

CURRICULUM VITAE OF FREDERICK H. C. HOTCHKISS

BORN: December 4, 1944, Oak Bluffs, Massachusetts
U.S. citizen

EDUCATION:

B.S. in earth science, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1966
M. Phil. in biology, Yale University, New Haven, Connecticut, 1971
Ph.D. in biology, Yale University, New Haven, Connecticut, 1974

MILITARY EXPERIENCE:

1966-1969 U.S. Navy Deep Submergence Systems Project, Ocean Engineering Branch,
Bethesda, Maryland. [Lt. USNR, honorable discharge.]

HONORS, AWARDS AND FELLOWSHIPS:

Russell P. Stanhope Distinguished Friend of Science Award
from the Massachusetts Association of Science Teachers, 2014
The Palaeontological Association Mary Anning Award, 2002
Fellow of the Linnaean Society of London, 2001
ASTM Committee E-7 on Nondestructive Testing Certificate of Appreciation, January 1994
ASTM Committee E-7 on Nondestructive Testing Certificate of Appreciation, January 1990
Smithsonian Postdoctoral Fellowship, 1973-1974
Connecticut State Scholarship Grant, 1972-1973
N.S.F. Graduate Traineeship. 1972-1973
N.D.E.A. Title IV Graduate Fellowship, 1969-1972

PROFESSIONAL SOCIETIES

Current: American Association of Zoological Nomenclature; Biological Society of Washington;
Linnaean Society of London; Mid-American Paleontological Society; New York Academy of
Sciences (life member); Paleontological Research Institution (life member); The Palaeontological
Association; The Paleontological Society; Western Interior Paleontological Society
Lapsed: Acoustical Society of America; American Association for the Advancement of Science; American
Society of Nondestructive Testing; American Society for Testing and Materials; American Society
of Zoologists; Canadian Society for Nondestructive Testing; Palaeontographical Society of
London; Society for Integrative and Comparative Biology; Society of Sigma Xi.

PROFESSIONAL EXPERIENCE:

2014-date Research Affiliate with Dr. Sam Bowring, Department of Earth and Planetary Sciences,
Massachusetts Institute of Technology
2004-date Director, Marine and Paleobiological Research Institute, Inc., Vineyard Haven,
Massachusetts [also President and Treasurer]
1998-date Departmental Associate, Department of Palaeobiology, Royal Ontario Museum,
Toronto, Ontario, Canada

1980-2004 Acoustic Design Engineer, Engineering Manager, and Product Manager for Transducers, NDT Division, Panametrics Inc., Waltham, Massachusetts [in July 2002 Panametrics Inc. was sold to General Electric and became GE Panametrics.] Manufacturing Manager for Transducers August 2002; [in December 2003 Panametrics NDT was divested from GE Panametrics and became R/D Tech Instruments Inc] Manufacturing Manager for Instruments & Transducers [through 15 January 2004].

1978-1979 Visiting Assistant Professor, Department of Biology, Moravian College, Bethlehem, Pennsylvania

1978 Consultant to Multiprep, Inc., Ardmore, Pennsylvania

1978 Jan-June Adjunct Assistant Professor, Department of Biology, Lehigh University, Bethlehem, Pennsylvania

1977-1978 Executive Vice President, Erenow Books, Willow Grove, Pennsylvania

1976-1979 Research Associate, Department of Geology and Paleontology, The Academy of Natural Sciences, Philadelphia, Pennsylvania

1974-1976 Visiting Assistant Professor of Biology, Division of Natural Sciences, State University of New York College at Purchase, Purchase, New York

1973-1974 Smithsonian Fellow in Evolutionary and Systematic Biology, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.

1971-1974 Associate in Mathematics and Statistics, TCE Incorporated, Boston, Massachusetts

1972-1973 Curatorial Assistant, Division of Invertebrate Paleontology, Peabody Museum of Natural History, Yale University, New Haven, Connecticut

1971-1972 Teaching Assistant, Department of Biology, Yale University, New Haven, Connecticut

1962-1965 Summer Field Assistant, Beach Sediment Studies Project, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

REFEREE FOR:

Journal of Paleontology; Journal of Theoretical Biology; Bulletin of Marine Science; Marine Biology; U.S. Geological Survey Professional Papers; Bulletins of American Paleontology; Alcheringa; American Naturalist; Malacologia; Journal of the Acoustical Society of America; ASNT Nondestructive Testing Handbook; The World and I; Journal of Testing and Evaluation; Palaeontologisch Zeitschrift; Acta Palaeontologica Polonica; Palaeontology; Proceedings of the Biological Society of Washington; SEPM Ichnology Publication; Scripta Geologica; Czech Geological Survey Bulletin of Geosciences; PLoS ONE.

