always results in "Win a few, lose a few". Some localities will have disappeared. He may have trouble locating land owners from whom he needs permission to collect. But some of the localities proved worthwhile and he obtains specimens that he needs.

Once he gets to the locality the first thing he does is to check the stratigraphy in the field. The reference he has used will surely state the stratigraphic occurrence of the fossils. It will say something like "lower part of the Bohunk Limestone", or "13.5 ft. above the base of the Labette Shale". Let's suppose the locality is a largish road cut and it turns out there

THE SEARCH FOR FOSSILS -- N. Gary Lane -- Continued

are two limestones and two shales exposed. He will need to know the physical characteristics of the shale or limestone: thickness, color, what the bedding is like, whether it is coarse or fine-grained, sandy, etc. He will also need to know what the rock units are above and below the Bohunk or the Labette and what their physical characteristics are like. This information should be included in at least some of the published references that he has consulted and he will be sure to have this literature, or copies of it, with him in the field. He will then decide, "Yes, this is the Bohunk, from here to here, and just above it is the thus-and-so rock unit and just below it is this other rock unit. They all fit the published descriptions". He will then start searching in the lower part of the Bohunk or measure up 13.5 feet in the Labette and begin to collect. Maybe he will find the brachiopods he is looking for, maybe he won't. If he doesn't then it's off to another locality and better luck.

PALEOASTRONOMY: THE CONTRIBUTION OF PALEONTOLOGY TO STUDY OF THE PAST HISTORY OF THE EARTH-MOON SYSTEM

Charles J. Peterson
Department of Physics and Astronomy
University of Missouri-Columbia 65211

At first impression, one might feel that a science such as astronomy which deals generally with distant objects would not have anythi ng in common with the study of past life on the earth, but the contrary is quite true. Astronomers deal with many phenomena in the universe. For example, we are interested in the origin of planetary systems; thus, study of our own solar system, and, in particular, our own planet yields information which we can apply to unraveling the mysteries of how planets are born during the process of formation of stars. This topic is very much related to the question of existence of life and intelligent civilizations elsewhere in our Galaxy. By interrelating geological data on the evolution of the atmosphere and the surface structure of the earth, the evolution of life here, present conditions on other planets in our solar system, and laboratory experiments, we slowly make progress toward understanding how life may have arisen on earth and the probabliity that similar occurences may have taken place elsewhere in the universe.

Astronomers study the structure and evolution of stars and the associated question of the origin of the energy that is radiated away. It is this radiation which determines the surface temperature of the earth. Life on our planet requires liquid water; thus, the existence of living forms at any era implies that temperature conditions must be between the freezing and boiling points of water at that time and this, in turn, tells us something about the solar luminosity. The oldest known living forms on earth are micro-organisms 3.5 billion years old. We can deduce from this that the amount of energy radiated by the sun has changed relatively little in that time span, a significant constraint with which any theory of stellar evolution must agree.

In fact, at the beginning of this century, this very fact posed a serious problem for astronomers, for, at that time, no known source of energy was sufficient to power the sun for longer than a few tens of millions of years. It would not be until the late 1930's that the mystery would be solved by the recognition that at the extreme densities and temperatures which prevail in the cores of stars, the lightweight element hydrogen can fuse to become heavier helium with the release of energy.

A specilized problem of interest to dynamicists concerns the origin and relation to the earth of our companion body, the moon. We do not know the circumstances of its origin nor how or when it became gravitationally bound into an orbit about the earth. One possibility is that it and the earth formed originally as a single, rapidly rotating object which, at some early time, split into two bodies. Or the earth and moon may always have been orbital companions, forming individually but close together from the pre-planetary materials which were left over after the formation of the sun in the center of the solar system. A third possibility is that the moon and earth formed in different parts of the solar system, but over the years their individual orbits about the sun brought them sufficiently close together that they became a single gravitationally bound system.

It is with regard to this latter subject that paleontological study can tell us about the past history of the earth-moon system. Without such additional study, we can know only about present conditions from direct measurement and from theoretical calculations. We know that the lunar gravitation raises tides in the oceans and on the land. The ocean tides would move continuously round and round the earth were it not for the continental masses which impede their movement. As the tides run into the continental shores, they act in such a manner to oppose the rotation of our planet; thus, the earth's rotation slows and the length of the day gradually increases. Conversely, the gravitational pull on the moon by the mass of the water in the tides, although essentially negligible compared to the whole bulk of the earth, acts to accelerate the moon in its orbit. The size of the lunar orbit slowly increases by an amount calculated to be 1½ inches per year, small enough not to be yet within our capability of direct measurement. The tiny increase in the length of the day is determinable, and is approximately 25 seconds increase per million years.

