



## Harvey C. Hoch

Professor and Chair  
Department of Plant Pathology

Co-Director, [Nanobiotechnology Center](#)

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**Ph.D.** 1972 Plant Pathology/Soils

University of Wisconsin, Madison

**M.S.** 1967 Plant Pathology/Soils

Colorado State University

**B.S.** 1965 Botany

Colorado State University

### Division of Effort

Research - 50%, Fungal cell biology, Biology of *Xylella fastidiosa*, Host-pathogen interactions, and Nanobiotechnology

Administration - 50%, Chair, Department of Plant Pathology at Cornell/Geneva

### Program Overview

Current research emphasizes aspects of the cell biology of plant pathogenic fungi, particularly the mechanisms by which these fungi use leaf surface characteristics (topological and chemical) to sense the right time and place to infect the host. Several fungal-host systems are studied; *Uromyces appendiculatus*, the causal agent of bean rust, *Guignardia bidwell* (*Phyllosticta ampellicida*), the causal agent of black rot of grape, and *Colletotrichum graminicola*, the incitant of anthracnose disease of grasses. Many of these studies incorporate nano- and microtechnology to fabricate intricate tools and surface topographies to help address many questions regarding fungal cell biology. Similarly, microfabrication approaches are being used to create artificial xylem vessels used in investigations concerning colony development, biofilm formation, and cell migration by *Xylella fastidiosa*, the bacterium that causes Pierce's disease of grape and related diseases of other plants. Much of the nanofabrication research is being conducted in conjunction with the [Nanobiotechnology Center](#).

In addition to supervising and participating in above research program, I am presently Chair of Cornell's Department of Plant Pathology at Geneva

### Links to Recent and Current Projects

[Microfabricated artificial xylem vessels used to study \*Xylella\* biology](#)

[Microfabricated surfaces to assess signaling in \*Colletotrichum\*](#)

### Professional Experience

2006-present Co-Director, Nanobiotechnology Center, Cornell University, Ithaca, New York

2005-present Chair, Department of Plant Pathology, Cornell University, New York State Agricultural Experiment Station, Geneva, New York

1990-present Professor, Department of Plant Pathology, Cornell University, New York State Agricultural Experiment Station, Geneva, New York

1982-1990 Associate Professor, Department of Plant Pathology, Cornell University, New York State Agricultural Experiment Station, Geneva, New York

- 1977-1982 Assistant Professor, Department of Plant Pathology, Cornell University, New York State Agricultural Experiment Station, Geneva, New York
- 1974-1977 Research Associate, Department of Plant Pathology, Cornell University, New York State Agricultural Experiment Station, Geneva, New York
- 1973-1974 Postdoctoral Research Associate, Botany Department, University of Georgia, Athens, Georgia
- 1972-1973 Postdoctoral Research Associate, Department of Plant Pathology, University of Wisconsin, Madison, Wisconsin

### Professional Activities

#### Professional Societies

American Phytopathological Society  
 Mycological Society of America  
 American Society of Microbiology

#### Professional Assignments, Honors, and Awards

- 1981-1987 Mycological Society of America representative to the Biological Stain Commission
- 1981-1984 Associate Editor, PHYTOPATHOLOGY
- 1981-1985 Associate Editor, CANADIAN JOURNAL OF MICROBIOLOGY
- 1986-1995 American Phytopathological Society representative to the Biological Stain Commission
- 1992-1996 Advisory Board, NIH sponsored National Vibrating Probe Facility, Marine Biology Laboratory, Woods Hole
- 1994 Ruth Allen Award, American Phytopathological Society
- 1995-1997 Councilor for Cell Biology/Physiology, Mycological Society of America
- 1996-2002 Member of Editorial Board, Mycologia, Mycological Society of America
- 2000-present Executive Board, Nanobiotechnology Center, Cornell University
- 2003-2005 Councilor for Cell Biology/Physiology, Mycological Society of America
- 2002 Elected Fellow, American Phytopathological Society
- 2003-present Member, Nanotechnology Technical Advisory Group to the President's Council of Advisors on Science and Technology (PCAST) for the National Nanotechnology Initiative (NNI)
- 2005-present Member advisory Board, BioCurrents Research Center (NIH:NCRR), Marine Biological Laboratory, Woods Hole
- 2006 Distinguished Mycologist Award, Mycological Society of America, 2006

### Current and Former Graduate Students (since 1990)

- 1990 Young Kwon (Ph.D.)
- 1996 Ary Correa (Ph.D.)
- 1996 KerChung Kuo (Ph.D.)
- 2000 Brian Shaw (Ph.D.)

