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### Citations

1. **Air G. M., A. R. Coulson, J, C. Fiddes, T. Friedmann,, C. A. Hutchison III, F. Sanger, P. M. Slocombe, and A. J. Smith.** 1978. Nucleotide sequence of the F protein coding region of bacteriophage phiX174 and the amino acid sequence of its product. *J Mol Biol.* **125:** 247-54.
2. **Altman, E., K. Young,, J. Garrett, R. Altman, and R. Young.** 1985. Subcellular localization of lethal lysis proteins of bacteriophages lambda and phiX174. *J Virol.* **53:** 1008-11.
3. **Aoyama, A., and M. Hayashi.** 1985. *In vitro* packaging of plasmid DNAs into φX174 bacteriophage capsid. *Nature* **297:** 704-707.
4. **Aoyama, A., and M. Hayashi.** 1986. Synthesis of bacteriophage φX174 *in vitro*: Mechanism of switch from DNA replication to DNA packaging. *Cell* **47:**99-106.
5. **Arai K., and A. Kornberg.** 1981. Unique primed start of phage φX174 DNA replication and mobility of the primosome in a direction opposite chain synthesis. *Proc. Natl. Acad. Sci. USA* **78:** 69-73.

6. **Arai, K., R. Low, J. Kobori, J. Shlomai, and A. Kornberg.** 1981. Mechanism of dnaB protein action. V. Association of dnaB protein, protein n', and other prepriming proteins in the primosome of DNA replication.. *J. Biol. Chem.* **256:** 5273-5281.
7. **Arai, K., R. McMacken, S. Yasuda, and A. Kornberg.** 1981. Purification and properties of *Escherichia coli* protein i, a prepriming protein in  $\phi$ X174 DNA replication. *J. Biol. Chem.* **256:** 5281-5287.
8. **Axelrod, N.** 1976. Transcription of bacteriophage  $\phi$ X174 *in vitro*: analysis with restriction enzymes. *J. Mol. Biol.* **108:** 771-9.
9. **Axelrod, N.** 1976. Transcription of bacteriophage  $\phi$ X174 *in vitro*: selective initiation with oligonucleotides. *J. Mol. Biol.* **108:** 753-70.
10. **Baas, P. D., W. R. Teertstra, A. D. van Mansfeld, H. S. Jansz, G. A. van der Marel, G. H. Veeneman, and J. H. van Boom.** 1981. Construction of viable and lethal mutations in the origin of bacteriophage  $\phi$ X174 using synthetic oligodeoxyribonucleotides. *J. Mol. Biol.* **152:** 615-39.
11. **Bayer M. E., and T. W. Starkey.** 1972. The adsorption of bacteriophage  $\phi$ X174 and its interaction with *Escherichia coli*: a kinetic and morphological study. *Virology* **49:** 236-56.

12. **Benbow, R. M., C. A. Hutchison III, J. D. Fabricant, and R. L. Sinsheimer.** 1971.

Genetic map of bacteriophage  $\phi$ X174. *J. Virol.* **7:** 549-558.

13. **Benevides, J. M., P. L. Stow, L. L. Ilag, N. L. Incardona, and G. J. Thomas, Jr.**

1991. Differences in secondary structure between packaged and unpackaged single-stranded DNA of bacteriophage  $\phi$ X174 determined by Raman spectroscopy : A model for  $\phi$ X174 DNA packaging. *Biochem.* **30:** 4855-4862.

14. **Bernal R. A., S. L. Hafenstein, N. H. Olson, V. D. Bowman, P. R. Chipman, T. S.**

**Baker, B. A. Fane and M. G. Rossmann.** 2003. Structural studies of bacteriophage alpha3 assembly. *J. Mol. Biol.* **325:** 11-24.

15. **Bernhardt T. G, W. D. Roof and R. Young.** 2000. Genetic evidence that the

bacteriophage phi X174 lysis protein inhibits cell wall synthesis. *Proc. Natl. Acad. Sci. USA* **97:** 4297-302.

