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The SEDIMENTARY Record

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INSIDE: CROSSING THE ECOLOGICAL DIVIDE: PALEOZOIC TO MODERN MARINE ECOSYSTEM IN THE ADRIATIC SEA

PLUS: GULF COAST SECTION, SEPM
NORTH AMERICAN MICROPALEONTOLOGY SECTION, SEPM
PRESIDENT'S COMMENTS

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SEPM Special Publication #85

Incised Valleys in Time and Space

Edited By: Robert W. Dalrymple, Dale A. Leckie and Roderick W. Tillman

This volume grew out of two SEPM-sponsored events, an SEPM Research Conference that took place in Casper, Wyoming, in 2002 (see Dalrymple, 2002, for a synopsis of the meeting), and an SEPM Research Symposium that was held at the AAPG/SEPM Annual Meeting in 2003. Several other papers have been added to broaden the range of examples presented. The theme of the volume, *"Incised Valleys in Time and Space"*, has been chosen because of the comparison of valleys of different ages and in different settings is a valuable approach to understanding the role of the many factors that interact to create the valley and to emplace the subsequent valley-filling deposits. Each example, whether modern or ancient, represents a real-world experiment that lacks the temporal and spatial scaling issues that inhibit the application of laboratory experiments. Of course, the dependent and independent variables cannot be "controlled" in natural systems, but our ability to deduce the approximate values of these quantities (e.g., subsidence, sediment supply, climate) is increasing continually, such that semiquantitative and even quantitative estimates can be made in some cases.

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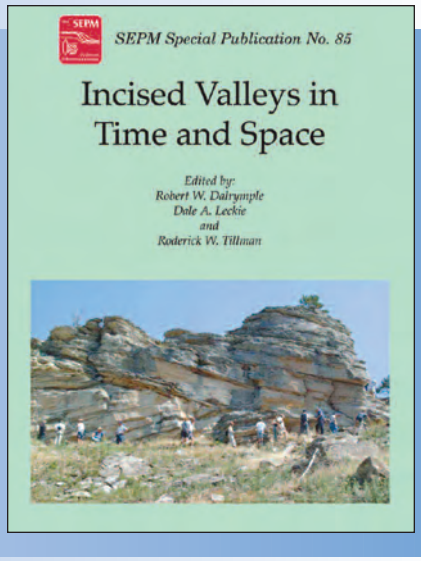

SEPM Miscellaneous #7, a joint SEPM/GSL publication

Seismic Geomorphology: Applications to Hydrocarbon Exploration and Production

Edited by: R. J. Davies, H. W. Posamentier, L. J. Wood, and J. A. Cartwright

We are poised to embark on a new era of discovery in the study of geomorphology. In recent years an entirely new way of studying landscapes and seascapes has been developed through the use of 3D seismic data. Just as CAT scans allow medical staff to view our anatomy in 3D, seismic data now allows Earth scientists to do what the early geomorphologists could only dream of - view tens and hundreds of square kilometres of the Earth's subsurface in 3D and therefore see for the first time how landscapes have evolved through time. This volume demonstrates how Earth scientists are starting to use this relatively new tool to study the dynamic evolution of a range of sedimentary environments.

SEPM is the North American distributor for this publication. International orders need to be placed through the Geological Society of London.

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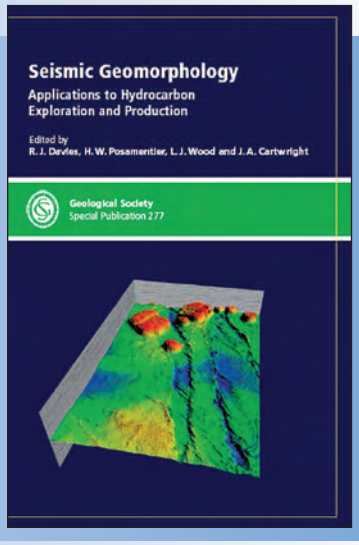

SEPM Special Publication #86

Proterozoic Geology of Western North America and Siberia

Edited by: Paul K. Link and Reed S. Lewis

This volume is a compendium of research on the Belt Supergroup. It is an outgrowth of Belt Symposium IV, held in Salmon, Idaho, in July, 2003, in conjunction with the Tobacco Root Geological Society annual field conference. Because of the geographic extent and great thickness of the Belt Supergroup, years of work have been required before conclusions are "bona fide". The Mesoproterozoic Belt Supergroup of western Montana and adjacent areas is geologically and economically important, but it has been frustratingly hard to understand. The previous Belt Symposium volumes offer an historical view of the progress of the science of geology in the western United States. The advent of U-Pb geochronology, especially using the ion microprobe (SHRIMP) and laser-ablation ICPMS, has injected geochronometric reality into long-standing arguments about Belt stratigraphy. Several papers in this volume utilize these new tools to provide constraints on age and correlation of Belt strata (Chamberlain et al., Lewis et al., Link et al., and Doherty et al.).

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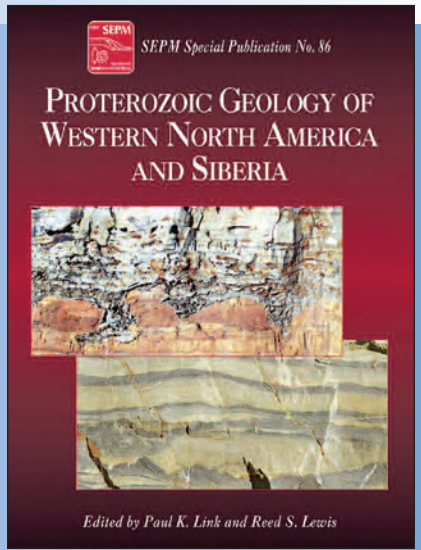