### Current and Former Postdoctoral and Visiting Scientists (since 1990)

- 1988-1990 Dr. Eric Allen
- 1989-1991 Dr. Beth Hazen
- 1989-1991 Dr. Gabriele Leinhos
- 1989-1990 Dr. Mary Ann Stumpf
- 1989-1991 Dr. Tom Molosok
- 1991-1993 Dr. Jana Lamboy
- 1996-1997 Dr. Ary Corrêa Jr.
- 1997-1999 Dr. Dave Clarke
- 2001-2002 Dr. Dace Apoga

2003-2005 Dr. Yizhi Meng  
2003 Dr. Larry Smart, visiting scientist, Syracuse University  
2004-2005 Dr. Jeremy Wahl  
2005-present [Dr. Tanya Taylor](#)  
2005-present [Dr. Leonardo De La Fuente](#)  
2006-present [Dr. Luciana Cursino dos Santos](#)

## Publications

### Referred Journal Articles

- Li, Yaxin, Guixia Hao, Cheryl D. Galvani, Yizhi Meng, Leonardo De La Fuente, H. C. Hoch, and Thomas J. Burr 2007. Type I and type IV pili of *Xylella fastidiosa* affect twitching motility, biofilm formation, and cell-cell aggregation. **Microbiology** 153: 719-726..
- De La Fuente, Leonardo, Emilie Montane, Yizhi Meng, Yaxin Li, Thomas J. Burr, H.C. Hoch, and Mingming Wu. 2007. Assessing adhesion forces of type I and type IV pili of *Xylella fastidiosa* bacteria using a microfluidic flow chamber. **Applied and Environmental Microbiology** 73: 2690-2696.
- Galvani, Cheryl D. , Yaxin Li, T. J. Burr, and H. C. Hoch. 2007. Twitching motility among pathogenic *Xylella fastidiosa* isolates and the influence of bovine serum albumin on twitching-dependent colony fringe morphology. **FEMS Microbiol. Lett.** 268: 202–208
- Shaw, B. D., G. C. Carroll, and H. C. Hoch. 2006. Generality of the prerequisite of conidium attachment to a hydrophobic substratum as a signal for germination among *Phyllosticta* species. **Mycologia** 98:186–194.
- Hoch, H. C., C. D. Galvani, D. H. Szarowski, and J. N. Turner. 2005. Two new fluorescent dyes applicable for visualization of fungal cell walls. **Mycologia** 97: 580-588.
- Meng, Y., Y. Li, C. D. Galvani, G. Hao, J. N. Turner, T. J. Burr, and H. C. Hoch. 2005. Upstream migration of *Xylella fastidiosa* via pilus-driven twitching motility. **Journal of Bacteriology**. 187: 5560-5567.