16. **Bernhardt, T. G., D. K. Struck, and R. Young.** 2001. The lysis protein E of  $\phi$ X174

is a specific inhibitor of the mraY-catalyzed step in peptidoglycan biosynthesis. *J. Biol. Chem.* **276:** 6093-97.

17. **Blasi, U., K. Nam, W. Lubitz, and R. Young.** 1990. Translational efficiency of

$\phi$ X174 lysis gene E is unaffected by upstream translation of the overlapping gene D reading frame. *J. Bacteriol.* **172:** 5617-23.

18. **Blattner F.R., G. Plunkett III, C. A. Bloch, N. T. Perna, V. Burland, M. Riley, J. Collado-Vides, J. D. Glasner, C. K. Rode, G. F. Mayhew, J. Gregor, N. W. Davis, H. A. Kirkpatrick, M. A. Goeden, D. J. Rose, B. Mau and Y. Shao.** 1997. The complete genome sequence of *Escherichia coli* K-12. *Science* **277**:1453-74.
19. **Bradley, D. E., C. A. Dewar, and D. Robertson.** 1969. Structural changes in *Escherichia coli* infected with a  $\phi$ X174 type bacteriophage. *J. Gen. Virol.* **5**: 113-21.
20. **Brentlinger K., S. Hafenstein, C. R. Novak, B. A. Fane, R. Birgon, R. McKenna, and M. Agbandje-McKenna.** 2002. *Microviridae*, a family divided. Isolation, characterization and genome sequence of a  $\phi$ MH2K, a bacteriophage of the obligate intracellular parasitic bacterium *Bdellovibrio bacteriovorus*. *J. Bacteriol.* **184**: 1089-1094.
21. **Brown D. T., J. M. MacKenzie, and M. E. Bayer.** 1971. Mode of host cell penetration by bacteriophage  $\phi$ X174. *J Virol.* **7**: 836-46.
22. **Brown, D. R., M. J. Roth, D. Reinberg, and J. Hurwitz.** 1984. Analysis of bacteriophage  $\phi$ X174 gene A protein mediated termination and reinitiation of  $\phi$ X174 DNA synthesis. I. Characterization of the termination and reinitiation reactions. *J. Biol. Chem.* **259**: 10545-10555.

23. Bull J.J., Badgett, M. R., and H. A. Wichman. 2000. Big-benefit mutations in a bacteriophage inhibited with heat. *Mol Biol. Evol.* **17:** 942-50.
24. **Bull J.J., M. R. Badgett, H. A. Wichman, J. P. Huelsenbeck, D. M. Hillis, A. Gulati, C. Ho, and I. J. Molineux.** 1997. Exceptional convergent evolution in a virus. *Genetics.* **147:** 1497-507.
25. **Burch, A. D. and B. A. Fane.** 2000. Efficient complementation by chimeric *Microviridae* internal scaffolding protein is a function of the COOH-terminus of the encoded protein. *Virology* **270:** 286-290.
26. **Burch, A. D. and B. A. Fane.** 2000. Foreign and chimeric external scaffolding proteins as inhibitors of *Microviridae* morphogenesis. *J Virol* **74:** 9347-52.
27. **Burch, A. D. and B. A. Fane.** 2003. Genetic analyses of putative conformation switching and cross-species inhibitory domains in *Microviridae* external scaffolding proteins. *Virology* **310:** 64-71.
28. **Burch, A. D., J. Ta, and B. A. Fane.** 1999. Cross-functional analysis of the *Microviridae* internal scaffolding protein. *J. Mol. Biol.*: **286:** 95-104.
29. **Chipman, P.R., M. Agbandje-McKenna, J. Renaudin, T. S. Baker, and R. McKenna.** 1998. Structural analysis of the Spiroplasma virus, SpV4: implications for

evolutionary variation to obtain host diversity among the Microviridae. Structure  
**6**:135-45.

