

Peter M. Hirst

Contact

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Academic

PhD The Ohio State University, USA, 1994
B.Hort.Sci. Massey University, New Zealand, 1984

Employment

2013-present	Professor	Department of Horticulture and Landscape Architecture Purdue University West Lafayette, Indiana USA
2002-2013	Associate Professor	
1997-2002	Assistant Professor	
1994 - 1996	Scientist	The Horticulture and Food Research Institute of New Zealand New Zealand
1990 - 1994	Graduate Research Associate	The Ohio State University
1984 - 1990	Technical Officer	Department of Scientific and Industrial Research (DSIR) New Zealand

Honors and Awards

- Jefferson Science Fellow – 1 year appointment at USAID. One of 5 people selected nationally across all areas of science, engineering and medicine. National Academies of Science, Engineering and Medicine. 2018-2019.
- Fellow, American Society for Horticultural Science, 2017

- PUCESA Mid Career Extension Award (for outstanding extension specialist with less than 20 years service). Purdue University Cooperative Extension Specialists' Association. 2016
- Experiment Station Excellence in Multistate Research Award from the Experiment Station Committee on Organization and Policy. 2015
- PUCESA Team Award for Indiana Horticultural Congress (Hirst as chair). Purdue University Cooperative Extension Specialists Association. 2015
- Millionaires Club Award, College of Agriculture, Purdue University. 2013
- Golden Apple Distinguished Service Award, Indiana Horticultural Society. 2010
- Guest professor, Northwest Agriculture and Forestry University, Yangling, China (2012 - present)
- NELD (National Extension Leadership Development) program (Colorado, Virginia, Missouri and Maine). 2007
- PUCESA Early Career Extension Award (for outstanding extension specialist with less than 10 years service). Purdue University Cooperative Extension Specialists Association. 2006
- Shepard Award (for best paper published in the Journal of APS), American Pomological Society. 2005
- USDA Award for Superior Service (USDA's most prestigious award presented in recognition to those who have made outstanding contributions supporting USDA's mission). Accepted as chair of NE-183 project. US Secretary of Agriculture, Washington DC. 2001
- CSREES Certificate of Appreciation ("for providing information to apple growers nationally about the likely success of establishing new apple cultivars in different regions") Cooperative State Research, Education, and Extension Service (CSREES). 2001
- Award for Excellence (in recognition of outstanding contributions to the Northeastern regional research) Northeastern Regional Association of State Agricultural Experiment Station Directors. 2000
- U.P. Hedrick Award (for best published paper by a student). American Pomological Society. 1994

University Service (past 5 years)

Department of Horticulture and Landscape Architecture

- Search committee for vegetable specialist faculty position (2013), department head (2013), plant stress faculty position (2014)
- Committee service – space committee, external messaging, mentoring committee for junior faculty (chair), extension committee, teaching committee, social committee

College of Agriculture

- Agenda and policy committee (2013)
- Search committee for Agriculture and Natural Resources program leader (2013-2014), Director of International Programs in Agriculture position (2015-16)

University

- University senate 2010-2015. Elected as departmental representative (2010-2012) and college representative (2013-2015). Committees: advisory, athletic affairs (chair), faculty affairs, grade appeals (chair), nominating
- University faculty mediator (to assist in resolving faculty grievances), 2015-2018

Professional Society Service

- National Coalition for Food and Agricultural Research (NCFAR), board member (ASHS representative), 2017-2021
- American Society for Horticultural Science (ASHS), Consulting editor Hort Technology (2002-present), editorial board for HortTechnology (2016-2018), finance committee (2014-2020), pomology working group (chair 2000), fruit publication award committee 2003-09 (chair 2005-06), membership representative (2015-present), nominations and elections committee (2015-2017), William A. (Tex) Frazier Lecture Series Selection Committee (2016-2020)
- American Pomological Society (APS) – President 2015-2016, executive board (1999-2002), advisory committee (2000-2005), Wilder medal committee, Hedrick award committee, 2nd VP (2011-2012), 1st VP (2013-2014)
- International Society for Horticultural Science, Vice-chair of environmental physiology working group (2016-2020), scientific committee for Symposium on Evaluation of Cultivars, Rootstocks and Management Systems for Sustainable Production of Deciduous Fruit Crops, Istanbul 2018
- NC-140 regional research committee – “Rootstock and interstem effects on pome and stone fruit trees”, chair 2005
- NE-183 regional research committee – “Multi-disciplinary evaluation of new apple cultivars”, chair 2001
- USDA Malus crop germplasm committee (2002 – present)
- US Apple Association – science advisory subcommittee (1998 – present)

National and international professional experience

- State extension specialist (tree fruits) – impact on Indiana apple industry over \$9 m annually
- Conducted international workshops or presentations in Armenia, Australia, Canada, China, Egypt, Kyrgyzstan, Mexico, New Zealand, Tajikistan, and Zambia.
- Invited speaker at state farmer outreach meetings in Idaho, Illinois, Kentucky, Michigan, Missouri, Minnesota, Ohio, Pennsylvania, Washington, Wisconsin.
- Project director ‘Autonomous pruning of specialty crops’, \$6.0 m USDA-SCRI multi-disciplinary and multi-state project (2012–2016)
- Project director ‘Appropriate postharvest handling, processing, and marketing of dried apricots in Tajikistan’. \$300,000. Hort Innovation Lab, USAID
- Chair, Indiana Horticultural Congress (2003 – present)

International

Dr. Hirst is very involved in international development work and has worked in this capacity in Afghanistan, Armenia, China, Egypt, Kyrgyzstan, Mexico, Tajikistan and Zambia. In 2012 he was appointed as a guest professor, North West Agriculture and Forestry University (NWAUFU), China. Hirst's international work has been sponsored by a number of programs ranging from a State Department project to support Afghanistan agriculture (capacity building), farmer-to-farmer (USAID), and some industry or privately funded. Currently, members of Hirst's lab are from Afghanistan, China, Egypt, Iran and Turkey. Hirst is project director of a recently funded Horticulture Innovation lab (USAID) project (\$300,000) to develop technologies for drying apricots in Tajikistan (2017-2018).