PRESENTATIONS/PUBLICATIONS

on echinoderms, biology and evolution:

2012. Hotchkiss, F.H.C. Growth zones and extraxial-axial skeletal homologies in Asteroidea. Proceedings of the Biological Society of Washington 125(2):106-121. Also given as a poster presentation titled "Revised extraxial-axial homologies in Asteroidea ", at the 14th International Echinoderms Conference, August 2012, Brussels, Belgium.
2012. Hotchkiss, F.H.C. and A. Glass. Observations on Onychaster (Ophiuroidea: Onychasteridae) (Famennian - Visean Age. Zoosymposia 7:121-138.

2011. Hotchkiss, F.H.C. and J.K. Keesing. An arm-stump specimen of *Archaster angulatus* Muller & Troschel, 1842 (Echinodermata: Asteroidea) [abstract]. Gulf of Mexico Science 29(2):144-145. Poster presentation prepared for the 6th North American Echinoderm Conference, Rosario Beach Marine Laboratory of Walla Walla University, Anacortes Island, WA, USA, August 14-19, 2011.
2010. Hotchkiss, F.H.C. and A. Glass. Observations on *Onychaster* (Ophiuroidea: Onychasteridae) (Famennian - Visean Age) [abstract]. Pp. 52-53 in M. Reich, J. Reitner, V. Roden, and B. Thuy (eds.), Echinoderm Research 2010, 7th European Conference on Echinoderms, Göttingen, October 2-9, 2010. Abstract volume and field guide to excursions. Universitätsdrucke Göttingen. Presented as a poster in Göttingen, and at the 6th North American Echinoderms Conference, Rosario Beach Marine Laboratory of Walla Walla University, Anacortes Island, WA, August 2011, abstract in Gulf of Mexico Science 29(2):144.
2010. Hotchkiss, F.H.C., and A. Glass. *Bdellacoma* in the Hunsrück Slate (Lower Devonian, Germany): Reidentification of *Urasterella verruculosa* (Asteroidea, Bdellacomidae). Pp. 15-21 in L.G. Harris, S.A. Böttger, C.W. Walker & M.P. Lesser (eds.), Echinoderms: Durham, Proceedings of the 12th International Echinoderm Conference, Durham, New Hampshire, USA, 7-11 August 2006, CRC Press/Balkema, Leiden, 679 pp.
2009. Hotchkiss, F. H. C. Arm stumps and regeneration models in Asteroidea (Echinodermata). Proceedings of the Biological Society of Washington 122(3):342-354.
2008. Hotchkiss, F. H. C. Starfish arm stumps: wound closure patterns and regeneration models [abstract]. Gulf of Mexico Science 26(2):152. Presented as a poster at the Fifth North American Echinoderm Conference, Melbourne, Florida, July 2008; the 4th Workshop of German and Austrian Echinoderm Research, Vienna, October 2008 [pp. 21-22 of published abstracts]; PaleoPodium 18, Hungarian Natural History Museum, Budapest, October 2008; and 13th International Echinoderms Conference, University of Tasmania, January 2009; Western Interior Paleontological Society's Founders' Symposium, March 2009; and at the 14th Annual Cape Cod Natural History Conference, March 2009.
2007. Hotchkiss, F. H. C., Rudolf J. Prokop and Václav Petr. Isolated ossicles of the Family Eospondylidae Spencer et Wright, 1966, in the Lower Devonian of Bohemia (Czech Republic) and correction of the systematic position of eospondylid brittlestars (Echinodermata: Ophiuroidea: Oegophiurida). SBORNÍK NÁRODNÍHO MUZEA V PRAZE Řada B – Přírodní vědy • sv. 63 • čís. 1; Acta Musei Nationalis Pragae, Series B – Natural History • vol. 63 • no. 1: 3-18.
2006. Glass, A. & F.H.C. Hotchkiss. *Bdellacoma* in the Hunsrück Slate (Lower Devonian, Germany): reidentification of *Urasterella verruculosa* (Asteroidea, Bdellacomidae). 12th International Echinoderm Conference, Durham, New Hampshire, 7 – 11 August 2006, Program and Abstracts: poster presentation. Presented also at Western Interior Paleontological Society symposium Inscribed in Stone: Evolution and the Fossil Record, Colorado School of Mines, 3 – 4 March 2007, Program and Abstracts p. 65. Presented also at 4th Workshop of German & Austrian Echinoderm Research, Naturhistorisches Museum Wien, 24-26 October 2008, Abstracts pp. 23-24. Presented also at PaleoPodium 18, Hungarian Natural History Museum, Budapest,