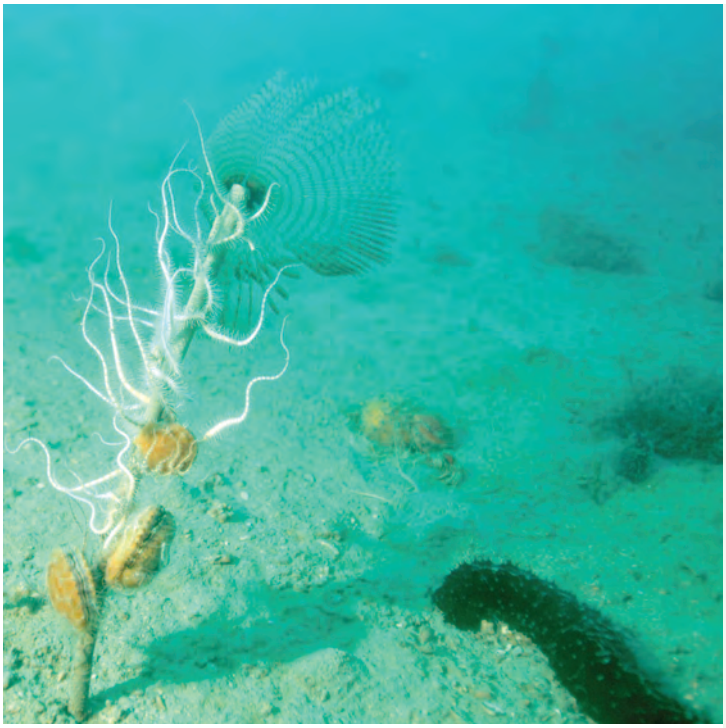

Cover Photo: Giving a remarkable impression of a Paleozoic crinoid with attached smaller stemmed echinoderms and brachiopods,an approximately 30 cm high polychaete worm (Sabella spallanzanii) *hosts other suspension feeders attached to its flexible tube, including ophiuroids* (Ophiothrix fragilis) *and scallops* (Aequipecten opercularis) *covered by an orange encrusting sponge, accompanied by a surface detritus-feeding holothurian* (Holothuria tubulosa) *and in the background brown algae and various erect bryozoans. Photographed 16 April 2006 on a 22 m deep silty sand substrate in the Adriatic Sea offshore of Rovinj, Croatia.*

CONTENTS

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Editors

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Crossing the Ecological Divide: Paleozoic to Modern Marine Ecosystem in the Adriatic Sea

Frank K. McKinney, Steven J. Hageman
Department of Geology, Appalachian State University, Boone, NC 28608
mckinneyfk@appstate.edu, hagemansj@appstate.edu

Andrej Jaklin
"Ruder Boskovic" Institute, Center for Marine Research, 52210 Rovinj, Croatia
jaklin@cim.irb.hr

ABSTRACT

The northern Adriatic Sea supports both typical modern marine benthic associations of animals that live within the sediment and other associations with a Paleozoic ecological aspect, rich in sedentary animals that live exposed on the sea floor. Site-specific information on sediment grain size, deposition rate, currents, nutrient availability, and life habits of animals in the local associations are compared to test several hypotheses about the transition from the Paleozoic to the modern ecosystem. By far the strongest correlations of life habit attributes is with nutrient concentration, supporting the hypothesis that increased nutrient concentration in the sea was important in the change from Paleozoic to modern marine benthic ecology.

INTRODUCTION

Profound change in marine ecosystems took place during the Mesozoic. The sedentary, suspension-feeding animals living *on top* of the sea floor (epibenthos), prevalent in Paleozoic marine ecosystems gave way to animals living *in* the sediment (endobenthos e.g., clams) and mobile carnivores (e.g., crabs, snails). The change in dominant life habits is sufficiently striking to be apparent to fossil collectors and thoughtful historical geology students, and it has been well documented by paleobiologists (e.g., Bambach, 1983; Sepkoski, 1981). The change is not purely a result of which animals made it through the massive end-Permian extinction. Extinction survivors include some brachiopods, crinoids, sponges, and bryozoans that are sedentary epibenthic suspension feeders. Collectively, these survivors with Paleozoic life habits have dwindled in importance in the sea while other survivors thrived, evolving morphologically and behaviorally into efficient predators (primarily epibenthic), and invaded endobenthic habitats, thus developing into the modern fauna (Sepkoski, 1981).

What caused the profound change from the sedentary, epibenthic suspension feeding communities of the Paleozoic to the endobenthic/carnivore-dominated modern communities? Recent syntheses (McKinney and Hageman, 2006; McKinney, 2007) group the hypotheses explaining the change into four groups that are not mutually exclusive: 1) clogging and tipping of sedentary epibenthic suspension-feeders by sediment-disturbing animals (Thayer, 1979, 1983); 2) displacement of low-energy Paleozoic taxa by the more rapidly growing, higher-energy modern fauna (Vermeij, 1987); 3) increased predation intensity at the sediment-water interface so that life is safer within the sediment (Vermeij, 1987); and 4) an increase from oligotrophic (low-nutrient) Paleozoic seas to more nutrient-rich conditions, with greater accumulation of food resources on and within the sea floor (Vermeij, 1987; Bambach, 1993, 1999).

These hypotheses were proposed twenty years ago, soon after the major changes in benthic marine communities were delineated. The hypotheses are difficult to test and since then, paleoecologists and evolutionary paleobiologists have changed focus; there have been few attempts to test the cause or causes of the most fundamental change in marine ecosystems during the Phanerozoic.

Here we test the hypotheses by using distributional patterns observable in the present to elucidate the processes recorded in the past. The shallow northern Adriatic Sea (Figure 1B) has a flat sedimentary floor averaging only 35 m deep yet includes local associations that have a Paleozoic ecological structure and others that have a modern structure. Adriatic oceanography has been intensely studied, and the benthos of the northern Adriatic is well known. This work provides a uniformitarian test for the four hypotheses listed above, comparing the distribution of benthic life habits within the northern Adriatic relative to a range of oceanographic variables.

OCEANOGRAPHIC CONTEXT

Oligotrophic water enters the Adriatic Sea from the Mediterranean through the Otranto Strait (Figure 1A) and then follows an overall cyclonic path with secondary cyclonic gyres in the southern, middle, and intermittently in the northern Adriatic (Artegiani et al., 1997). It is supplemented by fresh water along the way, 80% of which is added along the Italian coast, including water from the Po River (30% of the total), the single largest source (Raicich, 1994).

The northern Adriatic is so shallow that cyclonic flow is less vigorous there than elsewhere in the Sea. It is best developed during winter when low air temperatures and frequent windstorms eliminate the previous summer's density stratification so that both the western freshwater stream and northeastern windstorms enhance the basin-wide cyclonic pressure. In contrast, during the summer a variable combination of high discharge of the Po, high temperatures, and greatly diminished winds result in surface ponding of low density water that inhibits and sometimes almost stops cyclonic flow.