Extension

Dr. Hirst works with the tree fruit industry to help them adapt to changing times. This includes new varieties and rootstocks, growing systems, marketing systems, legislative changes and decreasing labor availability. He achieves his extension goals by organizing and resourcing extension programs, the Facts for Fancy Fruit newsletter, one-to-one communication with growers and is Chair of the Indiana Horticultural Congress. Changes made in the industry as a result of Hirst's extension program benefit the Indiana apple industry by over \$9 m annually. Highlights include:

- Editor of Facts for Fancy Fruit newsletter (www.hort.purdue.edu/fff)
- Chair, Indiana Horticultural Congress (www.inhortcongress.org)
- Invited speaker at state meetings in Idaho, Illinois, Kentucky, Michigan, Missouri, Ohio, Pennsylvania, Washington, Wisconsin.
- Conducted international workshops or presentations in Canada, China, Egypt, New Zealand, Australia, Mexico, and Zambia.

Research

Dr. Hirst's research program addresses the needs of growers by focusing on finding solutions to immediate problems while also conducting longer term mechanistic studies that aim to further our knowledge of basic processes. His three areas of focus are apple flower formation, fruit development and tree architecture and automation. To conduct this research he collaborates with molecular biologists, bioinformaticians, engineers, industrial developers, computer graphic modelers, economists and sociologists. Hirst has been invited to present his research to many national and international audiences. His research has been funded through competitive federal, state and industry grants (total approx. \$7.0 m). He currently supervises 5 researchers including graduate students and an undergraduate student.

Teaching

Dr. Hirst co-teaches HORT 30100 (Plant Physiology) with Dr. Y. Li. He previously taught HORT 42100 (Fruit Production) with Dr. B. Bordelon (2008-present). Dr. Hirst has received outstanding teaching evaluations from the students in this class and is an active guest lecturer, having given over 35 guest lectures.

Peer-reviewed publications

1. Jahed, K. and P.M. Hirst. 2018. Pollen source effects on seed number, fruit quality and return bloom of apple. *J. Amer. Pomol. Soc.* (accepted).
2. Elsysy, M.A. and P.M. Hirst. 2017. The role of spur leaves, bourse leaves, and fruit on local flower formation in apple: an approach to understanding biennial bearing. *HortScience* 52(9):1229-1232.
3. Jahed, K. and P.M. Hirst. 2017. Pollen tube growth and fruit set in apple. *HortScience* 52(8):1054-1059.
4. Marshall-Colon, A., S.P. Long, D.K. Allen, G. Allen, D.A. Beard, B. Benes, A.J. Christensen, D.J. Cox, J.C. Hart, P.M. Hirst, K. Kannan, D.S. Katz, J.P. Lynch, A.J. Millar, B. Panneerselvam, N.D. Price, D. Ralla, R.G. Shekar, S. Shrivastava, D. Shukla, V. Srinivasan, M. Stitt, E.O. Volt, Y. Wang, X. Yin and X.G. Zhu. 2017. Crops *in silico*: Generating virtual crops using an integrative and multi-scale modeling platform. *Frontiers in Plant Science* Vol. 8. doi: 10.3389/fpls.2017.00786
5. Fiser, M., J. Ravi, B. Benes, B. Shi and P. Hirst. 2017. IMaple: a source-sink developmental model for ‘Golden Delicious’ apple trees. *Acta Hort* 1160:51-59.
6. Ravi, J., S.A. Akbar, N. Elfiky, A. Kak, P. Hirst and B. Benes. 2016. Apple tree scanning and reconstruction using Kinect. *Acta Hort* (in press).
7. Kang, H., M. Fiser, B. Shi, F. Sheibani, P. Hirst and B. Benes. 2016. IMaple – Functional structural model of apple trees. *IEEE International Conference on Functional-Structural Plant Growth Modeling Simulation, Visualization and Applications (FSPMA 2016)*. P 90-97.
8. Franzen, J.B. and P.M. Hirst 2016. Optimal pruning of apple and effects on tree architecture, productivity and fruit quality. *Acta Hort* 1130: 307-310.
9. Chandrasekar, V., M.F. San Martin-Gonzalez, P. Hirst and T.S. Ballard. 2015. Optimizing microwave-assisted extraction of phenolic antioxidants from Red Delicious and Jonathan apple. *J. Food Process Eng.* 38(6): 571-582.
10. Zhang, Q., M. Han, C. Song, X. Song, C. Zhao, H. Liu, P.M. Hirst and D. Zhang. 2014. Optimizing planting density for production of high-quality apple nursery stock in China. *N.Z. J. Crop and Hort. Sci.* 43:1-11.