October 2008.

2004. Blake, D. B. & F. H. C. Hotchkiss. Recognition of the asteroid (Echinodermata) crown group: implications of the ventral skeleton. *Journal of Paleontology* 78(2):359-370.
2004. Hotchkiss, F. H. C. and R. Haude. Observations on Aganaster gregarius and Stephanoura belgica (Ophiuroidea: Ophiolepididae) (Early Carboniferous and Late Devonian age). pp. 425-431 in T. Heinzeller & J. H. Nebelsick (eds.) *Echinoderms*: München. Taylor & Francis Group, London. xxvi + 633 pp. [conference paper presented by R. Haude; see Haude & Hotchkiss 2003]
2003. Haude, R. & F. H. C. Hotchkiss. Observations on Aganaster gregarius and Stephanoura belgica (Ophiuroidea: Ophiolepididae). 11th International Echinoderm Conference, Munich, Germany, Oct. 6 – 10 2003, Programme and Abstracts.
2001. Hotchkiss, F.H.C. & P. H. von Bitter. Diminutive ophiuroids of modern aspect from the Lower Carboniferous of Nova Scotia. [Fourth North American Echinoderms Conference, 22-26 Aug 2001, Darling Marine Center, University of Maine, Walpole, Maine, program and abstracts p. 29.] *Gulf of Mexico Science* 19(2):189-190.
2000. Hotchkiss, F.H.C. On the number of rays in starfish. [From the Symposium Evolution of Starfishes: Morphology, Molecules, Development, and Paleobiology presented at the Annual Meeting of the SICB 6-10 January 1999, Denver, Colorado.] *American Zoologist* 40(3):340-354.
2000. Hotchkiss, F.H.C. Inferring the developmental basis of the sea star abnormality “double ambulacral groove” (Echinodermata: Asteroidea). *Revista Chilena de Historia Natural* 73:579-583.
2000. McDonald, K., B. M. Waggoner, F. H. C. Hotchkiss & J. A. Harper. Ophiuroids from the Imo Formation (Chesterian: Mississippian) of northern Arkansas. *Geological Society of America Abstracts with Programs* 32(7):A-446.
1999. Hotchkiss, F.H.C., R.J. Prokop and V.Petr. Isolated skeletal ossicles of a new brittlestar of the Family Cheiropterasteridae Spencer, 1934 (Echinodermata: Ophiuroidea) in the Lower Devonian of Bohemia (Czech Republic). *Journal of the Czech Geological Society* 44(1-2):189-193.
1999. Hotchkiss, F.H.C., R.J. Prokop and V. Petr. Isolated vertebrae of brittlestars of the Family Klasmuridae Spencer, 1925 (Echinodermata: Ophiuroidea) in the Devonian of Bohemia (Czech Republic). *Journal of the Czech Geological Society* 44(3-4):329-333.
1998. Hotchkiss, F.H.C. & J. M. Lawrence. Origin of abnormal numbers of rays in starfish (Echinodermata) (Abstract). [North American Echinoderms Meeting, August 16-19, 1998, Wallops Island Marine Science Center, Wallops Island, Virginia, program and abstracts p. 16.] *Gulf of Mexico Science* 16(1):120.
1998. Hotchkiss, F.H.C. & P. H. von Bitter. Diminutive ophiuroids (Echinodermata) from the upper Windsor Group (Lower Carboniferous: Late Viséan/Asbian) of Nova Scotia, Canada (Abstract). *Canadian Paleontology Conference Program and Abstracts No. 8* [The Eighth Canadian Paleontology Conference, 22-25 October 1998] [CPC-VIII Collingwood 1998], p. 11. [Also: Royal Ontario Museum Twentieth Annual Research Colloquium, 18 November 1998, Toronto, Abstracts of Papers, p. 8 (abbreviated abstract).]
1998. Hotchkiss, F.H.C. On the number of rays in starfish (abstract). *American Zoologist*

