

CURRICULUM VITAE

PHILLIP A. SHARP, PH.D.
INSTITUTE PROFESSOR

PROFESSIONAL ADDRESS

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EDUCATION

1966: B.A., Chemistry & Mathematics, Union College, Barboursville, KY
1969: Ph.D., Chemistry, University of Illinois, Urbana

POSITIONS

1999-date: Institute Professor, MIT
2000-2004 Director, The McGovern Institute
1991-1999 Salvador E. Luria Professor of Biology, MIT
1991-1999: Head, Department of Biology, MIT
1985-1991: Director, Center for Cancer Research, MIT
1982-1985: Associate Director, Center for Cancer Research, MIT
1979-1999: Professor, Center for Cancer Research and Department of Biology, MIT
1974-1979: Associate Professor, Center for Cancer Research and Department of Biology, MIT
1972-1974: Senior Research Investigator, Cold Spring Harbor Laboratory, Cold Spring Harbor, New York
1971-1972: Postdoctoral Fellow, Cold Spring Harbor Laboratory
1969-1971: Postdoctoral Fellow, California Institute of Technology
1966-1969 Research Assistant, Department of Chemistry, University of Illinois

HONORS AND AWARDS

2014 The SU2C Phillip A. Sharp Innovation in Collaboration Awards to foster collaboration among members of the SU2C scientific community that would enhance the SU2C mission to accelerate the development of new cancer treatments.