11. Chun, I.J., W.W. Zheng, C. Choi, Y.Y. Song, I.K. Kwang and P. Hirst. 2012. Multiple applications of lime sulfur for fruit thinning of 'Fuji' and 'Hongro' apple trees. *J. Bio-Environ. Control* 21(4): 445-451.
12. Zheng, W.W., M.Y. Park, P. Hirst, T.M. Yoon and I.J. Chun. 2012. The accumulation of rare earth elements fertilizer and its subsequent effects on apple fruit quality at harvest and during storage. *J. Bio-Environ. Control* 21(4): 452-458.
13. Li, Y. P.M. Hirst, Y. Wan, Y. Liu, Q. Zhou, H. Gao, Y. Guo, Z. Zhao, L. Wang and M. Han. 2012. Resistance to *Marssonina coronaria* and *Alternaria alternata* apple pathotype in the major apple cultivars and rootstocks used in China. *Hort Science* 47:1-4.
14. Hoover, E, R. Marini, E. Tepe, W. Autio, A. R. Biggs, J. M. Clements, R. Crassweller, D. Foster, M. Foster, P. Hirst, D. Miller, M. Parker, G. Peck, J. Racsko, T. Robinson, and M. Warmund. 2012. eApples: A Case Study in Using eXtension.org to Increase Access to Research-Based Information. *Hort Technology* 22: 576-579.
15. Wan, Y., H. Gao, Z. Zhao, Y. Lu, L. Wang, J. Yuan, and P. Hirst. 2011. An Early Ripening Apple Cultivar 'Qinyang'. *HortScience* 46:660-661.
16. Robinson, T., D. Wolfe, J. Masabni, R. Andersen, A. Azarenko, J. Freer, G. Reighard. P. Hirst, R. Hayden and B. McCluskey. 2010. Performance of plum rootstocks with 'Stanley', 'Valor', 'Veeblue' and 'Santa Rosa' as the scions in the 1991 NC-140 multi-state plum trial. *J. Amer. Pom. Soc.* 64:173-182.
17. Malladi, A. and P.M. Hirst. 2010. Increase in fruit size of a spontaneous mutant of 'Gala' apple (*Malus x domestica* Borkh) is facilitated by altered cell production and enhanced cell size. *J. Exp. Bot.* 61: 3003-3013.
18. Masabni, J., R. Andersen, A. Azarenko, G. Brown, J. Freer, R. Hayden, P. Hirst, B. McCluskey, R. Perry, T. Robinson and D. Wolfe. 2007. Performance of plum rootstocks with 'Stanley', 'Valor', and 'Veeblue' as the scion in the 1990 NC-140 multi-state plum trial. *J. Amer. Pom. Soc.* 61: 196-207.
19. Reighard, G., R. Andersen, J. Anderson, W. Autio, T. Beckman, T. Baker, R. Belding, G. Brown, P. Byers, W. Cowgill, D. Deyton, E. Durner, A. Erb, D. Ferree, A Gaus, R. Godin, R. Hayden, P. Hirst, S. Kadir, M. Kaps, H. Larsen, T. Lindstrom, N. Miles, F. Morrison, S. Myers, D. Ouelette, C. Rom, W. Shane, B. Taylor, K. Taylor, C. Walsh, and M. Warmund. 2007. Growth and yield of 'Redhaven' peach on nineteen rootstocks at twenty North American locations. *Acta Hort.* 732:271-278.
20. Marini, R.P., J.L. Andersen, W.R. Autio, B.H. Barritt, J.A. Cline, W.P. Cowgill, R.M. Crassweller, J.M. Garner, A. Gaus, R. Godin, G.M. Greene, C.R. Hampson, P.M. Hirst, M.M. Kushad, J. Masabni, E. Meilke, R. Moran, C.A. Mullins, M.L.