- Apoga, D., J. Barnard, H. G. Craighead, and H. C. Hoch. 2004. Quantification of substratum contact required for initiation of *Colletotrichum graminicola* appressoria. **Fungal Genetics and Biology** 41:1-12
- Russo, A. P., D. Apoga, N. Dowell, W. Shain, A. Turner, H. G. Craighead, A. J. Spence, S. T. Retterer, M. Isaacson, H. C. Hoch, and J. N. Turner. 2002. Microfabricated plastic devices from silicon using soft intermediates. **J. Biomed. Microdevices** 4: 227-283.
- Shaw, B. D., O. Kozlova, N. D. Read, B. Gillian Turgeon, and H. C. Hoch. 2001. Expression of recombinant aequorin as an intracellular calcium reporter in the phytopathogenic fungus, *Phyllosticta ampellicida*. **Fungal Genetics and Biology** 34: 207–215.
- Barja, F., Y. Jaquet, R. Ortega, H.C. Hoch, and M. Ojha. 2000. Identification and localization of calcium-dependent protease II in *Neurospora crassa* and *Uromyces appendiculatus*. **Protoplasma** 210: 85-91.
- Shaw, B. D. and H. C. Hoch. 2000. Ca<sup>2+</sup> Regulation of *Phyllosticta ampellicida* Pycnidiospore Germination and Appressorium Formation. **Fungal Genetics and Biology** 31: 43–53.
- Chandra, S., G. M. E. Leinhos, G. H. Morrison, and H. C. Hoch. 1999. Comparative imaging of total ion-species distribution in urediospore germlings of *Uromyces* using ion microscopy. **Fungal Genetics and Biology** 27: 77-87.
- Shaw, B. D. and H. C. Hoch. 1999. The pycnidiospore of *Phyllosticta ampellicida*: surface properties involved in substratum attachment and germination. . **Mycological Research** 103: 915-924.
- Barja , B., A. Corrêa Jr., R. C. Staples, and H. C. Hoch. 1998. Microinjected antisense INF24 oligonucleotides inhibit appressorium development in *Uromyces*. **Mycological Research** 102: 1513-1518.
- Kovacs, E., J. Van Buren, L. Pitifer, H. C. Hoch, and B. T. Terhune. 1998. Influence of irradiation in cell wall structure of stored apples. **Scanning**. 20: 264-270.91.
- Shaw, B. D., K. -C. Kuo, and H. C. Hoch. 1998. Germination and appressorium development of *Phyllosticta ampellicida* pycnidiospores. **Mycologia** 90:258-268.