2013 Elected Fellow of the AACR Academy

2013 The Lifetime Achievement in Science Award from the RNA Society

2013 Selected a Vallee Visiting Professor

2013 President, American Association for the Advancement of Sciences (AAAS)

2013 Award of Excellence from the Hope Funds for Cancer Research

2012 Honorary Degree of Doctor of Science, McGill University, Montreal, QC, Canada

2012 The Christian A. Herter Lecture, New York University School of Medicine

2012 Han-Mo Koo Memorial Lecture, Van Andel Research Institute, Grand Rapids, MI

2012 President-Elect, American Association for the Advancement of Science (AAAS)

2011 Elected Foreign Fellow of the Royal Society, UK

2011 Honorary degree, Doctor of Science, University of Minnesota

2010 AACR Margaret Foti Award for Leadership and Extraordinary Achievements in Cancer Research

2010 American Society for Biochemistry and Molecular Biology Herbert Tabor/Journal of Biological Chemistry Lectureship

2009 Honorary Academician of the Academia Sinica of Taiwan

2008 Honorary Academician of Academia Sinica, Republic of China

2008 Honorary Doctorate, Eberly College of Science (Penn State), State College, Pennsylvania

2008 Honorary Doctorate, Bates College, Maine

2007 The Karl Friedrich Bonhoeffer Lecture, Max Planck Institute, Göttingen, Germany

2007 The Winthrop-Sears Award from the Chemists' Club of New York

2006 The Inaugural Double Helix Medal for Scientific Research from Cold Spring Harbor Laboratory

2006 Honorary Doctorate, Ripon College, Ripon, Wisconsin

2006 The AACR Irving Weinstein Distinguished Lectureship Award
 2005 The 2004 National Medal of Science
 2005 Third Princess Chulabhorn Distinguished Lecturer, Chulabhorn Resesarch Institute, Bangkok, Thailand
 2005 KT Wang Foundation Bioorganic Chemistry Lecturer, The National Taiwan University and Academia Cinica, Taiwan
 2005: The University College Dublin Ulysses Inaugural Lecturer, Dublin, Ireland
 2004: Honorary Member, The National Academy of Sciences-Republic of Korea
 2003: Novartis Drew Award in Biomedical Research
 2003: Received the University of Illinois Alumni Achievement Award
 2002: The Fourth Annual Biotechnology Heritage Award from the Biotechnology Industry Organization (BIO) and the Chemical Heritage Foundation (CHF)
 2002: The Storer Life Sciences Lectures, University of California, Davis
 2002: Elected Honorary Fellow of the Royal Society of Edinburgh, Scotland
 2002: Lifetime Honorary Member of the Kentucky Academy of Sciences
 2001: Honorary Doctorate, Northern Kentucky University
 2001: The Norman Davidson Lecture, California Institute of Technology
 2001: The Walker Prize from the Museum of Science, Boston, MA
 1999: Doctor Honoris Causa, University of Buenos Aires, Argentina
 1999: Honorary Doctor of Medicine, Uppsala University, Sweden
 1999: Institute Professor, MIT
 1999: The Benjamin Franklin Medal of the American Philosophical Society
 1999: Honorary Doctor of Science, Thomas More College, KY
 1998: Honorary Doctor of Science, University of Glasgow, Scotland
 1996: Honorary Doctor of Science, Albright College, Reading, PA
 1996: Honorary Doctor of Science, University of Tel Aviv
 1995: Honorary Doctor of Science Degree, Bowdoin College, Brunswick, ME
 1994: Honorary Doctor of Science Degree, University of Kentucky
 1993: The Nobel Prize in Physiology or Medicine
 1993: Elected Fellow of the American Academy of Microbiology
 1993: The James R. Killian, Jr., Faculty Achievement Award, MIT
 1993: The Mendel Medal Award from Villanova University, Villanova, PA
 1992-1999: The Inaugural Salvador E. Luria Professorship (Chair), MIT
 1991: Honorary Degree of *Doctor of Humane Letters* from Union College, Barbourville, KY
 1991: Elected Member of the American Philosophical Society
 1991: Elected Member of the Institute of Medicine of the National Academy of Sciences
 1990: The Dickson Prize, University of Pittsburgh
 1988: The Albert Lasker Basic Medical Research Award
 1988: Louisa Gross Horwitz Prize, Columbia University
 1987-1992: The John D. MacArthur Professorship (Chair), MIT
 1987: Elected Fellow of the American Association for the Advancement of Science
 1987-1990: Elected Councilor of the National Academy of Sciences
 1986: The New York Academy of Sciences Award in Biological and Medical Sciences
 1986: The Gairdner Foundation International Award, Canada
 1986: The General Motors Research Foundation Alfred P. Sloan, Jr. Prize for Cancer Research
 1986-1987: Class of '41 Professorship (Chair), MIT
 1985: The Howard Ricketts Award, The University of Chicago
 1985: The Harvey Society Lecture
 1984: The Ada Doisy Lecture in Biochemistry
 1983: Elected to the National Academy of Sciences
 1983: Elected to the American Academy of Arts and Sciences
 1980: The Eli Lilly Award in Biological Chemistry
 1980: The National Academy of Sciences' U.S. Steel Foundation Award in Molecular Biology
 1974-1979: Recipient of an American Cancer Society Career Development Award

SERVICE

Member of the advisory committee, MIT's new Institute for Medical Engineering and Science (IMES), 2012
 Member of the HHMI Review Committee, 2011
 Member of the World Economic Forum (WEF) Technology Pioneers Program 2010 selection committee in the area of biotechnology/health, 2010
 Co-Chair of MIT's Production in an Innovation Economy (PIE) Commission, 2010
 Ad Hoc Member of the Committee to consider the future of HST at MIT, 2010
 Ad hoc member of the NIH/MIT Convergence White Paper on "The Third Revolution: Convergence of the Life Sciences, Physical Sciences and Engineering, 2010