- Parker, R.L. Perry, J.P. Privé, G.L. Reighard, T.L. Robinson, C.R. Rom, T. Roper, J.R. Schupp, E. Stover. 2006. Performance of ‘Gala’ trees on 18 dwarfing rootstocks: ten-year summary of the 1994 NC-140 rootstock trial. *J. Amer. Pom. Soc.* 60(2): 69-83.
21. Marini, R.P., B.H. Barritt, G.R. Brown, J.A. Cline, W.P. Cowgill, R.M. Crassweller, P.A. Domoto, D.C. Ferree, J.M. Garner, G.M. Greene, C.R. Hampson, P.M. Hirst, M.M. Kushad, J. Masabni, E. Meilke, R. Moran, C.A. Mullins, M.L. Parker, R.L. Perry, J.P. Privé, G.L. Reighard, T.L. Robinson, C.R. Rom, T. Roper, J.R. Schupp, E. Stover. 2006. Performance of ‘Gala’ apple on four semi-dwarf rootstocks: a ten-year summary of the 1994 NC-140 rootstock trial. *J. Amer. Pom. Soc.* 60(2): 58-68.
 22. Reighard, G.L., R. Andersen, J. Anderson, W. Autio, T. Beckman, T. Baker, R. Belding, G. Brown, P. Byers, W. Cowgill, D. Deyton, E. Durner, A. Erb, D. Ferree, A. Gaus, R. Godin, R. Hayden, P. Hirst, S. Kadir, M. Kaps, H. Larsen, T. Lindstrom, N. Miles, F. Morrison, S. Myers, D. Ouellette, C. Rom, W. Shane, B. Taylor, K. Taylor, C. Walsh, and M. Warmund. 2004. Eight-year performance of 19 peach rootstocks at 20 locations in North America. *J. Amer. Pom. Soc.* 58(4):174-202.
 23. Robinson, T.L., L. Andersen, A. Azarenko, B.H. Barritt, G.R. Brown, J.A. Cline, R.M. Crassweller, P.A. Domoto, C. Embree, A. Fennell, D.C. Ferree, E. Garcia, A. Gaus, G.M. Greene, C.R. Hampson, P.M. Hirst, E. Hoover, S. Johnson, M.M. Kushad, R. Marini, R. Moran, C.A. Mullins, M.L. Parker, R.L. Perry, J.P. Privé, G.L. Reighard, C.R. Rom, T. Roper, J.R. Schupp, E. Stover. 2004. Performance of Cornell-Geneva rootstocks across North America in multi-location NC-140 rootstock trials. *Acta Hort.* 658(1): 241-245.
 24. Shupert, D., A.P. Smith, J. Janick, P.B. Goldsbrough and P.M. Hirst.* 2004. Segregation of scab resistance in three apple populations: molecular marker and phenotypic analysis. *HortScience* 39(6): 1183-1184.
 25. Hoover, E., N. De Silva, S. McArtney and P. Hirst. 2004. Bud development and floral morphogenesis in four apple cultivars. *J. Hortic. Sci and Biotech.* 79: 981-984.
 26. Robinson, T., L. Anderson, A. Azarenko, B. Barritt, T. Baugher, G. Brown, G. Couvillon, W. Cowgill, Jr., R. Crassweller, P. Domoto, C. Embree, A. Fennell, E. Garcia, A. Gaus, R. Granger, G. Greene, P. Hirst, E. Hoover, S. Johnson, M. Kushad, R. Moran, C. Mullins, S. Myers, R. Perry, C. Rom, J. Schupp, K. Taylor, M. Warmund, J. Warner, and D. Wolfe. 2003. Performance of Cornell-Geneva apple rootstocks with ‘Liberty’ as the scion in NC-140 trials across North America. *Acta Hort.* 662:521-530.
 27. Hirst, Peter M.* 2002. The apple fruitlet thinning response to carbaryl is unaffected by russet. *Hort Technology* 12(1): 75-77.

28. Autio, W.R., J.L. Anderson, J.A. Barden, G.R. Brown, R.M. Crassweller, P.A. Domoto, W.A. Erb, D.C. Ferree, A. Gaus, P.M. Hirst, C.A. Mullins, and J.R. Schupp. 2001. Performance of 'Golden Delicious', 'Jonagold', 'Empire', and 'Rome Beauty' apple trees on five rootstocks over ten years in the 1990 NC-140 apple cultivar/rootstock trial. *J. Amer. Pom. Soc.* 55(3):131-137.
29. Autio, W. R., J. L. Anderson, J. A. Barden, G. R. Brown, R. M. Crassweller, P. A. Domoto, A. Erb, D. C. Ferree, A. Gaus, P. M. Hirst, C. A. Mullins, and J. R. Schupp. 2001. Location affects performance of 'Golden Delicious', 'Jonagold', 'Empire', and 'Rome Beauty' apple trees on five rootstocks over ten years in the 1990 NC-140 cultivar/rootstock trial. *J. Amer. Pom. Soc.* 55(3):138-145.
30. Domoto, P.A., W.R. Autio, G.R. Brown, D.C. Ferree, P.M. Hirst, C.A. Mullins and J.R. Schupp. 2001. Blackheart injury in 'Golden Delicious', 'Jonagold', 'Empire', and 'Rome Beauty' apple trees on five rootstocks over ten years in the 1990 NC-140 cultivar/rootstock trial. *J. Amer. Pom. Soc.* 55(3):146-153.
31. Hirst, P.M., W.R. Autio, J.A. Barden, G.R. Brown, R.M. Crassweller, P.A. Domoto and J.R. Schupp. 2001. Performance of trees in the 1990 NC-140 cultivar/rootstock planting: additional cultivars and rootstocks. *J. Amer. Pom. Soc.* 55(3):178-184.
32. McCartney, S.J., E.M. Hoover, P.M. Hirst and I.R. Brooking. 2001. Seasonal variation in the onset and duration of flower development within apple buds cv. 'Royal Gala'. *J. Hort Sci and Biotech.* 76(4): 536-540.
33. Rieghard, G.L., J.L. Anderson, R. Anderson, W. Autio, T. Beckman, R. Belding, G. Brown, W. Cowgill, D. Deyton, E. Durner, A. Erb, A. Gaus, P. Hirst, M. Kaps, N. Miles, F. Morrison, S. Myers, R. Perry, C.R. Rom, W. Shane, B. Taylor, K. Taylor, C. Walsh, and M. Warmund. 2001. Five-year performance of 19 peach rootstocks at 20 sites in North America. *Acta Hort.* 557: 97-102.
34. Hirst, P.M. and NC-140 cooperators. 2001. Early performance of 'Gala' on 18 dwarf and 4 semi-dwarf rootstocks growing at 24 sites in North America. *Acta Hort.* 557: 199-205.
35. Autio, W.R., J.L. Anderson, J.A. Barden, G.R. Brown, R.M. Crassweller, L.D. Tukey, P.A. Domoto, W.A. Erb, F. Morrison, D.C. Ferree, A. Gaus, P.M. Hirst, R.A. Hayden, C.A. Mullins, J.R. Schupp. 2001. Rootstock and scion interact to affect apple tree performance: results from the 1990 NC-140 cultivar/rootstock trial. *Acta Hort.* 557: 41-46.
36. Marini, R.P., J.L. Anderson, B.H. Barritt, G.R. Brown, J.A. Cline, W.P. Cowgill, P.A. Domoto, D.C. Ferree, J.M. Garner, G.M. Greene, C.R. Hampson, P.M. Hirst, M.M. Kushad, E. Meilke, C.A. Mullins, M.L. Parker, R.L. Perry, J.P. Privé, G.L. Reighard, T.L. Robinson, C.R. Rom, T. Roper, J.R. Schupp, E. Stover, and C.R. Unrath. 2000. Performance of 'Gala' on four semi-dwarf rootstocks: Five-year

