

Charles Francis Delwiche

Associate Professor, Department of Cell Biology and Molecular Genetics

Biosciences Research Building, Room 2108

University of Maryland at College Park

College Park, MD 20742-4407

Tel: 301-405-8286 FAX: 301-314-1248 email: delwiche -at- umd.edu

Website: <http://www.life.umd.edu/labs/delwiche/home.html>

Educational Background

B.A. 1984 Botany University of California at Berkeley

Ph.D. 1990 Botany University of Wisconsin - Madison

Chapters in Books

- Sharkey, T. D., F. Loreto, and **C. F. Delwiche**. 1991. The biochemistry of isoprene emission from leaves during photosynthesis. Pp. 153-184 in: *Trace Gas Emissions by Plants*, T. D. Sharkey, H. A. Mooney, and E. A. Holland (eds.). Academic Press, San Diego.
- Barns, S.M., **C.F. Delwiche**, J.D. Palmer, S.C. Dawson, K.L. Hershberger and N.R. Pace. 1996. Phylogenetic perspective on microbial life in hydrothermal ecosystems, past and present. Pp. 24-39 in: *Evolution of Hydrothermal Ecosystems on Earth (and Mars?)*, M. Walter, (ed.). Terrence J. Wiley and Sons, New York.
- Delwiche, C.F.**, and J. Palmer. 1997. The origin of plastids and their spread via secondary symbiosis. Pp. 53-86 in: *Origins of the Algae and Their Plastids*, D. Bhattacharya (ed.). Springer, Vienna.
- Chapman, R.L, M.A. Buchheim, **C.F. Delwiche**, T. Friedl, V.A.R. Huss, K.G. Karol, L.A. Lewis, J. Manhart, R.M. McCourt, J.L. Olsen, and D.A. Waters. 1998. Molecular systematics of the green algae. Pp. 488-507 in: *Molecular Systematics of Plants, 2nd Ed.*, P.S. Soltis, D.E. Soltis, and J.J. Doyle (eds). Chapman and Hall, New York.
- Palmer, J. and **Delwiche, C.F.** 1998. The origin and evolution of plastids and their genomes. Pp. 375-409 in: *Molecular Systematics of Plants, 2nd Ed.*, P.S. Soltis, D.E. Soltis, and J.J. Doyle (eds). Chapman and Hall, New York.
- Delwiche, C. F.**, R. A. Andersen, D. Bhattacharya, B. Mishler, and M. McCourt Richard. 2004. Algal evolution and the early radiation of green plants. Pp. 121-137 in J. Cracraft, and M. J. Donoghue, eds. *The Tree of Life*. Oxford University Press, London.
- Delwiche, C. F.**, 2007. Algae in the warp and weave of life: bound by plastids. In "Unraveling the Algae: The Past, Present, and Future of Algal Systematics" (J. Brodie, and J. Lewis, eds.), pp. 7-20. Taylor and Francis Group LLC, Boca Raton, FL.
- Hall, J.D., and **C.F. Delwiche**. 2007. In the shadow of giants: the charophyte green algae. In "Unraveling the Algae: The Past, Present, and Future of Algal Systematics" (J. Brodie, and J. Lewis, eds.), pp. 155-170. Taylor and Francis Group LLC, Boca Raton, FL.
- Delwiche, C. F.** (2007). The origin and evolution of dinoflagellates. In "Evolution of Primary Producers of the Sea" (P. G. Falkowski, and A. H. Knoll, eds.), pp 193-205. Elsevier, New York, NY.