Chair of the Scientific Review Council of the Cancer Prevention and Research Institute of Texas (CPRIT) – 2009-2012
Co-chair, NRC Committee on A New Biology for the 21st Century: Ensuring the United States Leads the Coming Biology Revolution, National Academy of Sciences, 2008-2010
Chair of the Scientific Advisory Committee, SU2C Project, AACR, 2008-
Member of the Board of FDA's Reagan-Udall Foundation, 2008-
Member of the Alfred P. Sloan Management Society of the MIT Sloan School of Management, 2007-
Elected member of the MIT Museum Advisory Board, 2005-
Member of the National Academies Committee on Scientific Communication and National Security (CSCANS), 2005-2009
Member, Lasker Jury of the Lasker Foundation, 2007-
Member of the Scientific Advisory Board of the Ontario Institute for Cancer Research (OICR), 2006-
Elected Member of the Board of Directors of the Whitehead Institute, 2005-
Member of the Gairdner Foundation Awards Committee, 2004-
Elected Member of the Corporation of Partners HealthCare Systems, Inc., 2003-
Member of the Board of Trustees of the Massachusetts General Hospital, 2002-
Member and Chair, Committee on Research and Education, Partners HealthCare Systems Inc., 2003-
Member of the Nominating Committee, Partners HealthCare Systems Inc., 2005-
Member of the Board of Scientific Governors of the Scripps Research Institute, 1999-
Member of the Science Advisory Committee for the Sandler Basic Science Program, UCSF, 1999-2007
Member of the Scientific Committee of the Ludwig Institute for Cancer Research, 1998-2008
Member of the Scientific Board of Advisors, The Van Andel Institute, 1996-
Chairman of the Scientific and Medical Advisory Board of the Huntsman Cancer Foundation, 1995-2001
Trustee and Member of the Alfred P. Sloan Foundation, 1995-2004
Chairman of the General Motors Cancer Research Foundation Awards Assembly, 1994-2006
Member of the Faculty of the Harvard-MIT Division of Health Sciences and Technology
Member of the Review Committee, The Medical Foundation (Health Resources in Action), 1982-2005, and its Chairman, 1988-2005
Member of the Advisory Council of the Molecular Biology Department, Princeton University, 1987- 2003

GOVERNMENT SERVICE

Member of the NCI Translational Science Program, 2010
Co-Chair of the National Cancer Advisory Board (NCAB) Working Group of the National Cancer Institute (NCI), NIH, 2010
Committee on Science Engineering and Public Policy (COSEPUP), Assuring the Integrity of Research Data in an Era of E-Science, National Academy of Sciences, 2007-
NHGRI Large-Scale Sequencing Program, committee member - current
NSAB committee member - current
MGC ESC committee member - current
Member of the National Cancer Advisory Board (NCAB), NCI, 1996-2000
Chairman of the National Cancer Advisory Board (NCAB), NCI, 2000-2002
Member of the NCI Advisory Committee to the Director, 2000-2001
Member of the President's Committee of Advisors on Science and Technology (PCAST), 1994-97
Member, Committee on Science, Engineering, and Public Policy (COSEPUP), 7/1/92-6/30/95

INDUSTRY

Member of the Scientific Advisory Board of Sirtris Pharmaceuticals, 2003-2010
Member of the Scientific Advisory Board of Fidelity Biosciences Group, 2004-
Member of the Board of Advisors, Polaris Venture Partners, 2002-
Member of the Advisory Board of Verastem, 2010-
Advisor and Investor in the Longwood Fund, 2010-
Member of the Board of Directors of Syros Pharmaceuticals, 2012-
Co-founder of Biogen, Inc., 1978 (now Biogen Idec), Chairman of the Scientific Board (to 2002) and member of the Board of Directors (to 2009)
Co-founder of Alnylam Pharmaceuticals (2002), Chairman of the Scientific Board and member of the Board of Directors

PROFESSIONAL SOCIETIES

The National Academy of Sciences
The Institute of Medicine
The American Association for the Advancement of Science
The American Society of Biological Chemists
The American Association for Cancer Research
The American Chemical Society

The American Society for Microbiology
The American Academy of Arts and Sciences
The American Society for Biochemistry and Molecular Biology
The American Philosophical Society