Terrigenous nutrients and sediment (70% silt; Colantoni et al., 1979) are introduced into the Adriatic Sea primarily by Po River. Only a small proportion of the Po's sediment load remains in its delta, the

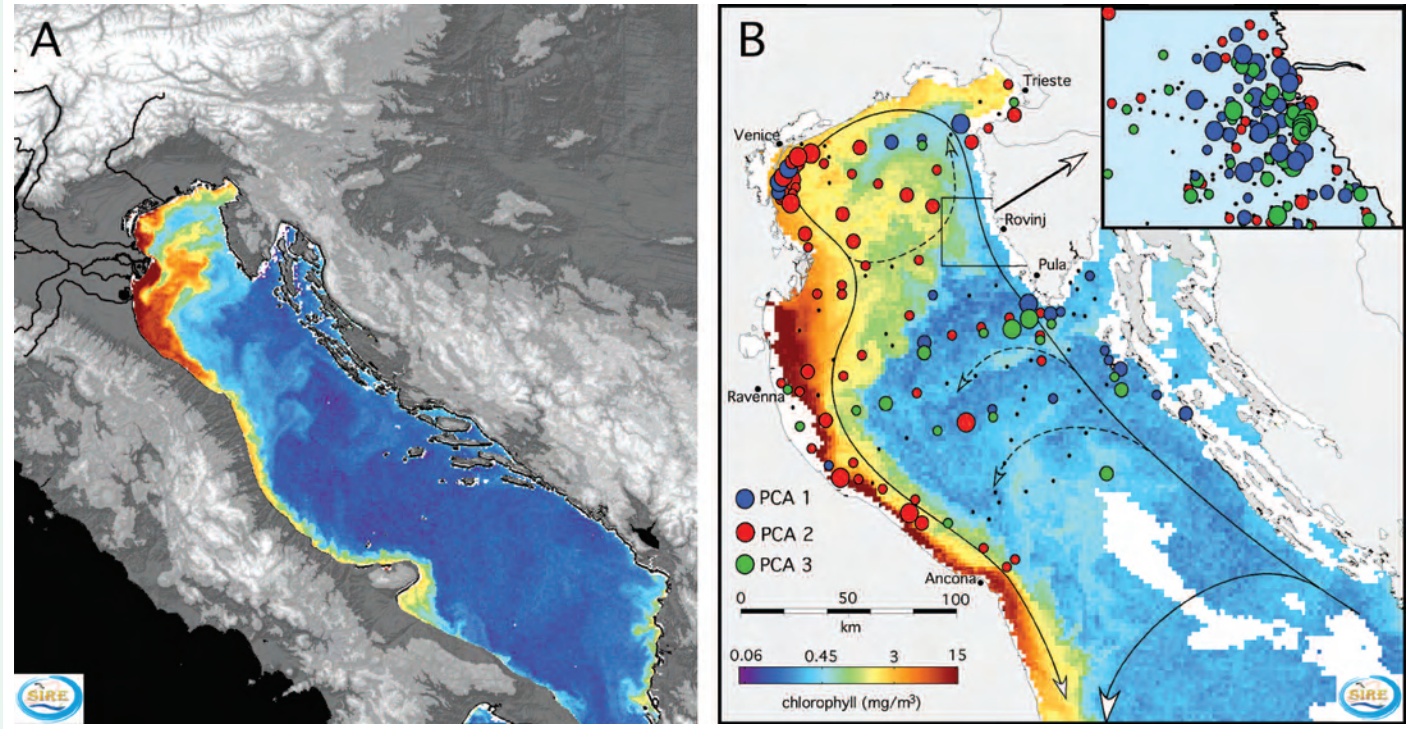


Figure 1. Chlorophyll a distribution in the Adriatic Sea. A), The entire Adriatic Sea on 14 August 2001. Counterclockwise circulation brings low-nutrient water (dark blue) through the Otranto Strait and up the Balkan coast, where nutrient input is virtually nil from the carbonates of the Dinarides. Nutrients - derived largely from the Apennines and the western Italian Alps - pour into the Adriatic from the Po and other rivers at the northwestern end of the Sea, and the basin-wide current system carries the nutrient-enriched water southward along the Italian coast; B), distribution of Vatova stations plotted on chlorophyll a map of the northern Adriatic for 16 February 2001.

bulk being swept southward (Cattaneo et al., 2003; Frignani et al., 2005) to accumulate in a relatively narrow band along the Italian coast. Most of the northern Adriatic is floored by Pleistocene carbonate sand that was partially reworked into overstepping parasequences during the Holocene transgression (Trincardi et al., 1994). Aside from coarse debris aprons at the base of carbonate escarpments and some local cemented sands, northern Adriatic sediments are fine-grained, largely silt-rich muds to medium sand (Jenkins et al., 2005).

Primary nutrients (N, P, Si) introduced by the Po River substantially exceed the mass of each transported up from the Mediterranean (Degobbis and Gilmartin, 1990). Lesser contributions from other Italian rivers combine with nutrients from the Po to result in about twice the mass of each of the primary nutrients being flushed out of the northern Adriatic southward along the Italian coast than stream northward along the Balkan coast, despite the loss of nutrients into sediments.

There is a permanent east to west increase in nutrients and chlorophyll *a* in the northern Adriatic Sea. Chlorophyll *a* measures the abundance of phytoplankton that are primary consumers, tracking nutrient availability. The east to west gradients in concentration are steeper and on average farther west during the winter when cyclonic circulation and communication with the rest of the Adriatic are stronger.

LIFE MODE CHARACTERIZATION OF LOCAL BENTHOS

Aristocle Vatova (1935, 1949) took Van Veen grab samples at several hundred stations in the middle and northern Adriatic, and for each sample he determined wet biomass of each animal species present. The 280 samples in the northern Adriatic included a total of 330 species plus 16 indeterminate assignments within an order or family; over half the species had mineralized skeletons. Polychaetes, bivalves, crustaceans, and snails comprise 82% of the species, typifying a modern fauna. Ophiuroids and crinoids were the only descendants of the Paleozoic fauna and comprised only 2% of the species.

Life mode of each species in Vatova's samples was determined. Life mode attributes and their various states scored were 1) *trophic type*: suspension feeder, deposit feeder, detritus feeder, carnivore, omnivore-grazer-herbivore; 2) *position relative to the sediment-water interface*: epibenthic, endobenthic; and 3) *mobility*: sedentary, mobile non-bioturbator, bioturbator.

Biomass values in Vatova's samples were log-transformed and analyzed using Principal Components Analysis. Principal Components Analysis is a method of combining variables through a weighting scheme into new dimensions. Thus variables with high values for coefficients of a combination (see examples in next paragraph) display the greatest degree of variation in the system. Localities with large values for biomass in a combination will plot high on an axis.

Three axes (PCAs) accounted for over 70% of the variance among samples. "Modern" attributes of bioturbator, endobenthos, and deposit feeder loaded on PCA 2, characterizing northwestern Adriatic sample stations (Figure 1 red dots). The "Paleozoic" attributes of sedentary, epibenthic, suspension feeder, and of epibenthic, mobile non-bioturbator, and omnivore loaded on PCA 1 and 3 respectively, characterizing northeastern sample stations (Figure 1B blue & green dots; Figure 2).