Tidal theory therefore suggests strongly that in the very distant past the length of the day was shorter (as short as 20 hours at the beginning of the Cambrian Period, 600 million years ago), the moon was closer to the earth (over millions of years the tiny annual change in its distance becomes appreciable), and the lunar month would have been shorter. On the other hand, the length of the year, the time that it takes our planet to move once about the sun, is believed to have remained essentially constant. The theory of gravitational tides as applied to the earth is not completely understood and astronomers greatly desire additional observational checks on their calculations and their theoretical principals. Furthermore, as tides and consequently their effect on the rotation of the Earth depend on the sea level as well as the configurations of the continental shore lines and ocean bottoms, the rate of rotational slowing will vary over the long geological eras, something we cannot calculate accurately.

Living organisms are affected by their environment which is in turn affected by these astronomical cycles. Because of the tilt of the earth's rotational axis to the direction of the sun, we have the annual seasonal cycle from winter to summer and a return to winter as the Earth revolves around the sun. Over the course of the year, living creatures such as corals, bivalves, and other sea organisms undergo a life cycle of rapid growth during the warm summers and slow or no growth during the cooler winters. The annual cycle is therefore recorded in the growth pattern of shells, the skeleton of corals, and limey secretion of algae. In fact, molluscan growth patterns have been used from at least the time of Leonardo da Vinci as an indication of the age of animals. But the other astronomical cycles may also affect growth. If the deposition of shell material occurs on a daily basis, then the growth pattern of the organism would reveal the number of days of growth per annual growth cycle. The lunar influence is somewhat more complex. One influence may result from the lunar brightness directly affecting growth cycles as the moon waxes and wanes over a month. The lunar tidal influence is complicated as ocean tides are raised by both the moon and by the sun. When the lunar and solar tides combine, at time of full or new moon, we have higher tides than at the times of the quarter moons, when the high lunar tides occur at the hour of low solar tide and vice versa. This interplay might affect growth patterns, however, and thus there would be the possibility of determination from growth patterns the number of lunar periods per annual cycle. One might also be able to detect some variation of the daily growth pattern due to the daily tidal cycle.

Remains of fossil organisms which exhibit cyclic growth patterns are known from as long ago as the Cambrian Period and in the case of stromatolites (the calcareous secretion by algae) as long ago as 2 billion years. If from growth patterns, we can establish the ratio of daily or lunar periods to the annual period, then we have exceedingly important data which can be related to astronomical theory concerning the earth-moon dynamics.

There are three criteria which an organism must satisfy if it is to yield the information we desire. First, the organism must undergo a rhythmic life cycle which will result in measurable structural features or patterns of features. Second, the life cycle must be related to an astronomical cycle. This point is significant--to be certain of the relationship of growth cycles to astronomical cycles, we need to study living organisms. To use fossils in this manner, we also must be certain of the correlation; hence, we best need to study living organisms whose predecessors are found over long periods in the geological record, preferentially the so-called "living fossils." Third, the organism, living or fossil, must exhibit at least two rhythmic growth patterns that are astronomically related so that a precise numberical ratio can be established between the two. Paleoastronomical studies to date have used four different types of animals, but of these only two strictly meet all three criteria.

John W. Wells of Cornell University was the first to study corals in the belief that the fine ridge structure represented a daily growth cycle superimposed on a coarser growth banding representing the annual growth cycle. This view was supported by studies of recent corals from the West Indies (he found 360 fine ridges per each year's growth), and Pennsylvanian and Middle Devonian rugose corals (about 390 and 400 days per year deduced, respectively). More recent work, however, has cast grave doubts on the earlier results. Not only are the fine ridges difficult to count in a reproducible way, but also other environmental factors affect the growth pattern in corals. University of Hawaii researches R. W. Buddemeier and R. A. Kinzie find that the coral Porites lobata grows with a lunar periodicity, but only when the growth rate is optimal; thus, not a complete record of months is preserved in an annual growth cycle. Unfortunately, too, the rugose corals studied by Wells have not survived into the modern era, violating our second criterion above.