EDITORIAL BOARDS

J. Virol. (to 1985); *Mol. Cell. Biol.* (to 1985); *Virology* (to 1986); *Cell* (to 1995); *RNA* (1995-)

PUBLICATIONS

1. Bloomfield, V. A. and Sharp, P. A. Variation in intrinsic viscosity ϕ parameter with chain topology, hydrodynamic interaction and excluded volume. *Macromol.* **1**, 380 (1968).
2. Sharp, P. A. and Bloomfield, V. A. Light scattering from wormlike chains with excluded volume effects. *Biopolymers* **6**, 1201-1211 (1968).
3. Sharp, P. A. and Bloomfield, V. A. Light scattering and hydrodynamic properties of polymer chains with excluded volume effects. *J. Chem. Phys.* **49**, 4564-4566 (1968).
4. Sharp, P. A. and Bloomfield, V. A. Intrinsic viscosity of wormlike chains with excluded-volume effects. *J. Chem. Phys.* **48**, 2149-2155 (1968).
5. Sharp, P. A., and Bloomfield, V. A. Binding of proflavine and ethidium bromide to two forms of T2 bacteriophage with different sedimentation coefficients. *Biochem. Biophys. Res. Commun.* **39**, 407-413 (1970).
- 5a. Cohen, S. N., Silver, R. P., Sharp, P. A., and McCoubrey, A. E. The problems of drug-resistant pathogenic bacteria. Studies on the molecular nature of R factors. *Ann. NY Acad. Sci.* **182**, 172-187 (1971).
6. Cohen, S. N., Silver, R. P., McCoubrey, A. E., and Sharp, P. A. Isolation of cotenated forms of R factor DNA from inicells. *Nature New Biol.* **231**, 249-251 (1971).
7. Kim, J., Sharp, P. A., and Davidson, N. Electron microscope studies of heteroduplex DNA from a deletion mutant of bacteriophage phiX-174. *Proc. Natl. Acad. Sci. USA* **69**, 1948-1952 (1972).
8. Tai, H. T., Smith, C. A., Sharp, P. A., and Vinograd, J. Sequence heterogeneity in closed simian virus 40 deoxyribonucleic acid. *J. Virol.* **9**, 317-325 (1972).
9. Sharp, P. A., Hsu, M., and Davidson, N. Note on the structure of prophage λ . *J. Mol. Biol.* **71**, 499-501 (1972).
10. Sharp, P. A., Hsu, M. T., Otsubo, E., and Davidson, N. Electron microscope heteroduplex studies of sequence relations among plasmids of *Escherichia coli*. I. Structure of F-prime factors. *J. Mol. Biol.* **71**, 471-497 (1972).
11. Sambrook, J., Sharp, P. A., and Keller, W. Transcription of Simian virus 40. I. Separation of the strands of SV40 DNA and hybridization of the separated strands to RNA extracted from lytically infected and transformed cells. *J. Mol. Biol.* **70**, 57-71 (1972).
12. Ozanne, B., Sharp, P. A., and Sambrook, J. Transcription of simian virus 40. II. Hybridization of RNA extracted from different lines of transformed cells to the separated strands of simian virus 40 DNA. *J. Virol.* **12**, 90-98 (1973).
13. Sambrook, J., Sugden, B., Keller, W., and Sharp, P. A. Transcription of simian virus 40. III. Mapping of "early" and "late" species of RNA. *Proc. Natl. Acad. Sci. USA* **70**, 3711-3715 (1973).
14. Botchan, M., McKenna, G., and Sharp, P. A. Cleavage of mouse DNA by a restriction enzyme as a clue to the arrangement of genes. *Cold Spring Harbor Symp. Quant. Biol.* **38**, 383-395 (1974).
- 14a. Botchan, M., Ozanne, B., Sugden, B., Sharp, P. A., and Sambrook, J. Viral DNA in transformed cells. III. The amounts of different regions of the SV40 genome present in a line of transformed mouse cells. *Proc. Natl. Acad. Sci. USA* **71**, 4183-4187 (1974).
15. Sharp, P. A., Sugden, B., and Sambrook, J. Detection of two restriction endonuclease activities in *Haemophilus parainfluenzae* using analytical agarose-ethidium bromide electrophoresis. *Biochemistry* **12**, 3055-3063 (1973).
16. Sharp, P. A., Cohen, S. N., and Davidson, N. Electron microscope heteroduplex studies of sequence relations among plasmids of *Escherichia coli*. II. Structure of drug resistance \otimes factors and F factors. *J. Mol. Biol.* **75**, 235-255 (1973).
17. Pettersson, U., Mulder, C., Delius, H., and Sharp, P. A. Cleavage of adenovirus type 2 DNA into six unique fragments by endonuclease R-RI. *Proc. Natl. Acad. Sci. USA* **70**, 200-204 (1973).
18. Sharp, P. A., Pettersson, U., and Sambrook, J. Viral DNA in transformed cells. I. A study of the sequences of adenovirus 2 DNA in a line of transformed rat cells using specific fragments of the viral genome. *J. Mol. Biol.* **86**, 709-726 (1974).
19. Mulder, C., Sharp, P. A., Delius, H., and Pettersson, U. Specific fragmentation of DNA of adenovirus serotypes 3, 5, 7, and 12, and adeno-simian virus 40 hybrid virus Ad2+ND1 by restriction endonuclease *R.EcoRI*. *J. Virol.* **14**, 68-77 (1974).