- summary of the 1994 NC-140 semi-dwarf rootstock trial. *J. Amer. Pom. Soc.* 54(2):84-91.
37. Marini, R.P., J.L. Anderson, B.H. W.R. Autio, Barritt, J.A. Cline, W.P. Cowgill, R.M. Crassweller, P.A. Domoto, D.C. Ferree, J.M. Garner, A. Gaus, G.M. Greene, C.R. Hampson, P.M. Hirst, M.M. Kushad, E. Meilke, C.A. Mullins, M.L. Parker, R.L. Perry, J.P. Privé, G.L. Reighard, T.L. Robinson, C.R. Rom, T. Roper, J.R. Schupp, E. Stover, C.R. Unrath. 2000. Performance of 'Gala' on 18 dwarf rootstocks: Five-year summary of the 1994 NC-140 semi-dwarf rootstock trial. 2000. *J. Amer. Pom. Soc.* 54(2):92-107.
 38. Hirst, P.M. and R.R. Flowers. 2000. Rootstock effects on growth and cell size of 'Gala' apple fruit. *Acta Hort.* 517:189-194.
 39. Jung, K.H., R. Stroshine, P. Cornillon and P.M. Hirst. 1998. Low field proton magnetic resonance sensing of water core and internal browning in whole apples. Paper 98-6020. ASAE, St. Joseph, MI.
 40. Hirst, P.M. and D.C. Ferree. 1996. Effects of rootstock on bud development and flower formation of 'Starkspur Supreme Delicious' apple. *Fruit Var. J.* 50(1):25-34.
 41. Warrington, I.J., C.J. Stanley, D.S. Tustin, P.M. Hirst and W.M. Cashmore. 1996. Light transmission, yield distribution, and fruit quality in six tree canopy forms of 'Granny Smith' apple. *J. Tree Fruit Prod.* 1 (1):27-54.
 42. Ferree, D.C., P.M. Hirst, J.C. Schmid, and P.E. Dotson. 1995. Performance of three apple cultivars with 22 dwarfing rootstocks during 8 seasons in Ohio. *Fruit. Var. J.* 49(3):171-178.
 43. Hirst, P.M. and D.C. Ferree. 1995. Effect of rootstock and cultivar on the growth and precocity of young apple trees. *Fruit Var. J.* 49(1):34-41.
 44. Hirst, P.M. and D.C. Ferree. 1995. Rootstock effects on shoot morphology and spur quality of 'Delicious' apple and relationships with precocity and productivity. *J. Amer. Soc. Hort. Sci.* 120(4):622-634.
 45. Hirst, P.M. and D.C. Ferree. 1995. Rootstock effects on the flowering of 'Delicious' apple. I. Bud development. *J. Amer. Soc. Hort. Sci.* 120(6):1010-1017.
 46. Hirst, P.M. and D.C. Ferree. 1995. Rootstock effects on the flowering of 'Delicious' apple. II. Nutritional effects with special reference to phosphorous. *J. Amer. Soc. Hort. Sci.* 120(6): 1018-1024.
 47. Warrington, I.J., C.J. Stanley, J.F. Julian, D.S. Tustin, P.M. Hirst and W.M. Cashmore. 1995. Pruning strategies for restructuring top-dominant central leader 'Granny Smith' apple trees. *N.Z J. Crop. Hort. Sci.* 23:315-322.

48. Tustin, D.S., P.M. Hirst, W.M. Cashmore, I.J. Warrington and C.J. Stanley. 1992. Spacing and rootstock studies with central leader apple canopies in a high vigour environment. *Acta Hort.* 349: 169-178.
49. Hirst, P.M., D.S. Tustin and I.J. Warrington. 1990. Fruit colour responses of 'Granny Smith' apple to variable light environments. *N.Z. J. Crop and Hort. Sci* 18:205-214.
50. Tustin, D.S., P.M. Hirst, I.J. Warrington and C.J. Stanley. 1989. Light distribution and fruit quality through multi-layered trellis apple canopies. *Acta Hort.* 243:209-212.
51. Tustin, D.S., P.M. Hirst, and I.J. Warrington. 1988. Influence of orientation and position of fruiting laterals on canopy light penetration, yield and fruit quality of 'Granny Smith' apple. *J. Amer. Soc. Hort. Sci.* 113(5):693-699.

Book Chapters published

Hirst, P.M. 2003. Flower bud formation, pollination and fruit set. *In: Concise Encyclopedia of Temperate Zone Tree Fruits*. Eds: T.A. Baugher and S. Singha. Hawthorn Press, New York.