30. **Colasanti, J., and D. T. Denhardt.** 1987. Mechanism of replication of bacteriophage  $\phi$ X174. XXII. Site-specific mutagenesis of the A\* gene reveals that A\* protein is not essential for  $\phi$ X174 DNA replication. *J. Mol. Biol.* **197**: 47-54.
31. **Crill, W. D., H. A. Wichman, and J. J. Bull.** 2000. Evolutionary reversals during viral adaptation to alternating hosts. *Genetics*. **154**: 27-37.
32. **Dalphin, M. E., B. A. Fane, M. O. Skidmore, and M. Hayashi.** 1992. Proteolysis of bacteriophage phi X174 prohead accessory protein gpB by *Escherichia coli* OmpT protease is not essential for phage maturation *in vivo*. *J. Bacteriol.* **174**: 2404-6.
33. **Deuerling, E., A. Schulze-Specking, T. Tomoyasu, A. Mogk, A, and B. Bukau.** 1999. Trigger factor and DnaK cooperate in folding of newly synthesized proteins. *Nature* **400**: 693-6.
34. **Ding Y., R. L. Duda, R. W. Hendrix, and J. M. Rosenberg.** 1995. Complexes between chaperonin GroEL and the capsid protein of bacteriophage HK97. *Biochemistry* **34**:14918-14931.

35. **Dokland, T., R. A. Bernal, A. Burch, S. Pletnev, B. A. Fane, and M. G.**

**Rossmann.** 1999. The role of scaffolding proteins in the assembly of the small, single-stranded DNA virus  $\phi$ X174. *J. Mol. Biol.* **288:** 595-608.

36. **Dokland, T., R. McKenna, L. L. Ilag, B. R. Bowman, N. L. Incardona, B. A.**

**Fane, and M. G. Rossmann.** 1997. Structure of a viral procapsid with molecular scaffolding. *Nature* **389:** 308-313.

37. **Dong, X.F., P. Natarajan, M. Tihova, J. E. Johnson, and A. Schneemann.** 1998.

Particle polymorphism caused by deletion of a peptide molecular switch in a quasiequivalent icosahedral virus. *J. Virol.* **72:** 6024-33.

38. **Earnshaw, W. C., and S. R. Casjens.** 1980. DNA packaging by the double-stranded

DNA bacteriophages. *Cell* **21:** 319-331.

39. **Eisenberg, S., J. Griffith, and A. Kornberg.** 1977.  $\phi$ X174 cistron A protein is a

multifunctional enzyme in DNA replication. *Proc. Natl. Acad. Sci. USA* **74:** 3198-202.

40. **Eisenberg, S., and A. Kornberg.** 1979. Purification and characterization of  $\phi$ X174

gene A protein. A multifunctional enzyme of duplex DNA replication. *J. Biol. Chem.* **254:** 5328-32.

41. **Eisenberg, S., J. F. Scott, and A. Kornberg.** 1976. An enzyme system for replication of duplex circular DNA: the replicative form of phage  $\phi$ X174. Proc. Natl. Acad. Sci. USA **73:** 1594-7.
42. **Ekechukwu, M. C., and B. A. Fane.** 1995. Characterization of the morphogenetic defects conferred by cold-sensitive prohead accessory and scaffolding proteins of  $\phi$ X174. J. Bact. **177:** 829-830.
43. **Ekechukwu, M. C., D. J. Oberste, and B. A. Fane.** 1995. Host and  $\phi$ X174 Mutations Affecting the Morphogenesis or Stabilization of the 50s Complex, a Single-Stranded DNA synthesizing Intermediate. Genetics **140:** 1167-1174.
44. **Fane, B. A.** unpublished results.
45. **Fane, B. A. and M. Hayashi.** 1991. Second-site suppressors of a cold-sensitive prohead accessory protein of bacteriophage  $\phi$ X174. Genetics **128:** 663-671.
46. **Fane, B. A., S. Shien, and M. Hayashi.** 1993. Second-site suppressors of a cold sensitive external scaffolding protein of bacteriophage  $\phi$ X174. Genetics: 134 1003-1011.

