

CURRICULUM VITAE -- ANTHONY JAMES PAWSON

Personal:

Born: 18 October 1952, Maidstone, U.K.

Citizenship: British, Canadian

Family: Married, 3 children

Address: Samuel Lunenfeld Research Institute,
Mount Sinai Hospital,
600 University Avenue,
Toronto, Ontario, Canada M5G 1X5
Phone: 416-586-8262
Fax: 416-586-8869
Email: pawson@mshri.on.ca
Lab web page: <http://pawsonlab.mshri.on.ca/index.php>

Education:

1970-1973 Undergraduate at Cambridge University, England.

1973 B.A. in Biochemistry

1973-1976 Graduate Student at the Imperial Cancer Research Fund, England with Dr. Alan E. Smith in the Department of Molecular Virology

1976 Ph.D. in Molecular Biology from King's College, London University, England

Postdoctoral Training:

1976-1977 Postdoctoral Research Fellow at the University of California, Berkeley, in the Molecular Biology and Virus Laboratory.

1977-1980 Postdoctoral Research Fellow at the University of California, Berkeley, in the Department of Zoology.

Academic Appointments:

1981-1985	Assistant Professor, Department of Microbiology, University of British Columbia, Canada
1985-	Senior Scientist, Samuel Lunenfeld Research Institute, Mount Sinai Hospital, Toronto
1985-1988	Associate Professor, Department of Medical Genetics, University of Toronto
1989-	Full Professor, University of Toronto
1994-	Head, Programme in Molecular Biology and Cancer, Samuel Lunenfeld Research Institute
2000-2001	Acting Director, Samuel Lunenfeld Research Institute
2002-2005	Director of Research, Samuel Lunenfeld Research Institute
2003-	Senior Fellow, Massey College, University of Toronto
2006-	Distinguished Scientist, Samuel Lunenfeld Research Institute

Scholarships/Fellowships:

1970	Exhibition, Clare College, Cambridge University
1973-1976	Bursarship at the Imperial Cancer Research Fund
1976-1978	NATO Postdoctoral Research Fellowship
1979-1980	Special Fellowship from the Leukemia Society of America, Inc.

Honours and Awards

1985-1988	Senior Scientist of the National Cancer Institute of Canada
1988-1999	Terry Fox Cancer Research Scientist of the National Cancer Institute of Canada
1991-	Apotex Chair in Molecular Oncology, Mount Sinai Hospital
1991-2001	International Research Scholar of the Howard Hughes Medical Institute

- 1994 Gairdner Foundation International Award (with T. Hunter)
- 1994 Elected Fellow of the Royal Society of London
- 1994 Elected Fellow of the Royal Society of Canada
- 1995 Robert L. Noble Prize (National Cancer Institute of Canada).
- 1995 George Drummond Memorial Award
(University of Alberta).
- 1996 John Colter Award
(University of Calgary).
- 1997 Boehringer Mannheim Prize
(Canadian Society of Biochemistry and Molecular & Cellular Biology)
- 1998 Henry Friesen Award
(Canadian Society for Clinical Investigation)
- 1998 AACR-Pezcoller International Award for Cancer Research
(American Association for Cancer Research/Pezcoller Foundation)
- 1998 Dr. H.P. Heineken Prize for Biochemistry and Biophysics
(Royal Netherlands Academy of Arts and Sciences)
- 1998 Flavelle Medal of the Royal Society of Canada
- 1998 Canadian Institutes of Health Research Distinguished Scientist Award.
- 1998 University Professor; University of Toronto
- 2000 Killam Prize for the Health Sciences
- 2000 J. Allyn Taylor International Prize in Medicine
(with T. Hunter, J. Schlessinger)
- 2000 Appointed as an Officer of the Order of Canada
- 2002 Prix Galien Canada
- 2002 Premier of Ontario's Platinum Medal for Research Excellence
- 2002 Michael Smith Prize in Health Research