An alternative animal which does meet all three criteria is the class of bivalves which have been studied most intensively by G. Pannella of the University of Puerto Rico. In principal, annual seasonal and lunar tidal factors affect growth patterns, but this is complicated as tidal rhythms are also affected by wind and local shoreline configurations, the result of which is to obscure the underlying lunar monthly rhythm. More recently, D. S. Jones at Princeton has shown that even in cases where a daily growth rhythm exists, a shell layer may not be deposited, thus giving erroneous information on the number of days per year. Also he found that fewer daily growth layers are formed as the animals grow older. Bivalves may yet with further study provide valuable information especially throughout the Tertiary Period which is represented by abundant fossil material.

Fossilized algal specimens or stromatolites once were thought to be especially promising for paleoastronomical purposes due to their two billion year record in geological strata. However, modern algal colonies may not be sufficiently close to fossil stromatolites for us to be certain of the rhythmic significances of growth layers in the fossils. Stromatolite laminations often show incomplete sequences, thus can provide only minimum values. Two billion year old stromatolites do suggest strongly that there may have been 450 days per year then. As this is not consistent with the present rate of slowing of the earth's rotation, here may be evidence that the rate of slowing has changed. Their growth patterns certainly must be influenced by tides, but interpretation has not allowed determination of reliable periods for the lunar month. Most significantly, however, the establishment of lunar tides two billion years ago rules out all theories for a comparatively recent formation or capture of the moon.

P. G. K. Kahn of the Freie Universitaet in Berlin and S. M. Pompea and R. B. Culver of Colorado State University have argued that the nutiloids may yield the best information over their 400 million years of existence. The living Nutilus grows with two rhythmically repeating structures. Growth of the outer shell leaves daily growth lines and once a month at almost precise time intervals, a new septum or chamber wall is formed as the animal makes the next inner chamber which it uses in regulation of its buoyancy. The number of growth lines per chamber is very regular. These researchers have studied twenty fossil nautiloids with three important conclusions which reinforce their belief that nautiloids are the best animals to study for paleoastronomical timekeeping purposes. First, the number of growth lines per chamber is constant for each specimen. Second, the number of growth lines per chamber is nearly the same for all species of the same geological era, implying a similarity of origin for the growth cycle. And last, the number of growth lines per chamber decreases monotonically with increasing geologic age. The only exceptions to the general pattern are species whose structural characteristics suggest a mode of living restricted to shallow coastal or inland sea waters, rather than the open sea, deep dwelling habitat of Nautilus and its extinct relatives. As a result, it is concluded for the oldest species of the Upper Ordovician, the lunar period was as short as 8 present days, corresponding to a lunar distance of approximately 100,000 miles, only 40 percent of the present orbital size. A full moon in the sky would have appeared 2½ times as large as today's moon, a truly spectacular sight. Their nautiloid data suggest that the recession of the moon from the earth has not occurred at a constant rate, but has changed two or three times for unknown reasons.

As biologists and paleontologists come to a better understanding of the growth cycles of living fossil creatures and the relationship of growth to ecological and cyclic factors, we can expect that paleontology will further augment and clarify our limited knowledge of the past history of both the earth's rotation and the lunar orbit about the earth. Work to date must be regarded as preliminary, but the results are encouraging. In spite of problems in measurement and interpretation of growth patterns, all studies are consistent in showing that the earth rotated faster in the past and that the moon has been slowly moving away, both factors in rough accord with theoretical predictions. Current research soon should clarify existing uncertainties and lead to resolutions of discrepancies in the fossil data. With at least part of the past history of the earth-moon system established, astronomical theoreticians will have the necessary foundations on which to build an improved dynamical theory.

AN OPEN LETTER

How many of you know our Japanese member Yutaka Baba? According to his last letter to me at least eight of us do. Yutaka is the 50-year old newspaper man who has been an avid fossil collector and trader. He has sent us his fine Oriental fossils: plants, crabs, corals, etc.

But all good things come to an end unfortunately. Last April Yutaka had a very serious operation, so that he now has a "half healthy body" (his words). But he is alive and thanks God for that and for the many friends who prayed for him.

As a result of his operation Yutaka can no longer go on field trips to collect the fossils he loved so well. Reluctantly he is leaving the ranks of MAPS members. He says that he has learned a great deal concerning geology and fossils from his many fossil friends in MAPS.

In an effort to repay the many kindnesses extended to him (again his words) he has sent a gift of $50 to MAPS. Yutaka also sends his kind regards to Professors Kumar and Hukla in India, and to U.S. members Dan Damrow, Gil Norris, Don Badman, Phil Marcus and Lloyd Gunther.

We wish you the very best possible, Yutake, in the days to come.