- Corrêa Jr., A., R. C. Staples, and H. C. Hoch. 1996. Inhibition of thigmostimulated cell differentiation with RGD-peptides in *Uromyces* germlings. **Protoplasma** 194: 91-102.
- Kuo, K.-C. and H. C. Hoch. 1996. Germination of *Phyllosticta ampellicida* pycnidiospores: prerequisite of adhesion to the substratum and the relationship of substratum wettability. **Fungal Genetics and Biology** 20: 18-29.
- Kuo, K.-C. and H. C. Hoch. 1996. The parasitic relationship between *Phyllosticta ampellicida* and *Vitis vinifera*. **Mycologia** 88: 629-634.
- Kuo, K.-C. and H. C. Hoch. 1995. Visualization of the extracellular matrix surrounding pycnidiospores, germlings, and appressoria of *Phyllosticta ampellicida*. **Mycologia** 87: 759-771.
- J. S. Lamboy, R. C. Staples, and H. C. Hoch. 1995. Superoxide dismutase: a differentiation protein expressed in *Uromyces* germlings during early appressorium development. **Exp. Mycol.** 19: 284-296.
- Corrêa Jr., A., and H. C. Hoch. 1995. Identification of thigmoresponsive loci for cell differentiation in *Uromyces* germlings. **Protoplasma** 186: 34-40.
- Moloshok, T. D., B. T. Terhune, J. S. Lamboy, and H. C. Hoch. 1994. Fractionation of extracellular matrix components from urediospore germlings of *Uromyces*. **Mycologia** 86: 787-794.
- Terhune, B. T., and H. C. Hoch. 1993. Substrate Hydrophobicity and Adhesion of *Uromyces* Urediospores and Germlings. **Exp. Mycol.** 17: 253-273.
- Corrêa Jr., A., and H. C. Hoch. 1993. Microinjection of urediospore germlings of *Uromyces appendiculatus*. **Exp. Mycol.** 17: 241-252.
- Moloshok, T. M., G. M. E. Leinhos, R. C. Staples, and H. C. Hoch. 1993. The autogenic extracellular environment of *Uromyces appendiculatus* urediospore germlings. **Mycologia** 85:392-400.
- Terhune, B. T., R. J. Bojko, and H. C. Hoch. 1993. Deformation of stomatal guard cell lips and microfabricated artificial topographies during appressorium formation by *Uromyces*. **Exp. Mycol.** 17: 70-78.
- Hoch, H. C., C. Kung, X.-L. Zhou, and M. A. Stumpf. 1992. Measuring mechanosensitive channels in *Uromyces*: Response. *Technical comment.* **Science** 256: 1335-1336.
- Stumpf, M. A., G. M. E. Leinhos, R. C. Staples, and H. C. Hoch. 1991. The effect of pH and K<sup>+</sup> on appressorium formation by *Uromyces appendiculatus* urediospore germlings. **Exper. Mycol.** 15: 356-360.
- Zhou, X-L., M. A. Stumpf, H. C. Hoch, and C. Kung. 1991. A mechano-sensitive cation channel in the plasma membrane of the topography sensing fungus, *Uromyces*. **Science** 253: 1415-1417.
- Kwon, Y. H., H. C. Hoch, and J. R. Aist. 1991. Initiation of appressorium formation in *Uromyces appendiculatus*: Organization of the apex, and the responses involving microtubules and apical vesicles. **Can. J. Botany** 69: 2560-2573.
- Kwon, Y. H., H. C. Hoch, and R. C. Staples. 1991. Cytoskeletal organization in *Uromyces* urediospore germling apices during appressorium formation. **Protoplasma** 165: 37-50.
- Allen, E. A., B. E. Hazen, H. C. Hoch, Y. Kwon, G. M. E. Leinhos, R. C. Staples, M. A. Stumpf, and B. T. Terhune. 1991. Appressorium formation in response to topographical signals by 27 rust species. **Phytopathology** 81: 323-331.
- Allen, E. A., H. C. Hoch, J. R. Stavely, and J. R. Steadman. 1991. Uniformity among races of *Uromyces appendiculatus* in response to topographic signaling for appressorium formation. **Phytopathology** 81: 883-887.
- Terhune, B., Allen, E., Hoch, H. C., Wergin, W., and E. Erbe. 1991 Morphology and ontogeny of stomata in *Phaseolus vulgaris*. **Can. J. Bot.** 69:477-484.
- Kwon, Y and Hoch, H. C. 1991. Temporal and spatial dynamics of appressorium development in *Uromyces appendiculatus*. **Exper. Mycol.** 15:116-131.
- Tiburzy, R., Hoch, H. C., and Staples, R. C. 1990. Isolation and purification of actin from the phytopathogenic filamentous fungus, *Uromyces appendiculatus*. **Europ. J. Cell Biol.** 53:364-372.
- Newhouse, J. R., Hoch, H. C., and MacDonald, W. L. 1990. Virus-like particles in hyphae and conidia of European hypovirulent (ds-RNA-containing) strains of *Endothia (Cryphonectria) parasitica*: **Can. J. Bot.** 68:90-101.