Hirst, P.M. 2017. Advances in understanding flowering and pollination in apple trees. *In: Achieving sustainable cultivation of apples*. Ed: K. Evans. Burleigh Dodds Science Publishing, Cambridge, UK.

Invited presentations – extension (out-of-state)

1. Hirst, P.M. 2105. Apple flower development – busting the myths. Mid-Atlantic fruit and vegetable Convention, Hershey, PA.
2. Hirst, P.M. 2016. Automation and modeling research at Purdue University. China Agricultural University, Beijing, China.
3. Hirst, P.M. 2016. Advanced technologies in apple production in the USA. China Agricultural University, Beijing, China.
4. Hirst, P.M. 2016. IMapple – an interactive growth and fruiting model for apple. Northwest Agricultural and Forestry University, Yangling, China.
5. Hirst, P.M. 2016. Research within the Department of Horticulture and Landscape Architecture at Purdue University. Northwest Agricultural and Forestry University, Yangling, China.
6. Hirst, P.M., T. Baugher, N. Elfiky, L. Glenna, J. Harper, A. Kak, T. Koselka, A. Patel-Campillo, J. Schupp and B. Wallach. 2016. Can apple tree pruning be automated? 1st International Apple Symposium, Yangling, China.
7. Hirst, P. M. 2011. Bigger Gala, bigger profits. Invited presentation at Idaho State Horticultural Society Annual Convention, Nampa, ID.
8. Hirst, P. M. 2011. Flowering and biennial bearing. Invited presentation at Idaho State Horticultural Society Annual Convention, Nampa, ID.
9. Hirst, P.M. 2011. Super size apples. Invited presentation at BC Tree Fruit Horticultural Symposium, Kelowna, British Columbia, Canada.
10. Hirst, P.M. 2011. Growing large sized apples – a new understanding of apple fruit growth. Invited presentation at the Central Ohio Fruit and Vegetable Growers Winter Update.
11. Hirst, P.M. 2011. Orchard systems for direct sales. Invited presentation at the Central Ohio Fruit and Vegetable Growers Winter Update.
12. Hirst, P.M. 2010. Breeding large sized apples: first step is understanding genetic control. Invited presentation, Northwest Agriculture and Forestry University, Yangling, China.

13. Hirst, P.M. 2010. Control of fruit size in apple. Invited seminar, China Agricultural University, Beijing, China.
14. Hirst, P.M. 2009. Apple flower initiation: looking into the black box. Invited presentation at Washington State Horticultural Association annual meeting, Wenatchee, WA.
15. Hirst, P.M. 2009. Supersize it! Apple fruit growth. Invited presentation at Washington State Horticultural Association annual meeting, Wenatchee, WA.
16. Hirst, P.M. 2008. Técnicas para Aumentar el Tamaño de La Fruta en la Variedad Gala (Techniques for improving fruit size in Gala). XIV International Symposium on Apple and Temperate Zone Fruit Trees, Cuauhtémoc, Mexico.
17. Hirst, P.M. 2008. Fruit size control in apple. Presentation at South West Michigan Horticultural Days conference, Benton Harbor MI.
18. Hirst, P.M. 2007. Apple production: it all starts with flowering. Presentation at the annual meeting of the Minnesota Apple Growers Association, La Crosse, WI.
19. Hirst, P.M. 2007. Supersize it: increasing fruit size in apples. Presentation at the annual meeting of the Minnesota Apple Growers Association, La Crosse, WI.
20. Hirst, P.M. 2007. Selecting, growing, and marketing tree fruits for a direct-market orchard. Presentation at Illinois Specialty Crop and Agritourism Conference. Springfield, IL.
21. Hirst, P.M. 2006. Genetic control of apple fruit size. Presentation to faculty and graduate students at the Department of Horticulture, University of Cairo, Egypt.
22. Hirst, P.M. 2006. New apples, new opportunities, new profits? Presentation at annual meeting of the Midwest Apple Improvement Association. Belleville, IL.
23. Hirst, P.M., A. Malladi and P.G. Goldsbrough. 2006. Genetics of fruit size. Presentation at International Fruit Tree Association annual meeting. Hershey, PA.
24. Hirst, P.M. 2006. A new understanding of fruit size. Presentation at Plant Growth Regulator workshop. International Fruit Tree Association. Hershey, PA.
25. Hirst, P.M. 2006. Bloom delay in peaches: Impact of growth regulators and oil. Presentation at Ohio Fruit and Vegetable Growers Conference. Columbus, OH.
26. Hirst, P.M. 2006. Bigger, redder Gala apples: genetic and environmental effects. Presentation at Ohio Fruit and Vegetable Growers Conference. Columbus, OH.
27. Hirst, P.M. 2004. Supersize it - improving apple fruit size. Presentation at Wisconsin Fruit and Vegetable Conference. Oconomowoc, WI.
28. Hirst, P.M. 2004. Flowering and spur development in apple. Presentation at Wisconsin Fruit and Vegetable Conference. Oconomowoc, WI.
29. Hirst, P.M. 2003. George Goodling Memorial lecture. How to grow big Gala. Presentation at Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA.