- 2003 Elected Associate Member, EMBO
- 2004 Poulsson Medal
(Norwegian Society of Pharmacology and Toxicology)
- 2004 Elected Foreign Associate of the National Academy of Sciences (US)
- 2004 Elected Foreign Member of the American Academy of Arts and Sciences
- 2004 Elected Fellow, American Academy of Microbiology
- 2004 Apointed to the Order of Ontario
- 2004 Ernst W. Bertner Memorial Award
(MD Anderson Cancer Center)
- 2004 Louisa Gross Horwitz Prize
(with T. Hunter)
- 2005 Special Achievement Award. Nature Biotechnology Winter Symposium.
- 2005 Wolf Prize in Medicine, Israel.
(with T. Hunter, A. Levitzki).
- 2005 The Royal Medal. Royal Society of London.
- 2005 Honorary Member, Japanese Biochemical Society.
- 2005 Daniel Nathans' Memorial Award (Van Andel Research Institute)
(with T. Hunter)
- 2006 Inducted to the Canadian Medical Hall of Fame
- 2006 Appointed to the Order of Companions of Honour by Queen Elizabeth II.
- 2007 The Herbert Tabor/Journal of Biological Chemistry ASBMB Lectureship
Award (with T. Hunter).
- 2007 The Jubilee Lecture Award. The Biochemical Society (UK).
- 2007 Howard Taylor Ricketts Award. University of Chicago.
- 2007 Premier's Summit Award for Medical Research (Ontario).
- 2007 Diamond Jubilee Award. The National Cancer Institute of Canada.

Journal Editor (past and present)

Progress in Biophysics and Molecular Biology
Journal of Cellular Physiology

Editorial Boards (past and present)

Trends in Genetics
Oncogene
Molecular and Cellular Biology
Cell Growth and Differentiation
Chemistry & Biology
Current Opinion in Cell Biology
Developmental Cell
Molecular Biology of the Cell
European Journal of Biochemistry
EMBO Journal

Advisory Boards

1992- 1997	Ariad Pharmaceuticals Inc. Scientific Advisory Board
1996- 1999	General Motors Cancer Research Foundation Assembly.
1997- 2000	Howard Hughes Medical Institute. Scientific Review Board.
1997- 1998	National Human Genome Research Institute (U.S.) Scientific Planning Committee
1997 - 2004	Jane Coffin Childs Memorial Fund for Medical Research. Scientific Advisory Board.
1998 - 2001	Royal Society of London. Sectional Committee 6.
1998 - 2004	Institute of Molecular and Cell Biology, Singapore. Scientific Advisory Board.
1998 -	Gairdner Foundation Medical Advisory Board
1999 -	MGH Cancer Center, Scientific Advisory Board.
1999 -	Argonex Discovery Inc., Scientific Advisory Board.
2001 - 2004	MDS-Proteomics, Scientific Advisory Board
2000 - 2005	Alliance for Cell Signaling (NIGMS Large Scale Collaborative Grant). External Advisory Committee.
2001 -	Cell Migration Consortium (NIGMS Large Scale Collaborative Grant). External Advisory Committee.
2002-	President's Advisory Committee. Canadian Institutes for Health Research.
2002 -	Faculty of 1000. Head of Faculty (Cell Biology).
2003 -	Structural Genomics Consortium. Scientific Advisory Board.
2005-	Co-President. Protein Modules Consortium.
2006-	Protein Data Bank (PDB) Scientific Advisory Board
2006-	Keystone Symposia Board of Directors.
2007-	Genentech Scientific Review Board.

- 2007- Roche Oncology. Scientific Advisory Board.
2007 - A*STAR Biomedical Sciences, International Advisory Council