Staples, R. C., Hoch, H. C., Freve, P., and Bourett, T. M. 1989. Heat shock-induced development

- of infection structures by bean rust uredospore germlings. **Experimental Mycology** 13:149-157.
- Epstein, L., Staples, R. C., and Hoch, H. C. 1989. Cyclic AMP, cyclic GMP and bean rust uredospore germlings. **Experiment. Mycol.** 13:100-104.
- Dahmen, H., Hoch, H. C., and Staub, T. 1988. Differential effects of sterol inhibitors on growth, cell membrane permeability and ultrastructure in two target fungi. **Phytopathology** 78:1033-1042.
- Hrazdina, G., Zobel, A. M., and Hoch, H. C. 1987. Biochemical, immunological and immunocytochemical evidence for the association of chalcone synthase with the endoplasmic reticulum membranes. **Proc. Natl. Acad. Sci.** 84:8966-8970.
- Hoch, H. C., Tucker, B. E., and Staples, R. C. 1987. An intact microtubule cytoskeleton is necessary for mediation of the signal for cell differentiation in *Uromyces*. **Europ. J. Cell Biology** 45:209-218.
- Laccetti, L., Staples, R. C., and Hoch, H. C. 1987. Purification of calmodulin from bean rust uredospores. **Exp. Mycol.** 11:231-235.
- Hoch, H. C., Staples, R. C., and Bourett, T. M. 1987. Chemically induced appressoria in *Uromyces appendiculatus* are formed aerielly, apart from the substrate. **Mycologia** 79:418-424.
- Hoch, H. C., Staples, R. C., Whitehead, B., Comeau, J., and Wolf, E. D. 1987. Signaling for growth orientation and cell differentiation by surface topography in *Uromyces*. **Science** 235:1659-1662.
- Epstein, L., Laccetti, L. B., Staples, R. C., and Hoch, H. C. 1987. Cell-substratum adhesive protein involved in surface contact responses of the bean rust fungus. **Physiol. Mol. Plant. Path.** 30:373-388.
- Caesar-Ton That, T., Van, K. H., Turian, G., and Hoch, H. C. 1987. Isolation and characterization of coated vesicles from filamentous fungi. **Europ. J. Cell Biol.** 43:189-194.
- Bourett, T. M., Hoch, H. C., and Staples, R. C. 1987. Association of the microtubule cytoskeleton with the thigmotropic signal for appressorium formation in *Uromyces*. **Mycologia** 79:540-545.
- Tucker, B. E., Hoch, H. C., and Staples, R. C. 1986. The involvement of F-actin in *Uromyces* cell differentiation: The effects of cytochalasin E and Phalloidin. **Protoplasma** 135:88-101.
- Martin, S. B., Abawi, G. S., and Hoch, H. C. 1986. The relation of population densities of the antagonist, *Laetisaria arvalis*, to seedling diseases of table beet incited by *Pythium ultimum*. **Can J. Microbiol.** 32:156-159.
- Gonsalves, D., Trujillo, E., and Hoch, H. C. 1986. Purification and some properties of a virus associated with cardamom mosaic, a new member of the potyvirus group. **Plant Dis.** 70:65-69.
- Bowers, W. S., Hoch, H. C., Evans, P. H., and Katayama, M. 1986. Thallophtic Allelopathy: Isolation and identification of laetisarinic acid. **Science** 232:105-106.
- Hoch, H. C., Bourett, T., and Staples, R. C. 1986. Inhibition of cell differentiation in *Uromyces* with D2O and taxol. **Europ. J. Cell Biol.** 41:290-297.
- Staples, R. C., Hoch, H. C., and Epstein, L. 1985. The development of infection structures by the rust and other fungi. **Microbiol. Sci.** 2:193-198.
- Staples, R. C., Hassouna, S., and Hoch, H. C. 1985. Effect of potassium on sugar uptake and assimilation by bean rust germlings. **Mycologia** 77:248-452.
- Hoch, H. C., and Staples, R. C. 1985. The microtubule cytoskeleton in hyphae of *Uromyces phaseoli* germlings: Its relationship to the region of nucleation and to the F-actin cytoskeleton. **Protoplasma** 124:112-122.
- Epstein, L., Laccetti, L., Staples, R. C., Hoch, H. C., and Hoose, W. A. 1985. Extracellular proteins associated with induction of differentiation in bean rust uredospore germlings. **Phytopathology** 75:1073-1076.
- Chao, W. L., Nelson, E. B., Harman, G. E., and Hoch, H. C. 1985. Downward movement of biological control agents in the rhizosphere. **Phytopathology** 76:60-65.
- Staples, R. C., Hoch, H. C., Epstein, L., Laccetti, L., and Hassouna, S. 1985. Recognition of host morphology by rust fungi; responses and mechanisms. **Can. J. Plant Pathol.** 7:314-322.
- Provvidenti, R., and Hoch, H. C. 1985. A foliar ringspot of *Thunbergia alata* caused by broad bean wilt virus. **Plant Dis.** 69:726.
- Martin, S. B., Abawi, G. S., and Hoch, H. C. 1984. Influence of the antagonist *Laetisaria arvalis* on infection of table beets by *Phoma betae*. **Phytopathology** 74:1094-1096.