- 19a. Sambrook, J., Sharp, P. A., Ozanne, B., and Pettersson, U. Studies on the transcription of simian virus 40 and adenovirus type 2. *Basic Life Sci.* **3**, 167-179 (1974).
20. Sharp, P. A., Gallimore, P. H., and Flint, S. J. Mapping of adenovirus 2 RNA sequences in lytically infected cells and transformed cell lines. *Cold Spring Harbor Symp. Quant. Biol.* **39**, 457-474 (1975).
21. Flint, S. J. and Sharp, P. A. Mapping of viral-specific RNA in the cytoplasm and nucleus of adenovirus 2-infected human cells. *Brookhaven Symp. Biol.* **26**, 333-358 (1975).
22. Mulder, C., Arrand, J. R., Delius, H., Keller, W., Pettersson, U., Roberts, R. J., and Sharp, P. A. Cleavage maps of DNA from adenovirus types 2 and 5 by restriction endonucleases *EcoRI* and *HpaI*. *Cold Spring Harbor Symp. Quant. Biol.* **39**, 397-400 (1975).
23. Grodzicker, T., Anderson, C., Sharp, P. A., and Sambrook, J. Conditional lethal mutants of adenovirus 2-simian virus 40 hybrids. I. Host range mutants of Ad2+ND1. *J. Virol.* **13**, 1237-1244 (1974).
24. Gallimore, P. H., Sharp, P. A., and Sambrook, J. Viral DNA in transformed cells. II. A study of the sequences of adenovirus 2 DNA in nine lines of transformed rat cell using specific fragments of the viral genome. *J. Mol. Biol.* **89**, 49-72 (1974).
25. Sambrook, J., Botchan, M., Gallimore, P., Ozanne, B., Pettersson, U., Williams, J., and Sharp, P. A. Viral DNA sequences in cells transformed by simian virus 40, adenovirus type 2 and adenovirus type 5. *Cold Spring Harbor Symp. Quant. Biol.* **39**, 615-632 (1975).
- 25a. Grodzicker, T., Williams, J., Sharp, P., and Sambrook, J. Physical mapping of temperature-sensitive mutations of adenoviruses. *Cold Spring Harbor Symp. Quant. Biol.* **39**, 439-446 (1975).
26. Sambrook, J., Williams, J., Sharp, P. A., and Grodzicker, T. Physical mapping of temperature-sensitive mutations of adenoviruses. *J. Mol. Biol.* **97**, 369-390 (1975).
27. Williams, J., Grodzicker, T., Sharp, P. A., and Sambrook, J. Adenovirus recombination: physical mapping of crossover events. *Cell* **4**, 113-119 (1975).
- 27a. Sambrook, J., Jackson, A., Keller, W., Ozanne, B., Sharp, P. A., and Sugden, B. "Transcription of SV40 in lytically infected and transformed cells." In *Tumor virus-host cell interaction*. Kolber, A.R. (editor), New York: Plenum Press, 91-116 (1975).
28. Mautner, V., Williams, J., Sambrook, J., Sharp, P. A., and Grodzicker, T. The location of the genes coding for hexon and fiber proteins in adenovirus DNA. *Cell* **5**, 93-99 (1975).
29. Flint, S. J., Wewerka-Lutz, Y., Levine, A. S., Sambrook, J., and Sharp, P. A. Adenovirus transcription. II. RNA sequences complementary to simian virus 40 and adenovirus 2 DNA in AD2+ND1- and AD2+ND3-infected cells. *J. Virol.* **16**, 662-673 (1975).
30. Flint, S. J., Gallimore, P. H., and Sharp, P. A. Comparison of viral RNA sequences in adenovirus 2-transformed and lytically infected cells. *J. Mol. Biol.* **96**, 47-68 (1975).
31. Sharp, P. A. and Flint, S. J. Adenovirus transcription. *Current Topics Microbiol. Immunol.* **74**, 137-166 (1976).
32. Flint, S. J., Berget, S. M., and Sharp, P. A. Adenovirus transcription. III. Mapping of viral RNA sequences in cells productively infected by adenovirus type 5. *Virology* **72**, 443-455 (1976).
33. Flint, S. J., Sambrook, J., Williams, J. F., and Sharp, P. A. Viral nucleic acid sequences in transformed cells. IV. A study of the sequences of adenovirus 5 DNA and RNA in four lines of adenovirus 5-transformed rodent cells using specific fragments of the viral genome. *Virology* **72**, 456-470 (1976).
34. Berget, S. M., Flint, S. J., and Sharp, P. A. "Characterization of viral, single-stranded DNA sequences in adenovirus infected cells." In *Animal virology*. (Baltimore, D., Huang, A. S., and Fox, C. F., eds.), New York: Academic Press, 81-96 (1976).
35. Berget, S. M., Flint, S. J., Williams, J. F., and Sharp, P. A. Adenovirus transcription. IV. Synthesis of viral-specific RNA in human cells infected with temperature-sensitive mutants of adenovirus 5. *J. Virol.* **19**, 879-889 (1976).
36. Flint, S. J. and Sharp, P. A. Adenovirus transcription. V. Quantitation of viral RNA sequences in adenovirus 2-infected and transformed cells. *J. Mol. Biol.* **106**, 749-774 (1976).
37. Sharp, P. A., Moore, C., and Haverty, J. L. The infectivity of adenovirus 5 DNA-protein complex. *Virology* **75**, 442-456 (1976).
38. Flint, S. J., Berget, S. M., and Sharp, P. A. Characterization of single-stranded viral DNA sequences present during replication of adenovirus types 2 and 5. *Cell* **9**, 559-571 (1976).
39. Berk, A. J. and Sharp, P. A. Ultraviolet mapping of the adenovirus 2 early promoters. *Cell* **12**, 45-55 (1977).
40. Donoghue, D. J. and Sharp, P. A. An improved bacteriophage λ vector: construction of model recombinants coding for kanamycin resistance. *Gene* **1**, 209-227 (1977).