30. Hirst, P.M. 2003. Flower and spur development in apple. Presentation at Mid-Atlantic Fruit and Vegetable Convention. Hershey, PA.
31. Hirst, P.M. and A. Malladi. 2002. Does size really matter? Factors controlling fruit size in apple. Presentation at the International Dwarf Fruit Tree Association meeting, Kelowna, British Columbia, Canada.
32. Hirst, P.M. 2002. Does fruit size really matter? Presentation at the Illinois Specialty Crops Conference, Champaign-Urbana, IL.
33. Hirst, P.M. 2001. High density apple tree training. Presentation at the annual meeting of the Kentucky State Horticultural Society, Lexington, KY.
34. Hirst, P.M. 2001. Gala - production and management. Presentation at the annual meeting of the Kentucky State Horticultural Society, Lexington, KY.
35. Hirst, P.M. 2001. Trends in the Indiana apple cider industry. Presentation at the Mid-America Fruit Growers annual meeting, Olathe, KS.
36. Hirst, P.M. 2001. Flowering and return bloom of apples. Presentation at the Mid-America Fruit Growers annual meeting, Olathe, KS.
37. Hirst, P.M. 2000. Flower and Spur Development and their Impact on Fruit Quality. Presentation at the Illinois Specialty Crops Conference, Champaign-Urbana, IL.
38. Hirst, P.M. 1999. Impact of FDA labeling on Indiana cider makers. Presentation at the Illinois Specialty Crops Conference, Champaign-Urbana, IL.
39. Hirst, P.M. 1999. Gala - The Variety and Production Characteristics. Presentation at the Michigan Horticultural Society, Grand Rapids, MI.
40. Hirst, P.M. 1999. Flowering and Spur Development in Apples. Presentation at the Michigan Horticultural Society, Grand Rapids, MI.
41. Hirst, P.M. 1998. Apple production in New Zealand. Presentation at the annual meeting of the Minnesota Apple Growers Association, LaCrosse, WI.
42. Hirst, P.M. 1998. Why is light so important to fruit growers? Presentation at the annual meeting of the Minnesota Apple Growers Association, LaCrosse, WI.
43. Hirst, P.M. 1997. International fruit marketing. Presentation to horticulture club, University of Arkansas, Fayetteville, AR.

Research presentations

1. Hirst, P.M., B. Benes, F. Sheibani, M. Fiser, H. Kang and B. Shi. 2017. IMapple: a functional-structural growth and fruiting simulation model of ‘Golden Delicious’ apple trees. Crops in Silico, Oxford, England.
2. Hirst, P.M. 2017. Return bloom in apple is related to bourse length. International Symposium on Flowering, Fruit Set and Alternate Bearing, Palermo, Italy.

3. Elsysy, M. and P.M. Hirst. 2016. Floral induction in biennial and annual apple cultivars. ASHS annual meeting, Atlanta, GA. Oral presentation.
4. Elsysy, M. and P.M. Hirst. 2016. Molecular bases of apple flowering inhibition by defoliation and gibberellins. ASHS annual meeting, Atlanta, GA. poster presentation.
5. Hirst, P.M., T. Baugher, N. Elfiky, L. Glenna, J. Harper, A. Kak, T. Koselka, A. Patel-Campillo, J. Schupp and B. Wallach. 2016. Defining and automating optimal dormant pruning. ASHS annual meeting, Atlanta, GA. Oral presentation.
6. Hirst, P.M., T. Baugher, N. Elfiky, L. Glenna, J. Harper, A. Kak, T. Koselka, A. Patel-Campillo, J. Schupp and B. Wallach. 2016. Defining and automating optimal dormant pruning. XI International Symposium on Integrating Canopy, rootstock and Environmental Physiology in Orchard Systems. Bologna, Italy. Oral presentation.
7. Jahed, K. and P. Hirst. 2016. Male and female interaction in apple: Pollen tube growth, fruit set, fruit quality, and return bloom. ASHS annual meeting, Atlanta, GA. Oral presentation.
8. Sheibani, F., M. Fiser, H. Kang, B. Shi, B. Benes and P. Hirst. 2016. IMapple: a functional-structural growth and fruiting simulation model of 'Golden Delicious' apple. ASHS annual meeting, Atlanta, GA. Graduate oral presentation.
9. Taskin, S. and P. Hirst. 2016. Pedicel characteristics effects on apple fruit size. ASHS annual meeting, Atlanta, GA. Oral presentation.
10. Xie, L., F. Sheibani, M. Elsysy and P. Hirst. 2016. Bourse length distribution and return bloom of four apple cultivars. ASHS annual meeting, Atlanta, GA. Undergraduate poster presentation. 3rd place, undergraduate student poster competition.
11. Elsysy, M.A. and P.M. Hirst. 2015. Local effect of fruiting on different anatomical and physiological traits in apple. ASHS annual meeting, New Orleans, LA. Oral presentation
12. Elsysy, M.A. and P.M. Hirst. 2015. The effects of auxins, gibberellins and defoliation on the expression of apple flowering genes (*Malus x domestica* Borkh.). ASHS annual meeting, New Orleans, LA. Poster presentation. (2nd place in graduate student competition)
13. Hirst, P.M., M. Fiser, B. Shi, B. Benes and J. Ravi. 2015. A source-sink developmental model of Golden Delicious apple trees. X International Symposium on Modeling in Fruit Research and Orchard Management, Montpellier, France. (oral presentation).
14. Hirst, P.M., E. Collier, B. Shi, M. Fiser, B. Benes. 2015. Analytical developmental of a spatio-temporal data-driven model of Golden Delicious apple leaves. X International Symposium on Modeling in Fruit Research and Orchard Management, Montpellier, France. (poster presentation).
15. Hirst, P.M., J. Ravi, N. Elfiky, and B. Benes. 2015. Apple tree scanning and reconstruction using Kinect. X International Symposium on Modeling in Fruit Research and Orchard Management, Montpellier, France. (poster presentation).
16. Sheibani, F., M. Elsysy, B. Xie, and P.M. Hirst. 2015. Managing bourse shoot growth to maximize flowering in apple. ASHS annual meeting, New Orleans, LA. Poster presentation

