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4. TITLE AND SUBTITLE The Genetic Dissection of Biomineralization : Coccolith Formation by Coccolithophore Algae	5. FUNDING NUMBERS N00014-96-1-0529
6. AUTHOR(S) Levine, R.P.	

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Hopkins Marine Station of Stanford University Oceanview Blvd Pacific Grove CA 93950	8. PERFORMING ORGANIZATION REPORT NUMBER NA
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13. ABSTRACT (Maximum 200 words)

1. We established that the organic material of the coccoliths consists of proteins, glycoproteins, and polysaccharides are found in preparations of isolated coccoliths.
2. We determined that the organic material affects crystal nucleation, post-nucleation crystal growth, and the architecture of the crystals. Results were obtained by light and scanning electron microscopy.
3. We determined that the coccoliths organic material contains to a-binding proteins and to isolated and purify the proteins.
4. We demonstrated that these protein have specific effects of the growth and form of crystals formed in solution as determined by a combination of light and scanning electron microscopy and atomic force microscopy.

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Final Report for the Office of Naval Research

Contract #N00014-96-1-0529

Principal Investigator: R. P. Levine

Institution: Hopkins Marine Station, Stanford University

Address: Ocean View Blvd., Pacific Grove, CA 93950

Grant Title: The Genetic Dissection of Biomineralization: Coccolith Formation by Coccolithophore Algae

Objective: The principal goal of the research is to identify organic material associated with biomineralized structures and to determine the role of the organic material in the biological nanofabrication of the structures. The organic material associated with the coccoliths of the marine alga *Pleurochrysis carterica* which are composed of subunits of single calcite crystals were chosen for the research.

Accomplishments:

1. The first accomplishment of the research was to establish that the organic material of the coccoliths consists proteins, glycoproteins, and polysaccharides are found in preparations of isolated coccoliths.
2. The second accomplishment of the research was to determine that the organic material affects crystal nucleation, post-nucleation crystal growth, and the architecture of the crystals. The results were obtained by light and scanning electron microscopy.
3. The third major accomplishment of the research was to determine that the coccoliths organic material contains to a-binding proteins and to isolated and purify the proteins.
4. The fourth accomplishment was to demonstrate that these protein have specific effects of the growth and form of crystals formed in solution as determined by a combination of light and scanning electron microscopy and atomic force microscopy. The results of this research are described in part in the publication by Smith *et al.* cited below.

Publication

Smith, B. L., Paloczi, G. T., Hansma, P. K., and Levine, R. P., 2000. Discovering nature's mechanism for making complex composite crystals. *J. Cryst. Res.* 211:116-121.

ATTACHMENT NUMBER 1

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