These results based on Vatova's systematic samples do not even include the most startlingly Paleozoic-appearing associations offshore of Rovinj, Croatia (Figure 2D, E). Samples located in these bryozoan tangles

were entered on Vatova's (1935) map of stations but were not included in either the discussion or tables of data. Quite possibly they were so rich in densely intergrown, firmly attached species that they could not be accommodated in Vatova's careful counts and biomass determinations.

LIFE MODES AND ENVIRONMENTAL VARIABLES

Sedimentation rate, sediment type, and nutrient environment are available for each of the northern Adriatic stations, along with distribution of biomass of carnivores and of bioturbators. Each of these is relevant to hypotheses for the Paleozoic to modern ecological change.

Variables with little regional influence

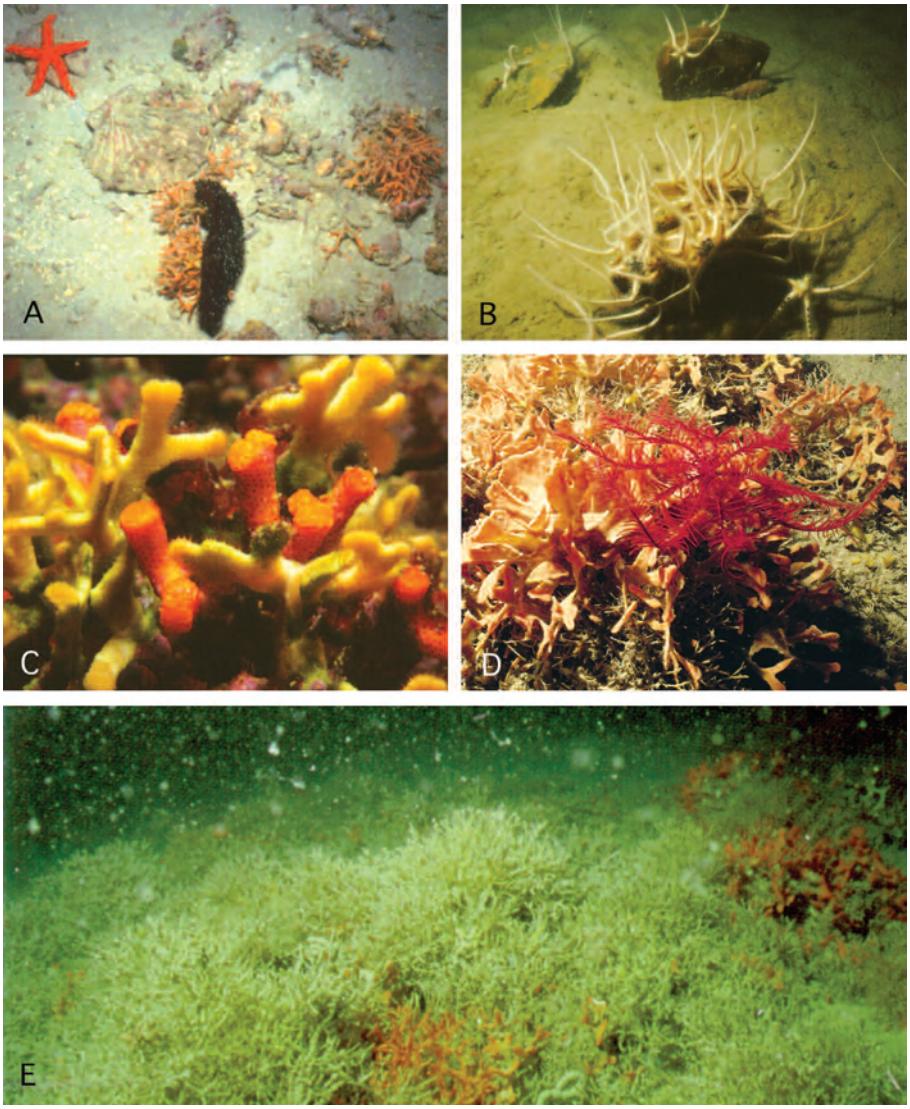
Sediment flux is considered detrimental to suspension feeders and is generated by sediment accumulation or by resuspension due to water motion or bioturbation (Rhoads and Young, 1970). Sixty-six of Vatova's stations were within the Italian coastal band of measurable sedimentation, spanning accumulation rates of 0.01-0.75 g cm^{-2} yr^{-1}. None of the life habit attribute states is significantly correlated with sediment accumulation rate (Table 1), which suggests that these rates are too low to have a major effect on the distribution of life modes across the area. Bioturbators occur in 275 of the 280 benthic samples characterized. They do not correlate significantly with epibenthos as a whole ($p = 0.311$) or with sedentary epibenthos ($p = 0.714$), and there is no significant difference in endobenthic biomass between samples with and samples lacking sedentary epibenthos (McKinney, 2007).

Predation intensity is low in the northern Adriatic, similar to that of high latitudes rather than the more predation-intense tropical shallow waters (McKinney, 2007). Most predators that are present have relatively low impact; very few are shell-crushing, shell-drilling, high energy predators that originated during the Mesozoic Marine Revolution. Shell-drilling intensity along the northwestern, Italian coast is more similar to normal Cretaceous drilling intensity than to the more highly escalated Cenozoic intensity (Kelley, 2006). There is no evidence for a lateral gradient in overall predation intensity (see below). Predation is not a sufficient cause for the west to east increase in epibenthos.

Variables with pronounced influence

Sediment texture is an important aspect of the benthic environment and correlates with some life mode attributes (Table 1). Only sedentary endobenthos correlates with an increase in grain size, apparently due to endobenthic tube-dwelling polychaetes' preference for sandy sediment. All the other significant ($p < 0.05$) correlations with grain size are with finer grain size, including sedentary and suspension-feeding epibenthos. Finer grain sizes are more common in the west than the east (Jenkins et al., 2005), so the absence of sedentary and suspension-feeding epibenthos in the west is not due to lack of availability of preferred substrate.