Distinguished/Keynote Lectures

- 1990 David Thompson Award Lecture.
1993 The Protein Society Annual Meeting. Keynote Speaker.
1993 The Gordon Conference on Cancer. Keynote Speaker.
1993 Symposium on SH2/SH3 Domains. Harvard. Keynote Speaker.
1993 24th International Symposium of the Princess Takamatsu Cancer Research Fund. Tokyo.
1993 Vivian Ernst Lecture, Brandeis University.
1994 Frontiers in Science and Medicine Lecture. Indianapolis University.
1994 7th Adam Neville Lecture, University of Dundee.
1994 Gavin Borden Lecture. British Society for Cell Biology, Edinburgh.
1994 3rd International Conference on Nerve Growth Factors and Neurotrophins. Keynote Lecture.
1994 J. Walter Juckett Lecture. Vermont Cancer Center, University of Vermont, Burlington.
1994 Gordon Hamilton Fairley Memorial Lecture. Royal Society of Medicine, London, UK.
1994 10th Ray A. and Robert L. Kroc Lectureship, Joslin Diabetes Center, Harvard Medical School, Boston.
1995 Imperial Cancer Research Fund Colloquium. Keynote Speaker.
1995 Uppsala University Jubilee Symposium.
1996 Tyrosine Phosphorylation and Cell Signaling Conference. The Salk Institute. Keynote Speaker.
1996 2nd Hot Springs Life Symposium on Signal Transduction, Singapore. Keynote Speaker.
1996 ASBMB Symposium on Subcellular Targeting of Signal Transduction Enzymes, Snowbird, Utah. Keynote Speaker.
1996 Distinguished Guest Lecturer, Baylor Medical College, Houston.
1998 Director's Lecture, National Institutes of Health, Bethesda, MD.
1998 ASBMB Symposium on Specificity of Signal Transduction Events by Targeting and Anchoring. Keynote Speaker.
1998 Nobel Symposium on Intracellular and Persistent Infections, Karolinska Institute, Sweden. Speaker.
1998 Genetics Institute Discovery Research Retreat. Keynote Speaker.
1998 Kroc lecture. Harvard University.
1998 FASEB Meeting on Protein Phosphatases. Keynote Speaker.
1999 Gordon Research Conference on Fibronectin, Integrins and Related Molecules. Ventura, California. Keynote Speaker.
1999 FASEB Conference on Molecular Pathogenesis of Bone Disease, Grannlibaken, California, Keynote Speaker.
1999 Thomas Starzl Lecture (American Society of Transplantation).
1999 FASEB Conference on Protein Kinases and Protein Phosphorylation. Keynote Speaker.

- 1999 Pfizer Lecture, Loeb Institute, University of Ottawa, Ottawa
- 1999 The Lansdowne Lecture, University of Victoria, BC.
- 2000 Calbiochem Lecture Series, University of California, San Diego.
- 2000 Keystone Symposium on Assembly of Signaling Networks. Taos, NM. Opening Lecture.
- 2000 Keystone Symposium on Joint Regulation of Signaling Pathways by Integrins and Growth Factors. Breckenridge, Colorado. Keynote Speaker
- 2000 Steelman lecture, University of North Carolina
- 2000 Conference on Traffic of Integral Membrane Proteins, Karolinska Institute, Sweden. Closing lecture.
- 2000 Gordon Research Conference on Signaling by Adhesion Receptors. Keynote Speaker.
- 2000 Dolman Award Lecture. University of British Columbia.
- 2000 Edwin G. Krebs Lecture in Molecular Pharmacology, University of Washington, Seattle.
- 2001 The BioDundee Lecture, University of Dundee, UK.
- 2001 EMBO Conference on Protein Phosphorylation and Protein Phosphatases. Marburg, Germany. Opening lecture.
- 2001 Nobel Conference on The Regulation of Cellular Function by the Ubiquitin-Proteasome System. Karolinska Institute, Sweden. Speaker.
- 2001 Choh Hao Li Memorial Lectures, University of California, Berkeley.
- 2002 EMBO Workshop on The Invasive Growth Program: Signals and Effectors. Torino, Italy. Keynote Lecture
- 2002 Burnham Institute, La Jolla. Distinguished Lecture.
- 2002 Lacy Lecture, University of Washington, St. Louis.
- 2002 Novartis Oncology Retreat. Quebec City. Keynote Lecture.
- 2002 Nobel Symposium on Self-organization. Karolinska Institute, Sweden. Speaker
- 2002 INSERM Meeting on Molecular Networks at the Plasma Membrane. St. Raphael, France. Keynote Speaker
- 2002 Meeting on Genes and Cancer. Warwick University, UK. Keynote Speaker.
- 2002 Bicel Lecture, University of Geneva, Switzerland.
- 2003 Keystone Symposium on Proteomics. Keynote Speaker.
- 2003 Sloan-Kettering Institute, New York. President's Lecture.
- 2003 Gordon Research Conference on Second Messengers and Protein Phosphorylation. Keynote Speaker.
- 2003 Gordon Research Conference on Analytical Chemistry. Keynote Speaker.
- 2003 19th International Congress of Biochemistry and Molecular Biology/2nd HUPO annual Congress. Osamu Hayaishi Lecture (Congress Opening Lecture)
- 2003 FASEB Conference on Growth Factor Receptor Tyrosine Kinases in Mitogenesis, Morphogenesis and Tumorigenesis. Keynote Speaker.
- 2003 IUBMB lecture. FEBS Meeting on Signal Transduction. Brussels, Belgium.
- 2003 Boehringer Ingelheim Lecture, University of Montreal.
- 2004 2nd Messengers and Phosphoproteins Conference. Montreal. Keynote Speaker.
- 2004 Bioscience 2004, Dundee. UK Biochemical Society. Plenary lecture.
- 2004 American Brain Tumor Association Lecture, Toronto.
- 2004 ORFeome meeting, Boston. Keynote Speaker.