41. Donoghue, D. J. and Sharp, P. A. "Model recombinants for the development and manipulation of EK2 phage vector systems." In *Molecular Approaches to Eucaryotic Genetic Systems: ICN-UCLA Symposia on Molecular and Cellular Biology* (G. Wilcox et al., ed.), Vol. VIII, pp. 41-53, New York: Academic Press (1977).
42. Berget, S. M., Moore, C., and Sharp, P. A. Spliced segments at the 5' terminus of adenovirus 2 late mRNA. *Proc. Natl. Acad. Sci. USA* **74**, 3171-3175 (1977).
43. Berk, A. J. and Sharp, P. A. Sizing and mapping of early adenovirus mRNAs by gel electrophoresis of S1 endonuclease-digested hybrids. *Cell* **12**, 721-732 (1977).
44. Berget, S. M. and Sharp, P. A. A spliced sequence at the 5'-terminus of adenovirus late mRNA. In *Gene Interaction and Transfer: Brookhaven Symp. Biol.* **29**, 332-344 (1977).
45. Berget, S. M., Berk, A. J., Harrison, T., and Sharp, P. A. Spliced segments at the 5' termini of adenovirus-2 late mRNA: a role for heterogeneous nuclear RNA in mammalian cells. *Cold Spring Harbor Symp. Quant. Biol.* **42**, 523-529 (1978).
46. Donoghue, D. J. and Sharp, P. A. Replication of colicin E1 plasmid DNA in vivo requires no plasmid-encoded proteins. *J. Bacteriol.* **133**, 1287-1294 (1978).
47. Berk, A. J. and Sharp, P. A. Spliced early mRNAs of simian virus 40. *Proc. Natl. Acad. Sci. USA* **75**, 1274-1278 (1978).
48. Berk, A. J. and Sharp, P. A. Structure of the adenovirus 2 early mRNAs. *Cell* **14**, 695-711 (1978).
49. Donoghue, D. J., Rothenberg, E., Hopkins, N., Baltimore, D., and Sharp, P. A. Heteroduplex analysis of the nonhomology region between Moloney MuLV and the dual host range derivative HIX virus. *Cell* **14**, 959-970 (1978).
50. Berk, A. J. and Sharp, P. A. "RNA splicing in the early mRNAs of simian virus 40 and adenovirus 2." In *Persistent viruses: ICN-UCLA Symposia on Molecular and Cellular Biology* (J. G. Stevens et al., eds), New York: Academic Press, pp. 431-444 (1978).
51. Donoghue, D. J. and Sharp, P. A. Construction of a hybrid bacteriophage-plasmid recombinant DNA vector. *J. Bacteriol.* **136**, 1192-1196 (1978).
52. Lockard, R. E., Berget, S. M., RajBhandary, U. L., and Sharp, P. A. Nucleotide sequence at the 5' terminus of adenovirus 2 late messenger RNA. *J. Biol. Chem.* **254**, 587-590 (1979).