Remarkably, almost every individual life mode attribute state and critical combination of states correlates significantly with both summer and winter chlorophyll *a* distribution in the northern Adriatic Sea (Table 1). The



Adriatic epibenthos near Rovinj, Istrian coast of Croatia. A) typical epibenthos of the sedimentary plain, both mobile (starfish, holothurian) and sedentary (bryozoans, tunicates, and diverse encrusting animals on the shell of a dead bivalve; B) suspension-feeding ophiuroids,* Ophiothrix fragilis*, exhibiting the common behavior of using a local topographic high (here the projecting portions of the semi-endobenthic bivalve* Atrina pectinata*) to gain elevation in the water column; C) intergrowth of the erect rigidly calcified bryozoans* Myriapora truncata *(red) and* Schizotheca serratimargo *(orange); D) the crinoid,* Antedon mediterranea*, using a colony of the bryozoan* Pentapora fascialis *as an ersatz stem, much as done by the ophiuroids on the cover and in the illustration above; E) meadow of the articulated erect bryozoan* Cellaria salicornioides *with scattered colonies of the bryozoan* P. fascialis*, during a marine snow event; white blobs in the water are mucilage generated by diatoms. Widths of view in A and B are about 40-50 cm in the foreground, in C about 9 cm, in D about 25 cm, and in E 1-1.5 m.

Table 1. Correlation of biomass of life mode attribute states and of position (endobenthos, epibenthos) in combination with associated critical attribute states. Note that "Paleozoic fauna" is negatively correlated with increase in productivity as indicated by chlorophyll a, whereas the biomass of "Modern fauna" increases with higher productivity. Correlations here and in the text are determined by Kendall's tau. Sign (positive, negative) is given for correlations p ≤ 0.05. Biomass and grain size (approximated to phi by FKM) data are from Vatova (1935, 1949), deposition rate is from Frignani et al. (2005), and chlorophyll a data are from Zavatarelli et al., 1998. Deposition rate ranges from 0.01-0.75 g cm^{2} yr^{-1}, grouped into 5 bins; phi ranges from -1.5 to 9, grouped into 11 bins; chlorophyll a ranges from 0->3.5 µg l^{-1}, grouped into 13 bins.

		Deposition Rate	Grain size (phi)	Chlorophyll *a* Summer	Chlorophyll *a* Winter
M	Endobenthos	.789	.064	+.000	+.000
O	Bioturbator	.828	.072	+.000	+.000
D	Deposit feeder	.487	.404	.060	+.023
E	Endobenthic sedentary	.399	-.008	+.044	+.003
R	Endobenthic bioturbator	.666	+.041	+.000	+.000
N	Endobenthic suspension feeder	.686	.458	+.000	+.000
	Endobenthic deposit feeder	.350	.347	+.010	+.001
	Detritus feeder	.429	+.023	+.016	+.023
	Carnivore	.884	.205	.471	.333
P	Suspension feeder	.998	.052	+.040	+.002
A	Epibenthos	.893	+.008	-.000	-.002
L	Sedentary	.621	+.023	.808	.738
E	Mobile non-bioturbator	.572	.129	-.000	-.013
O	Omnivore etc.	.913	+.017	-.000	-.000
Z	Epibenthic sedentary	.124	+.001	-.000	-.002
O	Epibenthic mobile non-bioturbator	.994	.067	-.000	-.020
I	Epibenthic suspension feeder	.313	+.001	-.000	-.002
C	Epibenthic omnivore etc.	.229	.320	-.001	-.008

exceptions are for sedentary and carnivore, and summer correlation with deposit feeder. The poor correlation of carnivores with chlorophyll *a* reflects the essentially uniform predation intensity across the northern Adriatic, and the poor correlation of sedentary with chlorophyll *a* is due to "sedentary" including stationary endobenthos as well as attached epibenthos, so the sedentary condition does not sort out exclusively to epibenthos.

Highly significant *positive* correlations ($p < 0.01$) with chlorophyll *a* characterize all but three of the attribute states of PCA 2 and combinations of *endobenthos* with other importantly associated states (Table 1), and only one correlation is non-significant. The positive correlations indicate that life modes that characterize the modern marine ecosystem are dominant in nutrient-rich regions of the northern Adriatic.

Highly significant *negative* correlations with chlorophyll *a* characterize all but five of the attribute states of PCA 1 and 3 and combinations of *epibenthos* with other importantly associated states (Table 1). The patterns for sedentary and for suspension feeder are complicated by the abundance of endobenthic suspension feeders that live in stationary burrows. The negative correlations of all the other attribute states and combinations indicate that life modes that characterized the Paleozoic marine ecosystem occur in nutrient-poor regions of the northern Adriatic.

WIDER IMPLICATIONS

Endobenthos and epibenthos alike are comprised of modern fauna taxa in the northern Adriatic. Therefore the marine benthic ecosystem that characterized the Paleozoic could have been carried on after the Paleozoic by the modern fauna. This is one of the most important paleontological insights from the northern Adriatic benthos.

As discussed above, the range of predation intensity and of sediment texture and flux, including flux generated by bioturbation, does not appear to have a major influence on the regional pattern of endobenthic versus epibenthos-rich associations in the northern Adriatic. The northern Adriatic offers no systematic support for the hypothesis that bioturbation caused the decline of the Paleozoic ecosystem. The basin-wide condition of low predation intensity means that the northern Adriatic in isolation does not provide an adequate test of predation as a cause of the change from Paleozoic to modern benthic ecology.

The environmental context that clearly determines the distribution of Paleozoic versus modern ecosystem structure in the northern Adriatic is nutrient availability as reflected in chlorophyll *a* content of the water. This gives strong support to the hypothesis (Vermeij, 1987; elaborated by Bambach, 1993, 1999) that increased nutrient concentration in shallow marine water was critical in the change from Paleozoic to modern marine ecosystem organization.

Sedentary suspension-feeding epibenthic associations exist today in some areas in the shallow Antarctic (Dayton and Oliver, 1977; Gili et al., 2006) and also at bathyal and abyssal depths, all of which are characterized by both low nutrient levels and low predation intensity, as in the northeastern Adriatic. In contrast, shallow waters where either nutrient-rich water and/or high predation occur have an endobenthos-rich modern ecosystem (McKinney, 2007). The latitudinal distribution of bryozoan-rich limestones (Taylor and Allison, 1998) and some studies of Cenozoic benthos across ecological gradients (Lukasik et al., 2000; Tomasovych, 2006) see the same pattern. It appears that "Paleozoic" ecosystems composed of animals of the modern fauna reappear regularly if an appropriate environment of low nutrient levels and low predation intensity occurs.

ACKNOWLEDGEMENTS

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ZAVATARELLI, M., RAICICH, F., BREGANT, D., RUSSO, A., and ARTEGIANI, A., 1998, Climatological biogeochemical characteristics of the Adriatic Sea: Journal of Marine Systems, v. 18, p. 227-263.

Accepted April 2007

SEPM Presentation Winners

The awards listed were earned from presentations at the SEPM Annual Meeting in Long Beach, California, April 2007. The awardees will be recognized at the SEPM Annual Meeting in 2008.