Articles in Refereed Journals

- Delwiche, C.F.**, L.E. Graham and N. Thomson. 1989. Lignin-like compounds and sporopollenin in *Coleochaete*, an algal model for land plant ancestry. *Science* 245:399-401. DOI: 10.1126/science.245.4916.399
- Graham, L. E., **C. F. Delwiche**, and B. Mishler. 1991. Phylogenetic connections between the "green algae" and "bryophytes." *Adv. Bryol.* 4:213-244.
- Sharkey, T. D., F. Loreto, and **C. F. Delwiche**. 1991. High carbon dioxide and sun/shade effects on isoprene emission from oak and aspen tree leaves. *Plant Cell Environ.* 14:333-338.
- Sharkey, T. D., F. Loreto, **C. F. Delwiche**, and I. W. Treichel. 1991. Fractionation of carbon isotopes during biogenesis of atmospheric isoprene. *Plant Physiol.* 97:463-466.
- Morden, C. W., **C. F. Delwiche**, M. Kuhnel, and J. D. Palmer. 1992. Gene phylogenies and the endosymbiotic origin of plastids. *Biosystems* 28:75-90.
- Delwiche, C. F.** and T. D. Sharkey. 1993. Rapid appearance of ^{13}C in biogenic isoprene when $^{13}\text{CO}_2$ is fed to intact leaves. *Plant Cell Environ.* 16:587-591.
- Mishler, B.D., L.A. Lewis, M.A. Buchheim, K. S. Renzaglia, D. J. Garbarz, **C. F. Delwiche**, F. W. Zechman, T. S. Kantz, and R. L. Chapman. 1994. Phylogenetic relationships of the "green algae" and "bryophytes". *Ann. Missouri Bot. Gard.* 81:451-483.
- Delwiche, C. F.**, M. Kuhnel, and J. D. Palmer. 1995. Phylogenetic analysis of *tufA* sequences indicates a cyanobacterial origin of all plastids. *Mol. Phylog. Evol.* 4:110-128.
- Barns, S.M., **C.F. Delwiche**, J.D. Palmer, and N.R. Pace 1996. Perspectives on archaeal diversity, thermophily and monophyly from environmental rRNA sequences. *Proc. Natl. Acad. Sci. USA* 93:9188-9193.
- Delwiche, C.F.**, and J. D. Palmer. 1996. Rampant horizontal transfer and duplication of rubisco genes in eubacteria and plastids. *Mol. Biol. Evol.* 13:873-882.
- Palmer, J.D., and **C.F. Delwiche**. 1996. Second-hand chloroplasts and the case of the disappearing nucleus. *Proc. Natl. Acad. Sci. USA* 93: 7432-7435.
- Köhler, S., **C.F. Delwiche**, L.G. Tilney, P. Webster, R.J.M. Wilson, J.D. Palmer, and D.S. Roos. 1997. A plastid of probable green algal origin in apicomplexan plastids. *Science* 275:1485-1489. [Delwiche and Köhler joint first authors]
- Roos, D., and **C.F. Delwiche**. 1998. Endosymbiosis: cyclical and permanent in evolution. *Trends Microbiol.* 343:345-346.
- Delwiche, C.F.** 1999. Tracing the thread of plastid diversity through the tapestry of life. *Am. Nat.* 154: S164-S177.
- Tengs, T., O.J Dahlberg, K. Shalchian-Tabrizi, D. Klaveness, K. Rudi, **C.F. Delwiche** and K.S. Jakobsen. 2000. Phylogenetic analyses indicate that the 19' hexanoyloxy-fucoxanthin-containing dinoflagellates have tertiary plastids of haptophyte origin. *Mol. Bio. Evol* 17:718-729.
- Cimino, M.T., K.G. Karol, and **C.F. Delwiche**. 2000. An artifact in the SSU rDNA sequence of *Chaetosphaeridium globosum* (Chlorophyta: Charophyceae). *J. Phycol.* 36:440-442.
- Oldach, D.W., **C.F. Delwiche**, K.S. Jakobsen, T. Tengs, E.G. Brown, J.W. Kempton, E.F. Schaefer, H.A. Bowers, H.B. Glasgow Jr., J.M. Burkholder, K.A. Steidinger, and P.A. Rublee. 2000. Heteroduplex mobility assay guided sequence discovery: elucidation of the small subunit (18S) rDNA sequences of *Pfiesteria piscicida* and related dinoflagellates from complex algal culture and environmental sample DNA pools. *Proc. Natl. Acad. Sci USA:* 97:4303-4308.
- Karol, K.G., R.M. McCourt, M.T. Cimino, and **C.F. Delwiche**. (2001). The closest living relatives of land plants. *Science* 294:2351-2353.
- Delwiche, C. F.**, K. G. Karol, M. T. Cimino, and K. J. Sytsma. 2002. Phylogeny of the genus *Coleochaete* (Coleochaetales, Charophyta) and related taxa inferred by analysis of the chloroplast gene *rbcL*. *Journal of Phycology* 38: 394-403.