53. Berget, S. M. and Sharp, P. A. Structure of late adenovirus 2 heterogeneous nuclear RNA. *J. Mol. Biol.* **129**, 547-565 (1979).
54. Sharp, P. A., Berk, A. J., and Berget, S. M. Transcription maps of adenovirus. In *Methods in Enzymology* **65**, 750-768 (1979).
55. Donoghue, D. J., Sharp, P. A., and Weinberg, R. A. An MSV-specific subgenomic mRNA in MSV-transformed G8-124 cells. *Cell* **17**, 53-63 (1979).
56. Manley, J. L., Sharp, P. A., and Gefter, M. L. RNA synthesis in isolated nuclei: identification and comparison of adenovirus 2 encoded transcripts synthesized in vitro and in vivo. *J. Mol. Biol.* **135**, 171-197 (1979).
57. Kronenberg, H. M., McDevitt, B. E., Majzoub, J. A., Nathans, J., Sharp, P. A., Potts, J. T., and Rich, A. Cloning and nucleotide sequence of DNA coding for bovine preproparathyroid hormone. *Proc. Natl. Acad. Sci. USA* **76**, 4981-4985 (1979).
58. Manley, J. L., Sharp, P. A., and Gefter, M. L. RNA synthesis in isolated nuclei: in vitro initiation of adenovirus 2 major late mRNA precursor. *Proc. Natl. Acad. Sci. USA* **76**, 160-164 (1979).
59. Berk, A. J., Lee, F., Harrison, T., Williams, J., and Sharp, P. A. Pre-early adenovirus 5 gene product regulates synthesis of early viral messenger RNAs. *Cell* **17**, 935-944 (1979).
60. Lee, F., Berk, A. J., Harrison, T., Williams, J., and Sharp, P. A. Regulation of early adenovirus mRNA synthesis. *ICN-UCLA Symposia* **48**, 581-594 (1979).
61. Donoghue, D. J., Sharp, P. A., and Weinberg, R. A. Comparative study of different isolates of murine sarcoma virus. *J. Virol.* **32**, 1015-1027 (1979).
62. Manley, J. L., Sharp, P. A., and Gefter, M. L. Synthesis and processing of adenovirus 2 RNA in vitro. *ICN-UCLA Symposia* **49**, 595-610 (1979).
63. Berk, A. J., Lee, F., Harrison, T., Williams, J., and Sharp, P. A. Phenotypes of adenovirus-5 host-range mutants for early-mRNA synthesis. *Cold Spring Harbor Symp. Quant. Biol.* **44**, 429-436 (1980).
- 63a. Donoghue, D. J., Goldfarb, M. P., Sharp, P. A., and Weinberg, R. A. Organization of murine sarcoma virus genomes. *Cold Spring Harbor Symp. Quant. Biol.* **44**, 721-726 (1980).
64. Sharp, P. A. Summary: molecular biology of viral oncogenes. *Cold Spring Harbor Symp. Quant. Biol.* **44**, 1305-1322 (1980).
- 64a. Sharp, P. A., Berk, A. J., and Berget, S. M. Transcription maps of adenovirus. *Methods Enzymol.* **65**, 750-768 (1980).

