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二枚貝異説再考：イノセラムスが原鰓類だという結晶学的証拠
The Bivalve Heresy revisited: crystallographic evidence implies inoceramids are protobrachs rather than pteriomorphians

平野 健幸[1*], 生形 貴男[1], 道林 克禎[1]
HIRANO, Takeyuki[1*], UBUKATA, Takao[1], MICHIBAYASHI, Katsuyoshi[1]

[1] 静岡大学
[1]Shizuoka University

The Inoceramidae, the most flourished bivalves throughout the Late Cretaceous, have been subjects of paleontologist's attention because of their great biostratigraphic utilities and biological enigma. In particular, their phylogenetic position has been a matter for debate in the last decade over a controversial heresy raised by Johnston and Collom (1998), i.e., the Inoceramidae should be placed with cryptodonts in the Protobranchia, not Pteriomorphia. The "Bivalve Heresy" is grounded on morphological and paleoecological traits that can only be regarded as inconclusive evidences. Here we present a new evidence for the "Bivalve Heresy" through the crystallographic features of the shell.

In this study, we focused on distribution of crystallographic orientation in the nacreous shell layer because it is different among higher taxa in the Bivalvia. We analyzed orientation of aragonite crystals in a total of three inoceramid species, namely *Inoceramus mihoensis*, *Sphenoceramus naumanni* and *S. sachalinensis*. Pearlescent fossil specimens recovered from the Upper Cretaceous Yezo Group were utilized for the orientation mapping using electron backscatter diffraction (EBSD: Oxford-HKL Channel5) attached with a SEM (Hitachi S-3400N). The EBSD analyses revealed that preferred orientation of the *a*-axis is unclear in all inoceramid specimens examined. Such a character was also reported in nucleoid protobranchs and is totally different from the crystallographic preferred orientation seen in pteriomorphians in which the *a*-axes are well aligned along the growth lines. Although crystallographic data hitherto been available are limited for protobranchs, this result exhibits a sign of inappropriateness of assigning the Inoceramidae to the Pteriomorphia.
Keywords: inoceramids, nacreous structure, crystallographic orientation, EBSD