Oral Presentation (2 way tie)

Ron Boyd and Kristian Ruming,
Dynamics of Downslope Sand Transport sourced from Estuarine Density Flows

Jürgen Schieber, J. B. Southard and K. G. Thaisen
The Sedimentology of Milk - Studying Deposition and Transport Modes of Moving Clay Suspensions

Poster Presentation (2 way tie)

Chris Kendall, Gene Shinn and Xavier Janson
Holocene Cyanobacterial Mats and Lime Muds: Links to Middle East Carbonate Source Rock Potential

Wayne Wright
Paleogeography and Depositional Geometries of the Pennsylvanian/Upper Carboniferous Succession of the Greater Permian Basin Region, Texas and New Mexico

Honorable Mention Posters

Gary Gianniny and K. L. Miskell-Gerhards
Progradational Sequence Sets on the Tectonically Active Eastern Margin of the Pennsylvanian Paradox Basin, Colorado and Utah

John Counts and Steve Hasiotis
Neoichnologic Experiments with Modern Scarabaeid Beetle Larvae: Implications for Backfilled Trace Fossils in Permian Continental Deposits, Hugoton Gas Field, Western Kansas

Gulf Coast Section SEPM Announces the Doris Malkin Curtis Medal

The Gulf Coast Section SEPM is pleased to announce the establishment of a new award, the Doris Malkin Curtis Medal, which recognizes geologists for their career contributions in the development of new concepts for understanding the geology of the Gulf of Mexico Basin and other basins globally. The award is named in honor of Doris Malkin Curtis, one of the pioneers in studying the paleontology and stratigraphy of Gulf Coast Geology. Dr. Curtis worked in the Gulf Basin for more than 50 years, and served the geologic profession in many ways.

Doris was born and reared in Brooklyn, New York, studied for her bachelor's degree at Brooklyn College, and completed her doctorate at Columbia. Her dissertation involved the biostratigraphy of the Miocene of the Atlantic Coastal Plain. As a graduate student she worked at the American Museum of Natural History on the Catalogue of Foraminifera. In 1939, she moved to Houston to seek employment in the petroleum industry. After working a few years with several small companies, Doris was hired by Shell Oil in 1941. Her initial assignment was as a paleontologist. Subsequently, she worked as a stratigrapher and as a geologist. From the beginning of her career, she was active with the Houston Geological Society by chairing committees and authoring technical papers on Gulf Coast stratigraphy. As exploration interests shifted, she was relocated to exploration offices in Baltimore and Tallahassee.

In 1950 the first phase of her Shell career ended when she married a Shell geologist. Not wanting to put aside her talents as an earth scientist, she joined the faculty of the University of Houston as an Assistant Professor and taught there for two years. It was about this time the now famous American Petroleum Institute Project 51 was gaining momentum and Doris, sensing the importance and scope of its program, immediately recognized a research challenge in which she wished to participate. She joined Scripps Institute of Oceanography as an Associate Research Geologist and completed a detailed study of the biofacies of ostrocod assemblages in relation to the various environments of deposition of the Northwest Gulf of Mexico.

Doris resumed her teaching career in 1954 by joining the faculty at the University of Oklahoma. After five years as an Assistant and Associate Professor of Geology specializing in sedimentology, she returned to Shell Oil in 1958, and was assigned to the Special Studies Group in the Baton Rouge office of the South Louisiana Exploration Division, which relocated to New Orleans in 1960. It was in this assignment that she initiated regional studies of time-synchronous deltas in the petroleum-rich Miocene of Coastal Louisiana. In 1970, a synthesis of this important work was published in SEPM Special Publication No. 15, *Deltaic Sedimentation: Modern and Ancient.*

In 1975 Shell Oil transferred Doris back to Houston, her original petroleum turf, to work in their International Ventures Group, and later, took a research assignment at Shell Development Company, from which she retired in 1979. After retiring she formed a consulting firm with Dorothy Jung Echols, her friend and colleague for more than fifty years.

During her long career, she authored more than thirty papers on paleoecology, biostratigraphy, ostracods, transgressive and regressive sedimentation, deltaic sedimentation, and on source and migration of hydrocarbons in the Cenozoic of the Gulf of Mexico Basin.

Doris took a very active part in all professional organizations of which she was a member and always tried to better public understanding of the petroleum industry. While working in New Orleans, she became active in the League of Women Voters and rose to the presidency of the organization. Through her leadership as a member of the Environmental Quality Committee of this organization, she presented facts about the industry's role in conservation and its contribution to pollution control. Because of her achievements with this committee, and especially being a recognized authority in the petroleum professional community, she was selected in 1967 as one of four delegates of the United States to participate in an exchange visit to the USSR. On this tour she had an opportunity to see the petroleum provinces in the Baku area on the Caspian Sea and other areas in European Russia.

Limitations of space preclude a complete list of Doris' many achievements in her service to scientific and professional organizations. To have known her was to experience her sincere dedication and interest in all facets of geology. Her professionalism manifested itself in volunteering and accepting assignments of increasing importance in many of the organizations of which she was a member. In addition to being President of SEPM Society for Sedimentary Geology, 1978-1979, Doris served as President of the Geological Society of America, 1990-1991, and President of the American Geological Institute, 1980-1981. She was an Honorary Member of SEPM Society for Sedimentary Geology and the Gulf Coast Section of SEPM. She was a Fellow of the Geological Society of America and the American Association for the Advancement of Science, and served as Chair of the National Academy of Sciences' U.S. National Committee on Geology, as well as serving as a member of other NAS committees from 1979 to 1990. Doris was listed in American Men and Women of Science and Who's Who in America. Two achievements of which she was especially proud were her selection to participate as a shipboard sedimentologist on two legs of the Deep Sea Drilling Project in 1978-1979 and in 1983, an experience described by her as being "as fascinating as a trip to the moon."

Doris was a coveted guest lecturer and had given numerous invited talks on various geologic topics. In March 1991, while President of GSA, she was a guest speaker on women's issues at Indiana University in conjunction with Women's History Month. It was on this trip that she had the first indications that she was not well. She cancelled the remainder of her speaking tour and returned home to Houston. On March 12, she was diagnosed as having acute leukemia. Fortified with frequent blood transfusions, Doris made several more trips as GSA President. However, on April 4, she was admitted to M.D. Anderson Hospital. After a little more than two months of intensive treatments, she expired on May 26, 1991.

To have known and worked with Doris for many years was a special privilege. Her positive outlook and "can-do" attitude towards life and her science never allowed for pessimism or gloom. With her charismatic personality and cosmopolitan experience, it is not at all surprising that she achieved so much and was so genuinely appreciated by all.