- Staples, R. C., Hassouna, S., Laccetti, L., and Hoch, H. C. 1984. Metabolic alterations in bean rust germlings during differentiation induced by potassium ion. **Exptl. Mycol.** 8:183-192.
- Staples, R. C., Gross, D., Tiburzy, R., Hoch, H. C., Hassouna, S., and Webb, W. W. 1984. Changes in DNA content of nuclei in rust uredospore germlings during the start of differentiation. **Exptl. Mycol.** 8:245-255.
- Martin, S. B., Abawi, G. S., and Hoch, H. C. 1984. Biological control of Phoma root rot of table beet seedlings with *Laetisaria arvalis*. **Phytopathology** 74:1094-1096.
- Hoch, H. C., and Staples, R. C. 1984. Evidence that cyclic AMP initiates nuclear division and infection structure formation in the bean rust fungus, *Uromyces phaseoli*. **Exptl. Mycol.** 8:37-46.
- Staples, R. C., Macko, V., Wynn, W. K., and Hoch, H. C. 1983. Letter to the Editor: Terminology to describe the differentiation response by germling of fungal spores. **Phytopathology** 73:380.
- Staples, R. C., Grambow, H. J., Hoch, H. C., and Wynn, W. K. 1983. Contact with membrane grooves induces wheat stem rust uredospore germlings to differentiate appressoria but not vesicles. **Phytopathology** 73:1436-1439.
- Staples, R. C., Grambow, H. J., and Hoch, H. C. 1983. Potassium ions induce rust fungi to develop infection structures. **Exptl. Mycol.** 7:40-46.
- Newhouse, J. R., Hoch, H. C., and MacDonald, W. L. 1983. The ultrastructure of *Endothia parasitica*: Comparison of a virulent with a hypovirulent isolate. **Can. J. Bot.** 61:389-399.
- Martin, S. B., Hoch, H. C., and Abawi, G. S. 1983. Population dynamics of *Laetisaria arvalis* and low-temperature *Pythium* spp. in untreated and pasteurized beet field soils. **Phytopathology** 73:1445-1449.
- Hoch, H. C., and Staples, R. C. 1983. Visualization of actin in situ by rhodamine-conjugated phalloin in the fungus *Uromyces phaseoli*. **Europ. J. Cell Biol.** 32:52-58.
- Hoch, H. C., and Staples, R. C. 1983. Ultrastructural organization of the non-differentiated uredospore germling of *Uromyces phaseoli*. **Mycologia** 75:795-824.
- Hrazdina, G., Marx, G. A., and Hoch, H. C. 1982. Distribution of secondary metabolites and their biosynthetic enzymes in pea (*Pisum sativum* L.) leaves. **Plant Physiol.** 70:745-748.
- Staples, R. C., and Hoch, H. C. 1982. A possible role for microtubules in the induction of nuclear division in bean rust uredospore germlings. **Exptl. Mycol.** 6:293-302.
- Hoch, H. C., and Howard, R. J. 1981. Conventional chemical fixations induce artifactual swelling of dolipore septa. **Exptl. Mycol.** 5:167-172.
- Hoch, H. C., Pratt, C., and Marx, G. A. 1980. Subepidermal air-spaces: Basis for the phenotypic expression of the Argenteum mutant of *Pisum*. **Am. J. Bot.** 67:905-911.
- Hoch, H. C., and Howard, R. J. 1980. Ultrastructure of freeze-substituted hyphae of the Basidiomycete, *Laetisaria arvalis*. **Protoplasma** 103:281-297.
- Burdsall, H. H., Jr., Hoch, H. C., Boosalis, M. G., and Setliff, E. C. 1980. *Laetisaria arvalis* sp. nov. (Aphylllophorales, Corticiaceae), a possible biological control agent for *Rhizoctonia solani* and *Pythium* species. **Mycologia** 72:728-736.
- Hoch, H. C., and Szkolnik, M. 1979. Fungicidal control of *Venturia inaequalis*: An analysis of the chlorotic flecks resulting from fungicide application to infected *Malus* leaves. **Phytopathology** 69:456-462.
- Hoch, H. C., and Provvidenti, R. 1979. Mycoparasitic relationships. V. Cytology of the *Sphaerotheca fuliginea-Tilletiopsis* sp. interaction. **Phytopathology** 69:359-362.
- Hoch, H. C., Hanssler, G., and Reisener, H. J. 1979. Cytochemical localization of N-acetyl-b-D-glucosaminidase in hyphae of *Mucor racemosus*. **Exptl. Mycol.** 3:164-173.
- Hoch, H. C., and Abawi, G. S. 1979. Biological control of *Pythium* root rot of table beet with *Corticium* sp. **Phytopathology** 69:417-419.
- Hoch, H. C., and Abawi, G. S. 1979. Mycoparasitism of *Pythium ultimum* oospores by *Fusarium merismoides*. **Mycologia** 71:621-625.
- Hoch, H. C. 1979. Penetration of chemicals into the *Malus* leaf cuticle: An ultrastructural analysis. **Planta** 147:186-195.
- Hoch, H. C. 1978. Mycoparasitic relationships. IV. *Stephanoma phaeospora* parasitic on a species of *Fusarium*. **Mycologia** 70:370-379.