- 38(5):2A. [full paper published in year 2000 -- see above]
1998. Hotchkiss, F.H.C. Discussion on pentamerism: the five-part pattern of Stromatocystites, Asterozoa and Echinozoa. Pp. 37-42 in R. Mooi & M. Telford (eds.), Echinoderms: San Francisco [Proceeding of the ninth International Echinoderms Conference, San Francisco, California, 5-9 August 1996] Balkema, Rotterdam.
1998. Hotchkiss, F.H.C. A "rays as appendages" model for the origin of pentamerism in echinoderms. Paleobiology 24:200-214.
1997. Hotchkiss, F.H.C., D. M. Rudkin, and S. Anderson. A case for rearmament -- the oldest known evidence of regeneration in sea stars (Abstract). 7th Canadian Paleontology Conference, University of Saskatchewan, Saskatoon, September 26-30, 1997. [Also: Rudkin, D. M., F. H. C. Hotchkiss and S. Anderson. A case for rearmament -- the oldest known evidence of regeneration in sea stars. Royal Ontario Museum Nineteenth Annual Research Colloquium, 20 November 1997, Toronto, Abstracts of Papers, p. 1 (abbreviated abstract).]
1995. Hotchkiss, F.H.C., D. M. Rudkin and D. K. Armstrong. Euzonosoma (Echinodermata: Ophiuroidea) from the Middle Ordovician Gull River Formation in Ontario - Some palaeogeographic and palaeoecological implications of the first North American record of the Encrinasteridae (Abstract). In: P. A. Johnston (ed.): Canadian Paleontology Conference, Program and Abstracts No. 5: [The Fifth Canadian Paleontology Conference and International Symposium on the Paleobiology and Evolution of the Bivalvia. Joint Meeting, Royal Tyrrell Museum of Palaeontology, Drumheller, Alberta, 29 September - 2 October 1995.] [CPC-V Drumheller '95]
1995. Hotchkiss, F.H.C. Lovén's law and adult ray homologies in echinoids, ophiuroids, edrioasteroids and an ophiocistioid (Echinodermata: Eleutherozoa). Proceedings of the Biological Society of Washington 108(3):401-435
1995. Hotchkiss, F.H.C., D. K. Armstrong & D. M. Rudkin. A new occurrence of the genus Euzonosoma (Echinodermata: Ophiuroidea) from the Middle Ordovician Gull River Formation (Caradocian) of Ontario - first North American Ordovician record of the Encrinasteridae. Pp. 483-486 In: J.D. Cooper, M.R. Droser & S.C. Finney (eds.): Ordovician Odyssey: Short papers for the Seventh International Symposium on the Ordovician System, Las Vegas, Nevada, USA, June 1995, 498 pp., The Pacific Section Society for Sedimentary Geology (SEPM). Fullerton, California.
1993. Hotchkiss, F.H.C. A new Devonian ophiuroid (Echinodermata: Oegophiurida) from New York State and its bearing on the origin of ophiuroid upper arm plates. Proceedings of the Biological Society of Washington, vol. 106, no. 1, pp. 63-84.
1992. Hotchkiss, F.H.C. Footnotes on Lovén's law. Presented at the Second North American Friends of Echinoderms Conference and Workshop, Harbor Branch Oceanographic Institution, Inc., 9-11 July 1992.
1990. Hotchkiss, F.H.C., S.E. Churchill, R.G. Gelormini, W.R. Hepp, R.J. Rentler & M.T. Tummarello. Events of autotomy in the starfish Asterias forbesi and A. vulgaris. Presented at 7th International Echinoderms Conference, Sept. 9/14, 1990, Atami, Japan. Published 1991, pp. 537-541 in T. Yanagisawa et al. (eds.), Biology of Echinodermata, A.A. Balkema, Rotterdam, 590 pp.