Edward B. Picou, Jr.

The first recipient of the Doris Malkin Curtis Medal award is **Dr. L. Frank Brown, Jr.** of the Bureau of Economic Geology at The University of Texas in Austin. In his five-decade career, Frank has been a leader in the development of studies in depositional systems, seismic stratigraphy, and later an advocate for sequence stratigraphy. Frank has worked on stratigraphic studies in many basins globally, including the Gulf Basin.

The award will be presented at the GCAGS / GCSSEPM Convention in Corpus Christi in October and again at the GCSSEPM Perkins Conference in Houston in December.

NAMS
North American Micropaleontology Section, SEPM

What is NAMS, Why is it important and What are the benefits of joining? Many of you may not be familiar with the North American Micropaleontology Section (NAMS) of SEPM, its activities, and why it is important to the geoscience community and you. I hope that this column will be informative and that after reading it, you will choose to join NAMS, renew your membership or make a donation to the Garry Jones Memorial Fund. The cost to join is minimal, but the benefits are diverse. NAMS promotes all aspects of micropaleontology through application, research and education dealing with biostratigraphy, ecology, paleontology, morphometrics and geologic history of all groups of microfossils. NAMS's goal is to bring together specialists from various subdisciplines of micropaleontology and foster increased communication among industry, museums, consulting firms and academia. It also promotes applications in rapidly expanding fields such as geochemistry and geomicrobiology.

How is micropaleontology used and why is it important? The petroleum industry has researched and used microfossils since the1920's. *Foraminifera* were the first microfossil group to be used extensively for age dating of rocks during drilling, and they are still used today for subsurface exploration. In the last 30 years, the use of *foraminifera* has been supplemented by *calcareous nannoplankton, palynomorphs, conodonts* and other microfossils. In addition to age dating, microfossils are essential for correlation of rock units and paleoenvironmental, evolutionary, and stable isotope studies. Today, they are also being used to study relevant topics such as sea-level change, global warming, oceanic changes, the affects of tsunamis, causes of mass extinctions, and atmospheric changes. The way these marine organisms respond to their environment over time is recorded in their fossilized remains and distribution after death. Microfossils are providing insight into many key issues that affect our daily lives. However, there is now a shortage of micropaleontologists. The main reason for this is 15 years of downsizing and outsourcing of micropaleontologists and other specialists by the petroleum industry. Now, there is a resurgence of interest in this discipline and a growing demand for these specialists. Until recently, many geoscientists thought that 3D seismic was the answer to all their problems. But, they are discovering that better seismic does not help them to understand the actual vs. the predicted penetrated section while drilling, the depositional history of a basin, the movement of salt, hydrocarbon migration and timing, which are all vital elements needed to find and develop new resources that are so critical to the world energy needs. The use of microfossils is essential to understanding earth's history. Unfortunately, there is now a shortage of micropaleontologists due to the short-sighted actions of the petroleum industry and this is projected to get much worse in the next 10 years with most of those working today being in their "50's". So, it is time to encourage and support micropaleontology students before the workforce is no longer viable. This is why NAMS's main goals are to promote micropaleontology and provide financial, and travel assistance to micropaleontology students primarily through the Garry Jones Memorial Fund and SEPM Mobil Foundation Travel Grant.

Garry Jones Memorial Fund: This endowed fund has finally reached a viable size where it can make significant contributions to support student research and education in micropaleontology. In the fall, NAMS solicits applications for the Garry Jones Memorial Grant from students. Each year in February, a $1500 grant is awarded to a deserving student. Applicants must be student members of NAMS. Proposals are ranked by the NAMS Council based on scientific merit, faculty recommendation, and financial need. The grant partially supports a M.S. or Ph.D. research project that is not funded by other major grants. This year, Andrew Kemp, a Ph.D. student in the Dept. of Earth & Environmental Science at the University of Pennsylvania was awarded the grant for his abstract entitled "Microfossils as indicators of Late Holocene relative sea-level change in the Albemarie-Pamlico estuarine system, North Carolina, USA". Please consider making a donation to this worthwhile fund, so that NAMS can continue to expand its program and support additional students. If interested, either send a check to the NAMS Treasurer, Don Van Nieuwenhuise whose contact information is on the NAMS website at www.sepm.org/nams/about.htm or make a pledge to the Garry Jones Memorial Fund by going to the SEPM website at www.sepm.org/foundation/sepm_foundation.htm; print and fill out a Donation Form for the Endowment Campaign, specifying the NAMS Fund and then, send the completed form with a check to SEPM Foundation office address.

Mobil Foundation Travel Grant: This grant funds student travel and meeting expenses to the SEPM/AAPG Annual Meeting to present a research paper or poster, and a one-year membership in SEPM. Every fall, each SEPM section may select an outstanding technical student presentation to be given at the next SEPM meeting. NAMS requires the student research to contain a substantial micropaleontologic component. Please watch for upcoming notices about the 2008 award this fall.

Other activities: Every year, NAMS hosts or sponsors micropaleontology meetings and organizes sessions at the SEPM /AAPG and GSA annual national meetings. It also, sponsors field trips or short courses in applied biostratigraphy. This year at the SEPM/AAPG Annual Meeting in Long Beach, NAMS co-sponsored a poster session entitled "NAMS Special Session: Integrated Biostratigraphic Analyses" and co-hosted the SEPM Marine Micropaleontology and Quantitative Stratigraphy Research Group joint meeting.

Photo: Cushman Foundation

What does NAMS have planned for the future? In 2008, NAMS is planning to co-sponsor an oral and poster session along with a field trip at the SEPM/AAPG Annual Meeting that will be held in San Antonio, TX. In 2009, NAMS is planning to host its second international microfossil conference in Houston, TX. This meeting will be similar to the Section's first successful conference that was held in March of 2005 at Rice University in Houston entitled "Geologic Problem Solving with Microfossils". Proceeds from this conference will go to the Garry Jones Memorial Fund. Please watch for announcements about these events and other activities on the NAMS website at www.sepm.org/nams.

Membership: Now that you know about some of the Section's recent activities and its goals, please consider helping NAMS advance the discipline of micropaleontology. Membership is only $10/year and you can prepay up to five years. For university-enrolled students, membership is only $5/year. If you subscribe to *Micropaleontology*, your dues are free. Membership forms are accessible on the NAMS website and in the newsletter, NAMS NEWS that is published twice annually. NAMS is working towards an exciting future and we want you to be a part of it! Please join and encourage others to join too.