--Dick Johannesen

THE EXCHANGE COLUMN

PIERO GIARONETTI, Via Bassini 15, 27.00 Pavia, Italy, wishes to swap or to sell large bell-shaped Italian Miocene Clypeaster (sea urchin) and Italian Pliocene molluscs from Piacehza and Asti. Interested in fossil Cypraeacea, crinoids trilobites, Cretaceous cephalopods, echinoids.

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Please add the following to your membership list:

Lt. (j.g.) Dean W. Buehler USS Towers (DDG-9) F.P.O. San Francisco, CA 96679	Serving in Asian Theater. Not in a position to trade at this time. Interested in all fossils of the midWest especially echinoderms.
Winston Crausaz Dept. of Geology Southwest Missouri State Univ. Springfield, MO 65802 417-836-5687	Instructor. Will not trade. Interested Mexican volcanoes, sedimentary rocks and fossils around Pico de Orizaba, Puebla-Veracruz, Mexico. Interested in fossils.
John J. Gorski Box 27 Lumberport, WV 26386 304-584-5973	Painter Will trade. Interested in all fossils. Has tree root fossils for trade. Has a high interest in all paleontology.
Gerald Gunderson 6413 Elmwood Avenue Middleton, WI 53562 608-836-1389	Science & math teacher. Will trade occasionally. Interested echinoderms, arthropods and fossils of striking appearance. Has <u>Linulella ampla</u> and <u>Dicellomus politus</u>, mass burial of 2 trilobites U. Cam. Collecting 29 yrs. would like to keep abreast of what others are doing.
David A. Hutchison 1506 Holly Lane Munster, IN 46321	
Jim Kostohrys 521 Cornell DesPlaines, IL 60016 312-827-8196	Sales Rep. Will trade. Interested Paleozoic era fossils. Has Penn. plant fossils, some good Silurian trilobites. Wants to meet more wonderful people like he's met in local club. (You came to the right place, Jim, you'll see!)
Larry Martin, Ten Million B.C. Inc. 3987 Queen Anne Drive Orlando, FL 32809 305-351-5289	Fossil Sales. Will trade. Interested in and has for trade Florida vertebrate fossils, but interested in all types of worldwide fossils. Wants to meet others interested in fossils.
Dr. James F. Miller Geography & Geology Dept. S.W. Missouri State University Springfield, MO 65802 417-836-5447	Asoc. Prof. of Geology (Spec. in Paleontology) Will not trade Interested Cambrian-Ordovician conodonts, Paleozoic crinoids (especially Mississippian). Any paleontology club meeting at Augustana (my Alma Mater) is something I would like to join. Both he and his wife collect fossils.
Dr. William N. Orr Geology Department University Oregon Eugene, OR 97403 503-685-4577	Prof. Will trade. Interested Micro-Paleontology. Has mollusks Tertiary, Eocene, Oligocene and Miocene.
Maurice R. Sandquist 1450 NE 139th Street N. Miami, FL 33161 305-895-7659	Retired. Will trade. Interested fossil fish Green River fm. Has fish, ammonites, trilobites, etc. Collecting 8 years. Interested in focusing on shark teeth, bone, etc. from the phosphate areas of central Florida.
William T. Watkins 223 Lyric Drive San Antonio, TX 78223 512-534-4006	Retired-Civil Svc. May trade. Interested in preparing & studying crinoids, etc. Has crinoids, echinoids, ammonites, etc. Found Cretaceous comatulid crinoids in caves. Has something to share with us. (Hope you write the <u>Digest</u>.)

The Mid-America Paleontology Society (MAPS) was formed to promote popular interest in the subject of paleontology, to encourage the proper collecting, study, preparation, and display of fossil material; and to assist other individuals, groups, and institutions interested in the various aspects of paleontology. It is a non-profit society incorporated under the laws of the State of Iowa.

MAPS is affiliated with the Midwest Federation of Mineralogical and Geological Societies, and with the American Federation of Mineralogical Societies. Membership in MAPS is open to anyone, anywhere who is sincerely interested in fossils and the aims of the Society.

Family membership $7.00; individual membership $7.00; junior membership $5.00 (between ages 8 and 16).

MAPS meetings are held on the 1st Saturday of each month (2nd Saturday if inclement weather) October through May at 2p.m. in the Science Building, Augustana College, Rock Island, Illinois.

President:	Cheryl DeRosear, Box 125, Donnellson, IA 52625
1st Vice President:	Don Good, 410 N.W. 3rd Street, Aledo, IL 61231
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Dated Material - Meeting Notice