47. **Feige U, and S. Stirm.** 1976. On the structure of the *Escherichia coli* C cell wall lipopolysaccharide core and on its  $\phi$ X174 receptor region. Biochem. Biophys. Res. Commun. **71:** 566-73.
48. **Floor, E.** 1970. Interaction of morphogenetic genes of bacteriophage T4. J Mol. Biol. **47:** 293-306.
49. **Fluit, A. C., P. D. Baas, and H. S. Jansz.** 1985. The complete 30-base pair origin region of bacteriophage  $\phi$ X174 in a plasmid is both required and sufficient for *in vivo* rolling circle DNA replication. Eur. J. Biochem. **149:** 579-584.
50. **Fujisawa, H. and M. Hayashi.** 1976. Viral DNA- synthesizing intermediate complex isolated during assembly of Bacteriophage  $\phi$ X174. J. Virol. **19:** 409-415.
51. **Georgopoulos, C. P, and B. Hohn.** 1978. Identification of a host protein necessary for bacteriophage morphogenesis (the groE gene product). Proc. Natl. Acad. Sci. USA. **75:** 131-5.
52. **Godson, G. N., B. G. Barrell, R. Standen, and F. C. Fiddes.** 1978. Nucleotide sequence of bacteriophage G4 DNA. Nature **276:** 236-247.

53. **Gordon C. L., S. K. Sather, S. Casjens, and J. King.** 1994. Selective *in vivo* rescue by GroEL/ES of thermolabile folding intermediates to phage P22 structural proteins. *J. Biol. Chem.* **269:** 27941-51.

54. **Haanes, E. J., D. R. Thomsen, S. Martin, F. L. Homa, and D. E. Lowery.** 1995. The bovine herpesvirus 1 maturational proteinase and scaffold proteins can substitute for the homologous herpes simplex virus type 1 proteins in the formation of hybrid type B capsids. *J. Virol.* **69:** 7375-9.

55. **Hafenstein, S. and B. A. Fane,** unpublished results.

56. **Hafenstein, S. and B. A. Fane.** 2002.  $\phi$ X174 genome-capsid interactions influence the biophysical properties of the virion: evidence for a scaffolding-like function for the genome during the final stages of morphogenesis. *J. Virol.* **76:** 5350-6.

57. **Hamatake, R. K., A. Aoyama, and M. Hayashi.** 1985. The *J* gene of  $\phi$ X174: *In vitro* analysis of *J* protein function. *J. Virol.* **54:** 345-350.

58. **Hamatake, R. K., K. J. Buckley, and M. Hayashi.** 1988. The *J* gene of  $\phi$ X174: Isolation and characterization of a *J* gene mutant. *Mol. Gen. Genet.* **211:** 72-77.

59. **Hanninen, A. L., D. Bamford, and J. K. Bamford.** 1997. Assembly of membrane-containing bacteriophage PRD1 is dependent on GroEL and GroES. *Virology* **227**: 207-210.
60. **Hayashi, M.** personal communication.
61. **Hayashi, M.** 1978. Morphogenesis of the isometric phages. pp.531-547. In: The single stranded DNA phages. Ed: D. Denhardt, D. Dressler and D. S. Ray. Cold Spring Harbor Laboratory, New York.
62. **Hayashi, M., A. Aoyama, D. L. Richardson, and M. N. Hayashi.** 1988. Biology of the bacteriophage  $\phi$ X174. pp. 1-71. In: *The Bacteriophages*, Vol. 2, Edited by R. Calendar. Plenum Publishing Corporation, New York.
63. **Hayashi, M., F. K. Fujimura, and M. Hayashi.** 1976. Mapping of *in vivo* messenger RNAs for bacteriophage  $\phi$ X174. *Proc. Natl. Acad. Sci. USA*. **73**: 3519-23.
64. **Hayashi M, N., and M. Hayashi.** 1981. Stability of bacteriophage  $\phi$ X174-specific mRNA *in vivo*. *J. Virol.* **37**: 506-10.
65. **Hayashi M. N., and M. Hayashi.** 1985. Cloned DNA sequences that determine mRNA stability of bacteriophage  $\phi$ X174 *in vivo* are functional. *Nucleic Acids Res.* **13**: 5937-48.

