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# This Week's Citation Classic

**Rhoads D C & Young D K.** The influence of deposit-feeding organisms on sediment stability and community trophic structure. *J. Mar. Res.* 28:150-78, 1970.
[Dept. Geology and Geophysics, Yale Univ., New Haven, CT; Boston Univ., MA; and Systematics-Ecology Program, Marine Biological Lab., Woods Hole, MA]

**Deposit-feeding and suspension-feeding organisms living on the seafloor show marked spatial separation; suspension feeders are largely confined to stable sandy or firm mud bottoms while deposit feeders attain highest densities on soft muds. The cause for this segregation is shown to be related to the physical instability of bottoms which are intensively bioturbated by deposit feeders. [The *SCI*® indicates that this paper has been cited in over 175 publications since 1970.]**

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"This paper represents one of the first interdisciplinary studies of how the biology of the seafloor can be shaped by, and coupled to, sedimentary and fluid processes. This was also one of the first times that SCUBA was employed to do *in situ* experimental work on subtidal mud bottoms. For these reasons I believe the paper has served as a model for other 'process' studies and this may explain its frequent citation.

"Research for this paper was begun in 1962 when, as a paleontology student at the University of Iowa, I received a summer fellowship at the Woods Hole Oceanographic Institution. This was the first time this Midwesterner had ever seen the ocean although I was familiar with ancient oceans preserved in the sedimentary rocks of the midcontinent. With this background, I set about looking at the bottom of Buzzards Bay, Massachusetts, with an unusual perspective. My objective was to understand why different kinds of bottom-dwelling invertebrates are associated with particular types of sediments (or sedimentary rocks in the context of paleoecological problems).

"My perspective was supported and nurtured by H. Sanders, R. Scheltema, and H. Turner of the Woods Hole Oceanographic Institution. I returned to Woods Hole several times and the work was continued under the direction of R.G. Johnson in the Interdivisional Committee on Paleobiology at the University of Chicago. In the 1960s, interdisciplinary work in the areas of geology and biology was uncommon and only a few 'enlightened' academic departments encouraged this approach. The project really started to crystallize when I met my coauthor, D.K. Young, who was on the staff of the short-lived, yet enormously successful, Systematics and Ecology Program at the Marine Biological Laboratory, Woods Hole.

"Young had found, by deploying sediment traps above the bottom, that sediment ingested and defecated by bottom invertebrates is easily suspended into the overlying water column. This finding was confirmed by earlier studies. Our experimental approach to seafloor processes subsequently was extended to other embayments with a great deal of success.

"The paper describes, for the first time, the phenomenon of trophic group amensalism. This phenomenon explains why many bottom-dwelling organisms that are immobile or feed by filtering particles from the water column cannot coexist with mobile deposit-feeding species. This latter group of invertebrates intensively processes the seafloor while feeding and thereby produces a physically unstable bottom. This instability explains the absence of suspension feeders which cannot tolerate a sedimentary surface which is continuously being resuspended or otherwise advected.

"I, and other marine scientists, continue to study trophic group amensalism and implications of this phenomenon for understanding sediment transport, nutrient recycling, faunal succession, bottom-water turbidity, and productivity.[1,2] The full range of implications of this phenomenon is just now being realized and I expect the paper will continue to be cited for another ten years. I am presently working on the evolution of trophic group amensalism. Young is applying these concepts to understanding acoustical properties of the seafloor as part of the Naval Ocean Research and Development Activity.[3]

"The major difficulty in carrying out this research was obtaining funding for interdisciplinary work. Those funding agencies which purport to be interested in such an approach fund specialists in several fields to work on a common problem. The peer review process is very hard on the individual who chooses to work between fields. A holistic approach to natural science is being seriously compromised by such funding practices."

1. **Rhoads D C & Boyer L F.** The effects of marine benthos on physical properties of sediments: a successional perspective. (McCall P L & Tevesz M J S, eds.) *Animal-sediment relations: the biogenic alteration of sediments.* New York: Plenum Press, 1982. p. 3-52.
2. **Rhoads D C & Germano J D.** Characterization of organism-sediment relations using sediment profile imaging: an efficient method of remote ecological monitoring of the seafloor (REMOTS SYSTEM). *Mar. Ecol.—Progr. Ser.* 8:115-25, 1982.
3. **Richardson M D & Young D K.** Geoacoustic models and bioturbation. *Mar. Geol.* 36:205-18, 1980.