17. Hirst, P.M. 2015. Automation in agriculture – robotics in the real world. Discovery Park, Purdue University. 2/5/15.
18. Hirst, P.M. 2015. IMapple – a structural-functional model for apple trees. University of Maribor, Slovenia. 6/8/15
19. Hirst, P.M. 2015. Combining physiology and engineering to improve orchard efficiency. University of Bologna, Italy. 6/10/15
20. Hirst, P.M., J. Park, A. Kak, J.R. Schupp, T. Baugher, L. Glenna, A. Patel-Campillo, J. Harper, H.K. Koselka, B. Wallach, and J. Tarara. 2014. Automated pruning of specialty crops. Oral presentation at ISHS International Horticultural Congress, Brisbane, Australia.
21. Franzen, J.B. and P.M. Hirst. 2014. Optimal pruning of apple and effects on tree architecture, productivity and fruit quality. Poster presentation at ISHS International Horticultural Congress, Brisbane, Australia.
22. Elsysy, M.A. and P.M. Hirst. 2014. Spur versus whole-tree regulation of apple flowering. HortScience (Supplement) 49(9): S158.
23. Jahed, K. and P. M. Hirst. 2014. Effects of pollen source and seed number on fruit set, fruit quality, and flower initiation of apple. HortScience (Supplement) 49(9): S157.
24. Shi, B., P.M. Hirst, B. Benes and M. Fiser. 2014. Simulation of light distribution in 3D model of ‘Golden Delicious’ apple trees. HortScience (Supplement) 49(9): S401.
25. Hirst, P.M. et al. 2013. Automation of Dormant Pruning of Specialty Crops. Oral presentation at ASHS meeting, Palm Desert, CA.
26. Hirst, P.M. 2010. Breeding large sized apples: first step is understanding genetic control. Invited presentation, Northwest Agriculture and Forestry University, Yangling, China.
27. Hirst, P.M. 2010. Control of fruit size in apple. Invited seminar, China Agricultural University, Beijing, China.
28. Hirst, P.M. 2010. Crop load effects on the cellular dynamics of apple fruit growth. 28th International Horticultural Congress, Lisbon, Portugal.
29. Hirst, P.M. 2009. Are resting spurs necessary for return bloom in apple? Annual meeting, American Society for Horticultural Science, oral presentation. St. Louis, MO.
30. Hirst, P.M. 2008. Técnicas para Aumentar el Tamaño de La Fruta en la Variedad Gala (Techniques for improving fruit size in Gala). XIV International Symposium on Apple and Temperate Zone Fruit Trees, Cuauhtémoc, Mexico. Invited speaker.
31. Rosaceae Specialty Crops Planning Workshop. 2007. Invited participant. MSU, East Lansing, MI.
32. Hirst, P.M. 2006. Explaining natural variation in apple fruit size in terms of cell production and cell cycle gene expression. 3rd International Rosaceae Genomics Conference, ISHS, Napier, New Zealand.

33. Hirst, P.M. 2004. Precocity and productivity of apple as affected by cultivar, rootstock and growing location. International symposium on orchard and plantation systems, ISHS, Budapest, Hungary. Poster presentation.
34. American Society for Horticultural Science, Austin, TX. 2004. "Molecular analysis of fruit size regulation in apple." Oral presentation by A. Malladi.
35. American Society for Horticultural Science, Providence, RI. 2003. "Luminex, a protocol for post harvest development of red color in apples." Oral presentation.
36. Hirst, P.M. 2002. Interstem effects on scion development of apple. First international symposium on rootstocks for deciduous fruit crops, ISHS, Zaragoza, Spain.
37. International Conference on the Physiological Mechanisms of Apple Fruit Growth and Abscission. 2002. Moderated session. Malladi and P. Hirst "Analysis Of Fruit Size Control In Apple Using Large-Fruited 'Gala' Mutants" presented by A. Malladi.
38. 7th American Society for Horticultural Science. 2000, Orlando, FL. "Dynamics of fruit growth" workshop. Organized and chaired workshop as Chair. pomology working group,
39. International Symposium on Orchard and Plantation systems. International Society for Horticultural Science, Nelson, New Zealand. 2000. "Early performance of 'Gala' on 18 dwarf and 4 semi-dwarf rootstocks growing at 24 sites in North America." Poster presentation. "Influence of rootstock and growing location on performance of European plum." Oral presentation.
40. XV International Horticultural Congress, Brussels, Belgium. 1998. "Rootstock effects on growth and cell size of 'Gala' apple fruit". Oral presentation. This paper was later published in *Acta Horticulturae* 517:189-194.
41. American Society for Horticultural Science Annual Conference, Salt Lake City, UT. 1997. "Cropping effects on flower development of 'Royal Gala' apple. Oral presentation. Session moderator.