66. **Hendrix R. W., L. G. Lawrence, G. F. Hatfull, and S. Casjens.** 2000. The origins and ongoing evolution of viruses. *Trends Microbiol.* **8:** 504-508.
67. **Hendrix, R. W., M. C. Smith, N. Burns, E. F. Ford, and G. F. Hatfull.** 1999. Evolutionary relationships among diverse bacteriophages and prophages: All the world's a phage. *Proc. Natl. Acad. Sci. USA* **96:** 2192-2197.
68. **Hendrix R.W., and L. Tsui.** 1978. Role of the host in virus assembly: cloning of the *Escherichia coli* groE gene and identification of its protein product. *Proc. Natl. Acad. Sci. USA* **75:**136-139.
69. **Holder K. K., and J. J. Bull.** 2001. Profiles of adaptation in two similar viruses. *Genetics.* **159:** 1393-404.
70. **Hutchison, C.A. III and R. L. Sinsheimer.** 1966. The process of infection with bacteriophage phi-X174. X. Mutations in a φX Lysis gene. *J. Mol. Biol.* **18:** 429-47.
71. **Ikeda, M., M. Wachi, H. K. Jung, F. Ishino, and M. Matsuhashi.** 1991. The *Escherichia coli* mraY gene encoding UDP-N-acetylmuramoyl-pentapeptide: undecaprenyl-phosphate phospho-N-acetylmuramoyl-pentapeptide transferase. *J. Bacteriol.* **1173:** 1021-6.

72. **Ilag, L. L., N. H. Olson, T. Dokland, C. L. Music, R. H. Cheng, Z. Brown, R.**

**McKenna, M. G. Rossmann, T. S. Baker, and N. L. Incardona.** 1995.

Bacteriophage  $\phi$ X174 procapsid: Purification and structure at 25 Å resolution.

Structure **3:** 353-363.

73. **Ilag L. L., R. McKenna, M. P. Yadav, J. N. BeMiller, N. L. Incardona N. L., and**

**M. G. Rossmann.** 1994. Calcium ion-induced structural changes in bacteriophage

$\phi$ X174. *J. Mol. Biol.* **244:** 291-300.

74. **Ilag, L. L., J. K. Tuech, L. A. Beisner, R. A. Sumrada, and N. L. Incardona.**

1993. Role of DNA-protein interactions in bacteriophage phi X174 DNA injection. *J.*

*Mol. Biol.* **229:** 671-84.

75. **Incardona, N.L.** 1983. A kinetic model for virus binding which involves release of

cell-bound virus-receptor complexes. *J. Theor. Biol.* **105:** 631-45.

76. **Incardona, N.L., and L. Selvidge.** 1973. Mechanism of adsorption and eclipse of

bacteriophage phi X174. II. Attachment and eclipse with isolated *Escherichia coli*

cell wall lipopolysaccharide. *J Virol.* **11:** 775-82.

77. **Incardona N. L., J. K. Tuech,, and G. Murti.** 1985 Irreversible binding of phage

$\phi$ X174 to cell-bound lipopolysaccharide receptors and release of virus-receptor

complexes. *Biochemistry* **24:**6439-46.

78. **Inagaki, M., A. Tanaka, R. Suzuki, H. Wakashima, T. Kawaura, S. Karita, S. Nishikawa, and N. Kashimura.** 2000. Characterization of the binding of spike H protein of bacteriophage phiX174 with receptor lipopolysaccharides. *J. Biochem. (Tokyo)* **127:** 577-83.