- Sharp, P. A., Manley, J., Fire, A., and Gefter, M. Regulation of adenovirus mRNA synthesis. *Annals NY Acad. Sci.* **354**, 1-15 (1980).
65. Manley, J. L., Handa, H., Huang, S-Y., Gefter, M., and Sharp, P. A. Transcription of animal genes in vitro. Miami Symp., pp. 361-378 (1980).
 66. Handa, H. and Sharp, P. A. Expression of early and late simian virus 40 transcripts in the absence of protein synthesis. *J. Virol.* **34**, 592-597 (1980).
 67. Sharp, P. A., Manley, J. L., Fire, A., and Gefter, M. Regulation of adenovirus mRNA synthesis. *New York Academy of Sci.* **354**, 1-15 (1980).
 68. Manley, J. L., Fire, A., Cano, A., Sharp, P. A., and Gefter, M. L. DNA-dependent transcription of adenovirus genes in a soluble whole-cell extract. *Proc. Natl. Acad. Sci. USA* **77**, 3855-3859 (1980).
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 72. Sharp, P. A. Adenovirus late transcription unit. In *Perspectives in Virol.*, Vol. II, pp. 9-30 (M. Pollard, ed.), New York: Alan R. Liss, Inc. (1981).
 73. Chu, G., and Sharp, P. A. A gene chimaera of SV40 and mouse beta-globin is transcribed and properly spliced. *Nature* **289**, 378-382 (1981).
 74. Chu, G., and Sharp, P. A. SV40 DNA transfection of cells in suspension: analysis of efficiency of transcription and translation of T-antigen. *Gene* **13**, 197-202 (1981).
 75. Sharp, P. A. Speculations on RNA splicing. *Cell* **23**, 643-646 (1981).
 76. Cepko, C. L., Hansen, U., Handa, H., and Sharp, P. A. Sequential transcription-translation of simian virus 40 by using mammalian cell extracts. *Mol. Cell. Biol.* **1**, 919-931 (1981).
 77. Lemischka, I. R., Farmer, S., Racaniello, V. R., and Sharp, P. A. Nucleotide sequence and evolution of a mammalian α -tubulin messenger RNA. *J. Mol. Biol.* **151**, 101-120 (1981).
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