- Cimino, M.T., and **C.F. Delwiche**. 2002. Molecular and morphological data identify a cryptic species complex in endophytic members of the genus *Coleochaete* Breb. (Coleochaetales, Charophyta). *J. Phycol.* 38:1213-1221.
- Cimino, M. T., J. L. Reveal, and **C. F. Delwiche**. 2003. (1569-1570) Proposals to conserve the name *Coleochaete soluta* against *C-prostrata* and the name *C-orbicularis* against *Phyllactidium pulchellum* with a note on the name *C-nitellarum* (Coleochaetaceae, Chlorophyceae). *Taxon* 52: 133-134.
- Eriksson, T., M. S. Hibbs, **C. F. Delwiche**, M. J. Donoghue, and A. D. Yoder. 2003. The phylogeny of Rosoideae (Rosaceae) enhanced by combining sequences of the internal transcribed spacers (ITS) of nuclear ribosomal DNA with the *trnL/F* region of chloroplast DNA. *Int. J. Plant Sci* 164:197-211.
- Charity, J. C., K. Pak, **C. F. Delwiche**, and S. W. Hutcheson. 2003. Novel exchangeable effector loci associated with *Pseudomonas syringae* *hrp* pathogenicity island: evidence for integron-like assembly from transposed gene cassettes. *Molecular Plant Microbe Interactions* 16: 495-507.
- Bachvaroff, T. R., G. T. Concepcion, C. R. Rogers, E. M. Herman, and **C. F. Delwiche**. 2003. Dinoflagellate EST data indicate massive transfer of genes to the nuclear genome. *Protist* 155: 65-78.
- Sánchez Puerta, M. V., T. R. Bachvaroff, and **C. F. Delwiche**. 2004. The complete mitochondrial genome of the haptophyte *Emiliania huxleyi* and its relation to heterokonts. *DNA Research* 11:1-10.
- Johnson, M. D., T. Tengs, **C. F. Delwiche**, D. Oldach, and D. K. Stoecker. 2004. Highly divergent SSU rRNA genes found in marine ciliates *Myrionecta rubra* and *Mesodinium pulex*. *Protist* 155:347-359.
- Delwiche, C. F.** 2004 The genomic palimpsest: genomics in evolution and ecology. *BioScience* 54:991-1001.
- McCourt, R. M., **Delwiche, C. F.**, and Karol, K. G. 2004. Charophyte algae and land plant origins. *Trends. Ecol. Evol.* 19:661-666.
- Sanchez Puerta, M. V., T. R. Bachvaroff, and **C. F. Delwiche**. 2005. The complete plastid genome sequence of the haptophyte *Emiliania huxleyi*: a comparison to other plastid genomes. *DNA research.* 12:151-156
- Bachvaroff, T.R., M.V. Sánchez Puerta & **C.F. Delwiche**. 2005. Chlorophyll c containing plastid relationships based on analyses of a multi-gene dataset with all four chromalveolates lineages. *Mol. Biol. Evol.* 22:1772-1782.
- Drummond, C., Hall, J. D., Karol, K. G., **Delwiche, C. F.**, and McCourt, R. M. 2005. Phylogeny of *Spirogyra* and *Sirogonium* (Zygnematophyceae) based on *rbcL* sequence data. *J. Phycol.* 41: 1055-1064.
- Bachvaroff, T. R., Sanchez-Puerta, M. V., and **Delwiche, C. F.** 2006. Rate variation as a function of gene origin in plastid-derived genes of peridinin-containing dinoflagellates. *J. Mol. Evol.* 62, 42-52.
- Shalchian-Tabrizi, K., Skanseng, M., Ronquist, F., Klaveness, D., Bachvaroff, T. R., **Delwiche, C. F.**, Botnen, A., Tengs, T., and Jakobsen, K. S. 2006. Heterotachy Processes in Rhodophyte-Derived Secondhand Plastid Genes: Implications for Addressing the Origin and Evolution of Dinoflagellate Plastids. *Mol Biol Evol* 23, 1504-1515. doi:10.1093/molbev/msl011
- Sanchez-Puerta, M. V., Lippmeier, J. C., Apt, K. E., and **Delwiche, C. F.** 2007. Plastid genes in a non-photosynthetic dinoflagellate. *Protist* 158, 105-117. doi:10.1016/j.protis.2006.09.004
- Johnson, M. D., Oldach, D., Delwiche, C. F., and Stoecker, D. K. 2007. Retention of transcriptionally active cryptophyte nuclei by the ciliate *Myrionecta rubra*. *Nature* 445, 426-428. doi:10.1038/nature05496