79. **Jazwinski, S. M. , A. A. Lindberg, and A. Kornberg.** 1975. The gene H spike protein of bacteriophages  $\phi$ X174 and S13. I. Functions in phage-receptor recognition and in transfection. *Virology* **66:** 283-93.

80. **Jazwinski, S. M. , A. A. Lindberg, and A. Kornberg..** 1975. The lipopolysaccharide receptor for bacteriophage phiX174 and S13. *Virology* **66:** 268-82.

81. **Jennings, B. and B. A. Fane.** 1997. Genetic analysis of the  $\phi$ X174 DNA binding protein. *Virology*: **227:** 370-377.

82. **Kawaura, T., M. Inagaki, S. Karita, M. Kato, S. Nishikawa, , and N. Kashimura.** 2000. Recognition of receptor lipopolysaccharides by spike G protein of bacteriophage  $\phi$ X174. *Biosci. Biotechnol. Biochem.* **64:**1993-7.

83. **Kodaira, K., K. Nakano, S. Okada, and A. Taketo.** 1992. Nucleotide sequence of the genome of bacteriophage  $\alpha$ 3: interrelationship of the genome structure and the

- gene products with those of the phages  $\phi$ X174, G4 and  $\phi$ K. Biochem. Biophysic.  
Acta. **1130**: 277-88.
84. **Kornberg, A.** 1980. DNA replication. Freeman. San Francisco.
85. **Kornberg, A.** 1982. Supplement to DNA replication. Freeman. SanFrancisco.
86. **Krol, M. A., N. H. Olson, J. Tate, J. E. Johnson, T. S. Baker, and P. Ahlquist.**  
1999. RNA-controlled polymorphism in the *in vivo* assembly of 180-subunit and 120-  
subunit virions from a single capsid protein. Proc. Natl. Acad. Sci. **96**: 13650-13655.
87. **Leffers, G., and V. B. Rao.** 1996. A discontinuous headful packaging model for  
packaging less than headful length DNA molecules by bacteriophage T4. J Mol Biol.  
258: 839-50.
88. **Liu, B. L., J. S. Everson, B. A. Fane, P. Giannikopoulou, E. Vretou, P. R.  
Lambden, and I. N. Clarke.** 2000. The molecular characterization of a  
bacteriophage (Chp2) from Chlamydia psittaci. J. Virol. 74: 3646 -9.
89. **Low, R. L., J. Shlomai, and A. Kornberg.** 1982. Protein n, a primosomal DNA  
replication protein of Escherichia coli. Purification and characterization. J. Biol.  
Chem. **257**: 6242-50.

90. **Maratea, D., K. Young, and R Young.** 1985. Deletion and fusion analysis of the phage  $\phi$ X174 lysis gene E. *Gene*. **40**: 39-46.
91. **McKenna, R.** personal communication.
92. **McKenna, R., B. R. Bowen, L. L. Ilag, M. G. Rossmann and B. A. Fane.** 1996. The atomic structure of the degraded procapsid particle of bacteriophage G4: Induced structural changes in the presence of calcium ions and functional implications. *J. Mol. Biol.* **265**: 736-750.
93. **McKenna, R., L. L. Ilag, and M. G. Rossmann.** 1994. Analysis of the single-stranded DNA bacteriophage  $\phi$ X174 at a resolution of 3.0 Å. *J. Mol. Biol.* **237**: 517-543.
94. **McKenna, R., D. Xia, P. Willingmann, L. L. Ilag, S. Krishnaswamy, M. G. Rossmann, N. H. Olson, T. S. Baker, and N. L. Incardonna.** 1992. Atomic structure of single-stranded DNA bacteriophage  $\phi$ X174 and its functional implications. *Nature* **355**: 137-143.
95. **Mukai, R., R. K. Hamatake, and M. Hayashi.** 1979. Isolation of the bacteriophage  $\phi$ X174 prohead. *Proc. Natl. Acad. Sci. USA* **76**: 4877-4881.