1985. Hotchkiss, F.H.C. [Notes on] Furcaster cf. F. leptosoma(?) (Salter, 1857). P. 241 in D.B. Sass & R.A. Condrate, Destruction of a Late Devonian ophiuroid assemblage: a victim of changing ecology at the Catskill delta front. Geological Society of America Special Paper 201:237-246.
1982. Hotchkiss, F.H.C. Ophiuroidea (Echinodermata) from Carrie Bow Cay, Belize. Pp. 387-412 in The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, I. Structure and Communities. K. Rutzler and I.G. Macintyre, editors. Smithsonian Contributions to the Marine Sciences, No. 12.
1980. Pruzan-Hotchkiss, A., I.B. Perelle, F.H.C. Hotchkiss & L. Ehrman. Altered competition between two reproductively isolated strains of Drosophila melanogaster. Evolution 34(3):445-452.
1980. Hotchkiss, F.H.C. The early growth stage of a Devonian ophiuroid and its bearing on echinoderm phylogeny. Journal of Natural History 14:91-96.
1979. Hotchkiss, F.H.C. Case studies in the teratology of starfish. Proc. Acad. Nat. Sci. Phil. 131: 139-157.
1978. Hotchkiss, F.H.C. Studies on echinoderm ray homologies. Loven's law applies to Paleozoic ophiuroids. Journal of Paleontology 52(3):537-544.
1977. Hotchkiss, F.H.C. Ophiuroid Ophiocanops (Echinodermata) not a living fossil. J. nat. Hist. 11: 377-380.
1977. Hotchkiss, F.H.C. Antarctic fossil echinoids - review and current research. Presented at 3rd Symposium on Antarctic Geology and Geophysics, August 22/27, 1977, Madison, WI. Published 1982, pp. 679-684 in C. Craddock (ed.) Antarctic Geoscience, Univ. Wisconsin Press, 1172 pp.
1977. Hotchkiss, F.H.C. Antarctic and southernmost South American fossil echinoids (progress report). Antarctic Journal of the United States 12(4):81.
1976. Macomber, J.B., A. Pruzan, F.H.C. Hotchkiss & L. Ehrman. Competition between two reproductively isolated strains of Drosophila melanogaster (Abstract). Genetics 83(3): S47.
1976. Hotchkiss, F.H.C. & A.M. Clark. Restriction of the family Poraniidae, sensu Spencer and Wright, 1966 (Echinodermata: Asteroidea). Bulletin of the British Museum (Natural History) Zoology 30(6):263-268 + pls. 1-3.
1976. Hotchkiss, F.H.C. Devonian ophiuroids of New York State: Reclassification of Klasmura, Antiquaster and Stenaster into the Suborder Scalarina nov., Order Stenurida. New York State Museum Bull, No. 425:1-39.
1975. Hotchkiss, F.H.C. Theory of population densities from animal tracks. Lecture given at: Rockefeller Field Research Center; New England Population Biologists meeting at Worcester Polytechnical Institute; New York Population Biology Seminar, Columbia University
1975. Hotchkiss, F.H.C. & P.R. Seegers. Variable symmetry in starfish. Presented at 2nd Echinoderms Conference, Sept. 26/Oct. 1, 1975, Rovinj, Yugoslavia. Published 1978, Thalassia Jugoslavica 12(1): 173-180.
1974. Hotchkiss, F.H.C. New data on the ancestry of sea-stars. Lecture given at: Smithsonian Institution; Case Western Reserve University; State University of New York College

at Purchase.