- 2005 EMBL, Heidelberg, Germany. Distinguished Lecture.
- 2005 Max-Planck Institute for Neurobiology, Martinsreid. Distinguished Lecture.
- 2005 David S. Sigman Memorial Lectureship Award. Molecular Biology Institute, University of California at Los Angeles.
- 2005 Peter Green Lecture. The Rudin-Kase Dean's Lecture Series. Mount Sinai School of Medicine. New York.
- 2005 Orrin Ingram Distinguished Lecture, Vanderbilt University Medical School.
- 2005 5th Canadian Proteomics Initiative Conference, Toronto. Keynote Speaker
- 2005 2nd Annual Cell Signalling Symposium. Dundee. Keynote Speaker.
- 2005 FASEB Immunology Conference, Snowmass, CO. Keynote Speaker.
- 2005 Modular Protein Domains. FEBS Workshop. Seefeld, Austria. Keynote Speaker.
- 2006 Luria Lecture. MIT Department of Biology, Cambridge, MA.
- 2006 Chemical Biophysics Symposium, Toronto. Keynote Speaker.
- 2006 Gordon Research Conference on Biology of 14-3-3 proteins. Oxford, UK. Keynote Speaker.
- 2006 British Society for Proteome Research. Cambridge, UK. Keynote Lecture.
- 2006 31ST European Symposium on Hormones and Cell Regulation, Mont Ste Odile, France. Keynote Speaker.
- 2006 FEBS/EMBO Workshop. 15th Protein Kinase Meeting – “Spatial and Temporal Regulation of Signaling. Oslo, Norway. Keynote Speaker.
- 2006 Euroconference on Protein Kinase Inhibitors. Paris, France. Keynote Speaker.
- 2006 Karolinska Research Lecture, Nobel Forum, Stockholm, Sweden.
- 2007 Distinguished Lecture, Beatson Research Institute, Glasgow, UK.
- 2007 Hadassah Horn Lecture, Weizmann Institute of Science, Israel.
- 2007 Special Conference on Signal Transduction. London Research Institute, Cancer Research UK. London, UK. Keynote Speaker
- 2007 9th DGZ Young Scientists Meeting on “Signaling cascades in Development and Disease”. Munster, Germany. Keynote Talk.
- 2007 Jean Shanks Lecture, Academy of Medical Sciences (UK), London, UK.
- 2007 International Conference on Anchored cAMP Signaling Mechanisms. Vollum Institute. Portland OR, USA. McAdams Wright Ragen Keynote Lecture.
- 2008 HUPO 7th Annual World Congress. Amsterdam, The Netherlands. Opening Plenary Lecture.
- 2008 MD Anderson Cancer Center, Houston, Texas. Blaffer Distinguished Scientist Lecture.