96. **Munekiyo, R., T. Tsuzuki, and M. Sekiguchi.** 1979. A new locus of *Escherichia coli* that determines sensitivity to bacteriophage  $\phi$ X174. *J Bacteriol.* **138:** 1038-40.
97. **Nakonechny, W. S, and C. M. Teschke.** 1998. GroEL and GroES control of substrate flux in the *in vivo* folding pathway of phage P22 coat protein. *J. Biol. Chem.* **273:** 27236-27244.
98. **Newbold J.E., and R. L. Sinsheimer.** 1970. The process of infection with bacteriophage  $\phi$ X174. XXXII. Early steps in the infection process: attachment, eclipse and DNA penetration. *J. Mol. Biol.* **49:** 49-66.
99. **Newcomb, W. W., B. L. Trus, N. Cheng, A. C. Steven, A. K. Shaeffer, D. J. Tenney, S. K. Weller, and J. C. Brown.** 2000. Isolation of Herpes Simplex Virus procapsids from cells infected with a protease-deficient mutant virus. *J. Virol.* **74:** 1663–1673.
100. **Novak C. and B. A. Fane.** 2004. The functions of the N-terminus of the  $\phi$ X174 internal scaffolding protein, a protein encoded in an overlapping reading frame in a two scaffolding protein system. *J. Mol. Biol.* **335:** 383-90.
101. **Oberste, J and B. A. Fane.** Unpublished results.

102. **Prasad, B. V. V., P. E. Prevelige, E. Marietta, R. O. Chen, D. Thomas, D., J. King, and W. Chui.** 1993. Three-dimensional transformation of capsids associated with genome packaging in a bacterial virus. *J. Mol. Biol.* **231**: 65-74.
103. **Prevelige, P. E. Jr., D. Thomas, and J. King.** 1993. Nucleation and growth phases in the polymerization of coat and scaffolding subunits into icosahedral procapsid shells. *Biophys. J.* **64**: 824-835.
104. **Renaudin, J., M. C. Paracel,, and J. M. Bove.** 1987. Spiroplasma virus 4: nucleotide sequence of the viral DNA, regulatory signals and the proposed genome organization. *J. Bacteriol.* **169**: 4950-4961.
105. **Richardson D. L., Jr., A. Aoyama, and M. Hayashi.** 1988. Proteolysis of bacteriophage  $\phi$ X174 prohead protein gpB by a protease located in the *Escherichia coli* outer membrane. *J. Bacteriol.* **170**: 5564-71.
106. **Roof, W. D., S. M. Horne, K. D. Young, and R. Young.** 1994. SlyD, a host gene required for  $\phi$ X174 lysis, is related to the FK506-binding protein family of peptidyl-prolyl cis-trans-isomerases. *J. Biol. Chem.* **269**: 2902-10.
107. **Sanger, F., A. R. Coulson, C. T. Friedmann, G. M. Air, B. G. Barrell, N. L. Brown, J. C. Fiddes, C. A. Hutchison III, P. M. Slocombe, and M. Smith.** 1978. The nucleotide sequence of bacteriophage  $\phi$ X174. *J. Mol. Biol.* **125**: 225-246.

108. **Savithri, H. S. and J. W. Erickson.** 1983. The self-assembly of the cowpea strain of southern bean mosaic virus: formation of T = 1 and T = 3 nucleoprotein particles. *Virology* **126**: 328-335.
109. **Schmidt, G.** 1973. Genetical studies on the lipopolysaccharide structure of *Escherichia coli* K12. *J. Gen. Microbiol.* **77**:151-60.
110. **Scott, J.F., S. Eisenberg,, L. L. Bertsch, and A. Kornberg. 1977.** A mechanism of duplex DNA replication revealed by enzymatic studies of phage  $\phi$ X174: catalytic strand separation in advance of replication. *Proc. Natl. Acad. Sci. USA* **74**: 193-7.
111. **Sertic V. and N. Bulgakov.** 1935. Classification et identification des typhi-phage. *C. R. Soc. Biol. Paris.* **119**: 1270-1272.
112. **Serwer P. and M. E. Pichler.** 1978. Electrophoresis of bacteriophage T7 and T7 capsids in agarose gels. *Journal of virology* **28**: 917-928.
113. **Shlomai J., and A. Kornberg.1980.** An *Escherichia coli* replication protein that recognizes a unique sequence within a hairpin region in  $\phi$ X174 DNA. *Proc. Natl. Acad. Sci. USA* **77**: 799-803.