Nancy Engelhardt-Moore, NAMS Past-President
<nancy.engelhardt-moore@dvn.com>

PRESIDENT'S COMMENTS

New President's Views

As I start my term as President of SEPM, I look forward with pleasure to serving the society and working with its many members during the coming year. I am fortunate to begin my presidency at a time when the society is financially healthy and membership stable. I am also fortunate to be working with Council members who are skilled and enthusiastic. Changes in the Council members were made at the SEPM Council meeting in Long Beach, and I want to thank the outgoing Council members for their hard work over the past year. The Society owes a debt of gratitude to Councilor for Sedimentology Ron Steel, Councilor for Paleontology Steve Holland, and Special Publications Co-editor Laura Crossey, whose terms expired at the beginning of April. In particular, I thank Bob Dalrymple for the strong and capable leadership he has provided as President of SEPM over the past year. As you will read below, Council just instituted some important changes to SEPM membership as a result of Bob's efforts. In addition, I would like to acknowledge those who are coming onto, or will continue to serve on, Council over the coming year; their names are listed on page 3 of this issue. SEPM's dedicated staff also deserves thanks from all of us for their many efforts on behalf of the organization.

I just returned from the Annual AAPG/SEPM Meeting, held in Long Beach. A significant proportion of the technical program, in fact, 50% of the posters and 33% of the oral presentations were contributed by SEPM. The Society owes thanks to the excellent SEPM committee that worked so hard on this meeting: Paul M. (Mitch) Harris, Morgan Sullivan, Frank Corsetti, Kenn Ehman, and Jean Hsieh. The Society also greatly benefited from $51,600 in contributions to underwrite costs associated with the meeting, including student participation in courses and field trips, thanks largely to the considerable efforts of SEPM Sponsorship Chair Mitch Harris and Executive Director Howard Harper.

As I look to the coming year, I think back to when I joined SEPM. I was a young MS student at the University of Wyoming in 1978 when I first joined. I can still remember the thrill when a new issue of JSR appeared in my mailbox. My office mates and I would settle back with the new issue and read and discuss the articles of interest to each of us. The journal I received then was entirely black and white, and electronic publishing was something I would never have dreamed possible. Since that time, I have witnessed considerable changes to JSR, to the other publications of SEPM, to the way the Society disseminates information and stays in touch with its members, and to membership categories. More changes have just been approved by Council during its meeting in Long Beach. Some of these are significant changes for the Society, and Council recognizes that they may require an adjustment for some members. Some of those changes are described below.

Print copies of journals: With their membership, all members currently receive online access to the journal of their choice and a year-end CD for that journal. Members are still able to choose a print version instead of the CD for no extra cost. Since 2006, members have been urged to request a print copy only if it is absolutely necessary; however, 38% of the member subscriptions to both JSR and PALAIOS are still print copies. The Society pays a significant publication cost for the printed copies, and that cost is not currently covered by the membership fee. Furthermore, the cost of supplying print copies rises rapidly as print runs decline, as they have been doing. Thus, to ensure the financial health of SEPM, Council has voted to institute a fee to cover the actual cost incurred in printing a copy of the journal for individual members who still want to have a print copy of their journal of choice. This fee will be $50 for each journal.

Membership Fees for Lesser Developed Countries: SEPM currently has only 10 members in China and 14 in India, where there are probably many hundreds of sedimentary geologists. If SEPM is truly to promote and represent sedimentary geology around the globe, it is imperative that we engage scientists in these and other lesser developed countries (LDC). At Bob Dalyrmple's urging, Council voted in Long Beach to institute a $25 membership fee for members from LDC. This fee is consistent with that now offered by other societies such as GSA. For such a fee, the member would receive electronic access to the SEPM journals; as with all members beginning in 2008, they would be charged $50 if they want a print version of a journal. Student members from LDC will pay a reduced fee of $15 with a similar cost for print journals.

Ad hoc web committee: As many of you know, the SEPM website underwent significant improvements last fall, although many of those changes were aethestic in nature. In February this year, an ad hoc committee was established to improve the content of the website and to transform the website into a valuable portal for members and for the sedimentary geology community as a whole. This committee reflects SEPM's commitment to furthering the goals of the society via internet technology. The objectives of the committee are to maximize the online resources/services available to members, promote a stronger sense of community through the internet, and engender an interest in the society within the public. Over the past month, this committee has discussed using the website to provide: (1) periodic editorials by respected members of the sedimentary geology community and adding short biographies of geology luminaries; (2) discussions/replies to journal articles and papers that appear in Special Publications to provide timely forums for these scientific exchanges; (3) content for and by students to make the website more friendly and helpful to students. The committee seeks input from SEPM members. Please email me (mary.kraus@colorado.edu) if you have ideas for the website.

Finally, at the Council meeting in Long Beach, the Sedimentary Geology Division of GSA (SGD) and SEPM started formal discussions to become more closely aligned. SGD has agreed to aim for more joint sessions with SEPM at GSA Meetings and explore co-sponsoring sessions with SEPM at AAPG or AGU. The SGD Newsletter will be discontinued and *The Sedimentary Record* used to publish information about the SGD. SGD members will receive *The Sedimentary Record* and website linkages between SGD and SEPM will increase. The goal of this closer association is to minimize duplication between SGD and SEPM and to provide a stronger voice for sedimentary geology in North America.

We welcome your opinions on any of the topics discussed in this column. Please contact Howard Harper hharper@sepm.org or myself mary.kraus@colorado.edu.

Mary Kraus, President

2008 Medalists

Medals and awards are an important part of the Society's mission. It is with great pride that we announce the 2008 awardees. They will be honored at the 2008 President's Reception and Awards Ceremony, during the SEPM Annual Meeting held in San Antonio, Texas on April 22, 2008.

Twenhofel Medalist: Steve Stanley

Shepard Medalist: Chuck Nittrouer

Pettijohn Medalist: Henry Posamentier

Moore Medalist: Richard Fortey

James Lee Wilson Award: to be announced

Honorary Member: to be announced

Distinquished Service Award: Tom Van Loon

John Warme receives 2007 Twenhofel Medal from President Bob Dalrymple.

Call for 2009 SEPM Award Nominations

Do you know of someone who deserves special recognition?

Nominations are open for the following awards:

- Twenhofel Medal - for excellence in overall sedimentary geology
- Pettijohn Medal - for excellence in sedimentology
- Shepard Medal - for excellence in marine geology
- Moore Medal - for excellence in paleontology
- Wilson Award - for outstanding work at the beginning of a career in sedimentary geology
- Honorary Membership - for outstanding service and science in sedimentary geology

It is easy to nominate someone, just go to http://www.sepm.org/awards/nominationform.htm and fill out the form.

Once nominated a candidate will be considered for three years.