1974. Hotchkiss, F.H.C. [Review of] The Biology of the Indian Ocean, Bernt Zeitshel (ed.). American Scientist 62(6): 741-742.
1974. Hotchkiss, F.H.C. Abnormal sea stars needed. Sea Secrets 18(4): 6.
1974. Hotchkiss, F.H.C. Studies on Paleozoic ophiuroids and the ancestry of the Asterozoa. Ph. D. dissertation, Yale University, June 1974, vi + 147 pp., 24 pls. Abstract in Dissertation Abstracts International 35(6):2922B.
1973. Hotchkiss, F.H.C. [Review of] Physiology of Echinoderms by John Binyon. American Scientist 61(5): 589.
1972. Hotchkiss, F.H.C. New paleontological data on the antiquity of the ophiuroid calycinal system. Presented at the 1st Echinoderms Conference, Smithsonian Institution, Washington, D.C.
1972. Hotchkiss, F.H.C. & H.B. Fell.. Zoogeographical implications of a Paleogene echinoid from East Antarctica. Journ. Roy. Soc. New Zealand 2(3): 369-372.
1971. Hotchkiss, F.H.C. [Review of] Genetics of the Evolutionary Process by Theodosius Dobzhansky. American Scientist 59(5): 610.
1970. Hotchkiss, F.H.C. North American Ordovician Ophiuroidea, the genus Taeniaster Billings, 1858 (Protasteridae). Proc. Biol. Soc. Wash. (D.C.), 83(5): 59-76.

PRESENTATIONS/PUBLICATIONS/PATENTS

on ultrasonics and nondestructive testing:

2000. Cotter, D.J., T.E. Michaels, J.E. Michaels, D. Kass, M.E. Stanton, I.V. Kosenko & F.H.C. Hotchkiss. Low-frequency ultrasonic imaging of composite structures with squirter-based water coupled and air coupled transducers. Presented at 45th International SAMPE Symposium, May 21-25, Long Beach, CA [The Society for the Advancement of Material and Process Engineering]
2000. Cotter, D.J., T.E. Michaels, J.E. Michaels, D.Kass, M.E. Stanton, I.V. Kosenko & F.H.C. Hotchkiss. Squirter, roller probe, and air-coupled ultrasonic transducer techniques for low frequency inspection of advanced composite materials. 15th World Conference on Non-Destructive Testing, Roma 15-21 October 2000. ISSN 1435-4934 The e-Journal of Nondestructive Testing and Ultrasonics. <http://www.ndt.net/article/wcndt00/papers/idn215.htm>
- 1997/98. E.A. Ginzel & F.H.C. Hotchkiss. Ultrasonic beam profile modelling. First published on the Ultrasonic-Testing OnLine Journal (<http://www.ultrasonic.de>.) June 1997. Published January 1998 in CSNDT Journal 19:19-31.
1992. Hotchkiss, F. H. C. Guide to designs of IIW-type blocks [with addendum of further observations]. Welding in the World/Le Soudage dans le Monde 30(7/8):158-173.
1990. Hotchkiss, F. H. C. Guide to designs of IIW-type blocks. NDT International 23(6):319-331.
1990. Fowler, K. A., D. R. Patch & F. H. Hotchkiss. Ultrasonic transducer assembly. US Patent

04918990.

1989. VanValkenburg, H.E. & F.H.C. Hotchkiss. Angle-beam calibration blocks: beam index anomalies. Poster presented at 12th World Conference on Non-Destructive Testing, Amsterdam, April 23/28, 1989.
1988. Hotchkiss, F. H. C. & J. Castel. Exemples de méthodes d'évaluation des tolérances de transducteurs ultrasonores à partir des spécifications de fabrication. Presented at Programme-Colloque Sofranel, Paris, 2 June 1988.
1987. Hotchkiss, F. H. C., D.R. Patch & M.E. Stanton. Examples of ways to evaluate tolerances on transducer manufacturing specifications. Presented at ASNT 1987 Spring Conference, Phoenix, AZ. Published in Materials Evaluation 45(10):1195-1202.
1984. Fowler, K.A., F.H.C. Hotchkiss & T.V. Yamartino. How the user can obtain consistent ultrasonic transducers from multiple sources. Presented at DoD Manufacturing Technology Advisory Group Ultrasonic Workshop, Test & Inspection Sucommittee, 12-14 June 1984, FABTECH WEST, Long Beach, CA.
1983. Fowler, K.A. & F.H.C. Hotchkiss. Computer aided design and comprehensive test procedures produce optimized transducer performance and uniformity. Presented at Programme-Colloque Sofranel, Paris, June 1983.