Meetings Organized

- 1983 Terry Fox Symposium on Cancer Genes, Vancouver.
- 1991 Banff meeting on Signal Transduction.
- 1993 Banff meeting on Signal Transduction.
- 1993 Oncogenes Meeting, Frederick.
- 1994 Keystone Symposium on Transmembrane Signal Transduction.
- 1995 Co-Chair, FASEB Meeting on Protein Kinases and Protein Phosphorylation.
- 1995 AACR meeting on Signal Transduction, Banff.
- 1996 Samuel Lunenfeld Research Institute International Symposium on Cell Signaling.
- 1997 Chair, FASEB Meeting on Protein Kinases and Protein Phosphorylation

- 1998 Banff meeting on Signal Transduction.
- 1999 Keystone meeting on Specificity in Signal Transduction
- 2000 Keystone meeting – Signaling 2000.
- 2001 HHMI Workshop on Signaling Networks and Complexes
- 2001 Banff meeting on Signal Transduction
- 2002 Gordon Research Conference on Peptide Growth Factors (Vice-Chair).
- 2004 Gordon Research Conference on Growth Factor Signaling. Chair.
- 2004 Banff meeting on Signal Transduction.
- 2005 Banff meeting on Signal Transduction.
- 2008 Banff meeting on Signal Transduction.

PUBLICATIONS:

1. Pawson, T., G.S. Martin, and A.E. Smith. 1976. Cell-free translation of virion RNA from nondefective and transformation-defective Rous sarcoma viruses. **J. Virol.** 19: 950-967.
2. Pawson, T. 1976. The proteins and nucleic acids of RNA tumour viruses. Ph.D. Thesis, London, University.
3. Pawson, T., R. Harvey, and A.E. Smith. 1977. The size of Rous sarcoma virus mRNAs active in cell-free translation. **Nature** (London) 268:416-420.
4. Duesberg, P., P. Mellon, T. Pawson, G.S. Martin, K. Bister, and P.K. Vogt. 1978. Defining transforming (*onc*) genes and gene products of avian acute leukemia and carcinoma viruses. pp. 245-266 in **J.C. Stevens G.J. Todaro, and C.F. Fox** (eds.).
5. Mellon, P., T. Pawson, G.S. Martin, K. Bister, and P. Duesberg. 1978. Specific RNA sequences and gene products of MC29 avian acute leukemia virus. **Proc. Natl. Acad. Sci. USA** 75:5874-5878.
6. Duesberg, P., P. Mellon, T. Pawson, K. Bister, and P.K. Vogt. 1979. Anatomy of the RNA and Gene Products of MC29 and MH2, two defective avian tumor viruses causing acute leukemia and carcinoma: Evidence for a new class of transforming genes. pp. 241-260 in R. Neth and K. Mannweiler (eds.), **Modern Trends in Human Leukemia, III**, Springer-Verlag, Heidelberg.
7. Moss, P., N. Honeycutt, T. Pawson, and G.S. Martin. 1979. Viral transformation of chick myogenic cells: The relationship between differentiation and the expression of the *src* gene. **Exptl. Cell. Res.** 123:95-105.
8. Pawson, T., P. Mellon, P. Duesberg, and G.S. Martin. 1980. *env* gene of Rous sarcoma virus: Identification of the gene product by Cell-free translation. **J. Virol.** 33:993-1003.
9. Pawson, T., and G.S. Martin. 1980. Cell-free translation of avian erythroblastosis virus RNA. **J. Virol.** 34:280-284.
10. Lee, W.-H., K. Bister, T. Pawson, T. Robbins, C. Moscovici, and P.H. Duesberg. 1980. Fujinami sarcoma virus: An avian RNA tumor virus with a unique transforming gene. **Proc. Natl. Acad. Sci. USA** 77:2018-2022.
11. Pawson, T., J. Guyden, T.-H. Kung, K. Radke, T. Gilmore, and G.S. Martin. 1980. A strain of Fujinami sarcoma virus which is temperature-sensitive in protein phosphorylation and cellular transformation. **Cell** 22:767-775.
12. Pawson, T., T.-H. Kung, and G.S. Martin. 1981. Structure and phosphorylation of the Fujinami sarcoma virus gene product. **J. Virol.** 40:665-672.