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- Provvidenti, R., and Hoch, H. C. 1977. Tomato leaf roll caused by the interaction of the wilt gene and tobacco mosaic virus infection. **Plant Dis. Reprtr.** 61:500-502.
- Hoch, H. C. 1977. Use of permanganate of increase the electron opacity of fungal walls. **Mycologia** 69:1209-2113.
- Hoch, H. C. 1977. Mycoparasitic relationships: *Gonatobotrys simplex* parasitic on *Alternaria tenuis*. **Phytopathology** 67:309-314.
- Hoch, H. C. 1977. Mycoparasitic relationships. III. Parasitism of *Physoleptera obtusa* by *Calcarisporium parasiticum*. **Can. J. Bot.** 55:198-207.
- Hoch, H. C., and Fuller, M. S. 1977. Mycoparasitic relationships. I. Morphological features of interactions between *Pythium acanthicum* an several fungal hosts. **Arch. Microbiol.** 111:207-224.
- Hoch, H. C., and Setliff, E. C. 1976. Sterigmata and basidiospore development in *Poria latemarginata*. **Mem. N.Y. Bot. Gardens** 28:98-104.
- Maxwell, D. P., Maxwell, M. D., Hanssler, G., Armentrout, V. N., Murry, G. M. and Hoch, H. C. 1975. Microbodies and glyoxylate-cycle enzyme activities in filamentous fungi. **Planta** 124:109-123.
- Hoch, H. C. 1975. Ultrastructural alterations observed in isolated apple leaf cuticles. **Can. J. Bot.** 53:2006-2013.
- Hoch, H. C., Hagedorn, D. J., Pinnow, D. L., and Mitchell, J. E. 1975. Role of *Pythium* spp. as incitants of bean root and hypocotyl rot in Wisconsin. **Plant Dis. Reprtr.** 58:443-447.
- Hoch, H. C., and Mitchell, J. E. 1975. Further observations on the mechanisms involved in primary asexual spore cleavage in *Aphanomyces euteiches*. **Can. J. Bot.** 53:1085-1091.
- Hoch, H. C. 1974. Preparation of fungal hyphae grown on agar-coated microscope slides for electron microscopy. **Stain Technol.** 49:318-320.
- Hoch, H. C., and Hagedorn, D. J. 1974. Studies on chemical control of bean root and hypocotyl rot in Wisconsin. **Plant Dis. Reprtr.** 58:941-944.
- Setliff, E. C., Hoch, H. C., and Patton, R. 1974. Studies on nuclear division in basidia of *Poria latemarginata*. **Can. J. Bot.** 52:2323-2333.
- Hoch, H. C., and Maxwell, D. P. 1974. Proteinaceous hexagonal inclusions in hyphae of *Whetzelinia sclerotiorum* and *Neurospora crassa*. **Can. J. Microbiol.** 20:1029-1035.
- Hoch, H. C., and Mitchell, J. E. 1973. The effects of osmotic water potentials on *Aphanomyces euteiches* during zoosporogenesis. **Can. J. Bot.** 51:413-420.
- Hoch, H. C., and Mitchell, J. E. 1972. A continuous flow system for inducing and observing asexual spore formation in *Aphanomyces euteiches*. **Can. J. Bot.** 50:681-682.
- Hoch, H. C., and Mitchell, J. E. 1972. The ultrastructure of zoospores of *Aphanomyces euteiches* and of their encystment and subsequent germination. **Protoplasma** 75:113-138.
- Hoch, H. C., and Mitchell, J. E. 1972. The ultrastructure of *Aphanomyces euteiches* during asexual spore formation. **Phytopathology** 62:149-160.

**Technical articles, review articles, book chapters:**

- Shaw, B. D., and H. C. Hoch. 2007. Ions as Regulators of Growth and Development. In: The Mycota, Biology of the Fungal Cell, Second Edition. RJ Howard and NAR Gow (eds), Springer-Verlag, Berlin. pp. xx-xx. (in press)
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