- Palenik, Brian, Jane Grimwood, Andrea Aerts, Pierre Rouze, Asaf Salamov, Nicholas Putnam, Chris Dupont, Richard Jorgensen, Evelyne Derelle, Stephane Rombauts, Kemin Zhou, Robert Otillar, Sabeeha Merchant, Sheila Podell, Terry Gaasterland, Carolyn Napoli, Karla Gendler, Andrea Manuell, Vera Tai, Olivier Vallon, Gwenael Piganeau, Séverine Jancek, Marc Heijde, Kamel Jabbari, Chris Bowler, Martin Lohr, Steven Robbens, Gregory Werner, Inna Dubchak, Gregory J Pazour, Qinghu Ren, Ian Paulsen, **C F. Delwiche**, Jeremy Schmutz, Daniel Rokhsar, Yves Van de Peer, Hervé Moreau, and Igor Grigoriev. 2007. Tiny eukaryotes provide genomic insights into the Paradox of the Plankton. *Proc. Natl. Acad. Sci. USA*. 7705-7710. doi: 10.1073/pnas.0611046104
- Sánchez-Puerta, M. V., T. R. Bachvaroff, and **C. F. Delwiche**. 2007. Sorting wheat from chaff in multi-gene analyses of chlorophyll c-containing plastids. *Mol. Phylog. Evol.* 44:885-897.
- Hall, John D., Kenneth G. Karol, Richard M. McCourt and Charles F. Delwiche 2008 Phylogeny of the conjugating green algae based on chloroplast and mitochondrial nucleotide sequence data. *J. Phycol.* 95:643-654. doi: 10.1111/j.1529-8817.2008.00485.x
- Hall, J. D., McCourt, R.M., and **Delwiche, C.F.** 2008. Patterns of cell division in the filamentous Desmidiaceae, close green algal relatives of land plants. *Amer. J. Bot.* 95:643-654. doi:10.3732/ajb.2007210
- Sánchez-Puerta, M. V., and **Delwiche, C. F.** 2008. A hypothesis for plastid evolution in chromalveolates. *J. Phycol.* 44:1097-1107. DOI: 10.1111/j.1529-8817.2008.00559.x
- Handy SM, Bachvaroff TR, Timme RE, Coats DW, Kim S, **Delwiche CF**. 2009. Phylogeny of four Dinophysiacean genera (Dinophyceae, Dinophysiales) based on rDNA sequences from single cells and environmental sample. *J. Phycol.* 45:x (in press)
- Hoppenrath, M., Bachvaroff, T.R., Handy, S.M., **Delwiche, C.F.**, and Leander, B.S. 2009. Molecular phylogeny of ocelloid-bearing dinoflagellates (Warnowiidae) as inferred from SSU and LSU rDNA sequences. *BMC Evol. Biol.* 9:116-x. (in press)

Book Reviews, Other Articles, and Notes

- Delwiche, C.F.** 2000. *Griffins and chimeras: evolution and horizontal gene transfer*. *Bioscience* 50:85-87 (book review of Horizontal Gene Transfer, 1998, M. Syvanen and C.I. Kado, eds., Chapman & Hall, London).
- Delwiche, C.F.** 2000. Gene Transfer Between Organisms. Pp. 193-197 in: *McGraw-Hill 2001 Yearbook of Science & Technology*. McGraw-Hill, New York.
- Delwiche, C. F.** 2005. Voyage to the Bottom of the Tree. *Science* 307:676-677.
- Coats D.W., Bachvaroff T., Handy S.M., Kim S., Garate-Lizarraga I., and **Delwiche C.F.** (2008) Prevalence and phylogeny of parasitic dinoflagellates (genus *Blastodinium*) infecting copepods in the Gulf of California. *Oceanides* 23(1, 2): 67-77. (invited)