13. Weinmaster, G., and T. Pawson. 1982. Localization and characterization of phosphorylation sites of the Fujinami avian sarcoma virus and PRCII virus transforming proteins. **J. Cell. Biochem.** 20:337-348. Also Tumor Viruses and Differentiation 203-214.
14. Weinmaster, G., E. Hinze, and T. Pawson. 1983. Mapping of multiple phosphorylation sites within the structural and catalytic domains of the Fujinami avian sarcoma virus transforming protein. **J. Virol.** 46:29-41.
15. Ingman-Baker, J., E. Hinze, J.G. Levy, and T. Pawson. 1984. Monoclonal antibodies to the transforming protein of Fujinami avian sarcoma virus discriminate between different *fps*-encoded proteins. **J. Virol.** 50:572-578.
16. Stone, J.C., T. Atkinson, M.E. Smith, and T. Pawson. 1984. Identification of functional regions in the transforming protein of Fujinami sarcoma virus by in-phase insertion mutagenesis. **Cell** 37:549-558.
17. Weinmaster, G., M.J. Zoller, M. Smith, E. Hinze and T. Pawson. 1984. Mutagenesis of Fujinami sarcoma virus: Evidence that tyrosine phosphorylation of P130^{gag-fps} modulates its biological activity. **Cell** 37:559-568.
18. Pawson, T., and G. Weeks. 1984. Expression of *ras*-encoded proteins in relation to cell growth and differentiation. In "**Genes and Cancer**" (eds. M. Bishop, M. Greaves and J. Rowley), Alan R. Liss (New York). pp. 461-470.
19. Pawson, T., T. Amiel, E. Hinze, N. Auersperg, N. Neave, A. Sobolewski, and G. Weeks. 1985. Regulation of a *ras*-related protein during development of *Dictyostelium discoideum*. **Mol. and Cell. Biol.** 5:33-39.
20. Stone, J.C., and T. Pawson. 1985. Correspondence between immunological and functional domains in the transforming protein of Fujinami sarcoma virus. **J. Virol.** 55:721-727.
21. MacDonald, I., J. Levy, and T. Pawson. 1985. Expression of the mammalian *c-fes* protein in hematopoietic cells and identification of a distinct *fes*-related protein. **Mol. and Cell. Biol.** 5:2543-2551.
22. Weinmaster, G., and T. Pawson. 1986. Protein kinase activity of FSV (Fujinami Sarcoma Virus) P130^{gag-fps} shows a strict specificity for tyrosine residues. **J. Biol. Chem.** 261:328-333.
23. MacAuley, A., N. Auersperg, and T. Pawson. 1986. Expression of viral p21^{ras} during acquisition of a transformed phenotype by rat adrenal cortex cells infected with Kirsten murine sarcoma virus. **Mol. and Cell. Biol.** 6:342-346.
24. Weinmaster, G., M. Zoller, and T. Pawson. 1986. A lysine in the ATP-binding site of P130^{gag-fps} is essential for protein-tyrosine kinase activity. **EMBO J.** 5:69-76.

25. Sadowski, I., J.C. Stone, and T. Pawson. 1986. A noncatalytic domain conserved among cytoplasmic protein-tyrosine kinases modifies the kinase function and transforming activity of Fujinami sarcoma virus P130^{gag-fps}. **Mol. Cell. Biol.** 6:4396-4408.
26. Weeks, G., and T. Pawson. 1987. The synthesis and degradation of *ras*-related gene products during growth and differentiation in *Dictyostelium discoideum*. **Differentiation** 33:207-213.
27. Meckling-Hansen, J., R. Nelson, P. Branton, and T. Pawson. 1987. Enzymatic activation of Fujinami sarcoma virus *gag-fps* transforming proteins by autophosphorylation at tyrosine. **EMBO J.** 6:659-666.
28. Sadowski, I. and T. Pawson. 1987. Catalytic and non-catalytic domains of the Fujinami sarcoma virus P130^{gag-fps} protein-tyrosine kinase distinguished by the expression of *v-fps* polypeptides in *Escherichia coli*. **Oncogene** 1:181-191.
29. Johnson, P.W., W.S. Trimble, N. Hozumi, T. Pawson, and J.C. Roder. 1987. Correlation of natural killer cell recognition with *ras* oncogene expression. In: **Development and recognition of the transformed cell.** (Eds. M.I. Greene and T. Hamaoko). Plenum Publishing Corporation, New York. pp. 243-260.
30. Auersperg, N., T. Pawson, A. Worth and G. Weinmaster. 1987. Modification of tumor histology by point mutations in the *v-fps* oncogene: Possible role of extracellular matrix. **Cancer Research** 47:6341-6348.
31. Cogliano, A., D. Mock, T. Pawson and H.C. Tenenbaum. 1987. In vitro transformation of osteoblasts: putative formation of osteosarcoma in vitro. **Bone** 8:299-304.
32. DeClue, J.E., I. Sadowski, G.S. Martin, and T. Pawson. 1987. A conserved domain regulates interactions of the *v-fps* protein-tyrosine kinase with the host cell. **Proc. Natl. Acad. Sci. USA** 84:9064-9068.
33. Pawson, T. 1987. Growth factors, oncogenes, and breast cancer. **In Fundamental Problems in Breast Cancer.** (Eds. A. Paterson and A. Lees). Martinus Nijhoff Publishing, pp. 155-171.
34. Pawson, T. 1987. Oncogenes - The New Testament. **Trends in Genetics** 3:268.
35. Pawson, T. 1987. Transcription factors as oncogenes. **Trends in Genetics** 3:223.
36. Weeks, G., A.F. Lima and T. Pawson. 1987. A *ras*-encoded protein in *Dictyostelium discoideum* is acylated and membrane-associated. **Molecular Microbiology** 1:347-354.
37. Greer, P.A., K. Meckling-Hansen and T. Pawson. 1988. The human *c-fps/fes* gene product expressed ectopically in rat fibroblasts is nontransforming and has restrained protein-tyrosine kinase activity. **Mol. Cell. Biol.** 8:578-587.

38. Sadowski, I., T. Pawson, and A. Lagarde. 1988. *v-fps* protein-tyrosine kinase coordinately enhances the malignancy and growth factor responsiveness of pre-neoplastic lung fibroblasts. **Oncogene** 2:241-247.
39. Pawson, T., P. Greer, M. Moran, K. Meckling-Hansen, A. Brooks-Wilson and I. Sadowski. 1988. Structure-function relationships in cellular and viral *fps/fes* cytoplasmic protein-tyrosine kinases. **In Biology of Growth Factors** (eds. J. Kudlow, D. MacLennan, A. Bernstein, and A. Gotlieb). Advances in Experimental Medicine and Biology. 234:55-64.
40. Edwards, A., M. Arquint, P. Braun, R. Dunn, J. Roder, T. Pawson and J. Bell. 1988. Myelin-associated glycoprotein, a cell adhesion molecule of oligodendrocytes, is phosphorylated in brain. **Mol. Cell. Biol.** 8:2655-2658.
41. Birek, C., T. Pawson, A.G. McCulloch, and H.C. Tennenbaum. 1988. Neoplastic transformation of osteogenic cells: quantitative morphometric analysis of an *in vitro* model for osteosarcoma. **Carcinogenesis** 9:1785-1791.
42. Rapp, U.R., G. Heidecker, M. Huleihel, J.L. Cleveland, W.C. Choi, T. Pawson, J.N. Ihle, and W.B. Anderson. 1988. raf family serine/threonine protein kinases in mitogen signal transduction. **Cold Spring Harbor Symp. Quant. Biol.** 53:173-184.
43. Moran, M., A. Koch, I. Sadowski, and T. Pawson, 1988. Mutational analysis of a phosphotransfer motif essential for *v-fps* tyrosine kinase activity. **Oncogene** 3:665-672.
44. Pawson, T. 1988. Non-catalytic domains of cytoplasmic protein-tyrosine kinases: regulatory elements in signal transduction. **Oncogene** 3:491-495.
45. Letwin, K., S.-P. Yee, and T. Pawson. 1988. Novel protein-tyrosine kinase cDNAs related to *fps/fes* and *eph* cloned using anti-phosphotyrosine antibody. **Oncogene** 3: 621-627.
46. MacAuley, A., and T. Pawson. 1988. Cooperative transforming activities of *ras*, *myc* and *src* viral oncogenes in nonestablished rat adrenal cortex cells. **J. Virol.** 62:4712-4721.
47. Birek, C., Pawson, T., McCulloch, C.A.G., and H.C. Tenenbaum. 1988. Dexamethasone effects on induction of neoplastic transformation by Fujinami sarcoma virus in an *in vitro* chick embryo periosteal model for osteosarcoma. **Cancer Res.** 48:7231-7236.
48. Brooks-Wilson, A., E. Ball, and T. Pawson. 1989. The myristylation signal of p60^{v-src} functionally complements the N-terminal *fps*-specific region of P130^{gag-fps}. **Mol. Cell. Biol.** 9:2214-2219.
49. Yee, S.-P., D. Mock, V. Maltby, M. Silver, J. Rossant, A. Bernstein and T. Pawson. 1989. Cardiac and neurological abnormalities in *v-fps* transgenic mice. **Proc. Natl. Acad. Sci. USA** 86:5873-5877.

50. Attia, J., M. Tropak, P.W. Johnson, W. Newerly-Abramow, T. Pawson, J.C. Roder, and R.J. Dunn. 1989. Modulated adhesion: a proposal for the role of myelin-associated glycoprotein in myelin wrapping. **Clinical Chemistry** 35:717-720.
51. Taylor, G., M. Reedijk, V. Rothwell, L. Rohrschneider, and T. Pawson. 1989. The unique insert of cellular and viral *fms* protein tyrosine kinase domains is dispensable for enzymatic and transforming activities. **EMBO J.** 8:2029-2037.
52. Lavigne, A., V. Maltby, D. Mock, C. Brady, J. Rossant, T. Pawson and A. Bernstein. 1989. High incidence of lung, bone, and lymphoid tumors in transgenic mice overexpressing mutant alleles of the p53 oncogene. **Mol. Cell. Biol.** 9:3982-3991.
53. Koch, A., M. Moran, I. Sadowski, and T. Pawson. 1989. The common *src* homology region 2 domain of cytoplasmic signaling proteins is a positive effector of v-*fps* tyrosine kinase function. **Mol. Cell. Biol.** 9:4131-4140.
54. Yee, S.-P., D. Mock, P. Greer, V. Maltby, J. Rossant, A. Bernstein, and T. Pawson. 1989. Lymphoid and mesenchymal tumors in transgenic mice expressing the v-*fps* protein-tyrosine kinase. **Mol. Cell. Biol.** 9:5491-5499.
55. Pawson, T., K. Letwin, T. Lee, Q.-L. Hao, N. Heisterkamp, and J. Groffen. 1989. The *FER* gene is evolutionarily conserved and encodes a widely expressed member of the *FPS/FES* protein-tyrosine kinase family. **Mol. Cell. Biol.** 9:5722-5725.
56. Greer, P., V. Maltby, J. Rossant, A. Bernstein, and T. Pawson. 1990. Myeloid expression of the human *c-fps/fes* proto-oncogene in transgenic mice. **Mol. Cell. Biol.** 10:2521-2527.
57. Heidecker, G., M. Huleihel, J.L. Cleveland, W. Kolch, T.W. Beck, P. Lloyd, T. Pawson, and U. Rapp. 1990. Mutational activation of *c-raf-1* and definition of the minimal transforming sequence. **Mol. Cell. Biol.** 10:2503-2512.
58. Ellis, C., M. Moran, F. McCormick, and T. Pawson. 1990. Phosphorylation of GAP and GAP-associated proteins by transforming and mitogenic tyrosine kinases. **Nature** 343:377-381.
59. Kazlauskas, A., C. Ellis, T. Pawson and J. Cooper. 1990. Binding of GAP to activated PDGF receptors. **Science** 247:1578-1581.
60. Kriz, R., L.-L. Lin, L. Sultzman, C. Ellis, C.-H. Heldin, T. Pawson, and J. Knopf. 1990. Phospholipase C isozymes: structural and functional similarities. In: Proto-oncogenes in cell development. (Wiley, Chichester). **CIBA Foundation Symposium.** 150:112-127.
61. Decker, S.J., C. Ellis, T. Pawson, and T. Velu. 1990. Effects of substitution of threonine 654 of the epidermal growth factor receptor on epidermal growth factor-mediated activation of phospholipase C. **J. Biol. Chem.** 265:7009-7015.

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