114. **Shlomai, J., L. Polder, K. Arai, and A. Kornberg.** 1981. Replication of  $\phi$ X174 DNA with purified enzymes. I. Conversion of viral DNA to a supercoiled, biologically active duplex. *J. Biol. Chem.* **256**: 5233-8.
115. **Siden, E. J. and M. Hayashi.** 1974. Role of the gene B product in bacteriophage  $\phi$ X174 development. *J. Mol. Biol.* **89**: 1-16.
116. **Simpson, A. A., Y. Tao, P. G. Leiman, M. O. Badasso, Y. He, P. J. Jardine, N. H. Olson, M. C. Morais, S. Grimes, D. L. Anderson, T. S. Baker, and M. G. Rossmann.** 2000. Structure of the bacteriophage  $\phi$ 29 DNA packaging motor. *Nature* **408**: 745-50.
117. **Sinsheimer, R. L.** 1959. A single-stranded deoxyribonucleic acid from bacteriophage  $\phi$ X174. *J. Mol. Biol.* **1**: 43-53.
118. **Sinsheimer, R. L.** 1968. Bacteriophage  $\phi$ X174 and related viruses. *Prog. Nucleic Acid Res. Mol. Biol.* **8**: 115-69.
119. **Smith L. H., K. Grohmann, and R. L. Sinsheimer.** 1974. Nucleotide sequences of the 5' termini of  $\phi$ X174 mRNAs synthesized *in vitro*. *Nucleic Acids Res.* **1**: 1521-9.

120. **Smith L. H, and R. L. Sinsheimer.** 1976. The *in vitro* transcription units of bacteriophage  $\phi$ X174. I. Characterization of synthetic parameters and measurement of transcript molecular weights. *J. Mol. Biol.* **103:** 681-97.
121. **Smith L. H, and R. L. Sinsheimer.** 1976. The *in vitro* transcription units of bacteriophage phiX174. II. *In vitro* initiation sites of  $\phi$ X174 transcription. *J. Mol. Biol.* **103:** 699-710.
122. **Smith L. H, and R. L. Sinsheimer.** 1976. The *in vitro* transcription units of bacteriophage  $\phi$ X174. III. Initiation with specific 5' end oligonucleotides of *in vitro*  $\phi$ X174 RNA. *J Mol Biol.* **103:** 711-35.
123. **Spindler, K.R., and M. Hayashi.** 1979. DNA synthesis in *Escherichia coli* cells infected with gene H mutants of bacteriophage  $\phi$ X174. *J Virol.* **29:** 973-82.
124. **Sternberg N.** 1973. Properties of a mutant of *Escherichia coli* defective in bacteriophage lambda head formation (groE). I. Initial characterization. *J. Mol. Biol.* **76:** 1-23.
125. **Sternberg, N.** 1976 A genetic analysis of bacteriophage lambda head assembly. *Virology* **71:** 568-82.

126. **Storey, C. C., M. Lusher, and S. J. Richmond.** 1989. Analysis of the complete nucleotide sequence of Chp1, a phage which infects *Chlamydia psittaci*. *J. Gen. Virol.* **70:** 3381-3390.
127. **Sullivan, W.** 1979. New York Times, 7 May, p.D13
128. **Tessman, E. S, and P. K. Peterson.** 1976. Bacterial rep- mutations that block development of small DNA bacteriophages late in infection. *J Virol.* **20:** 400-12.
129. **Tessman, E. S, I. Tessman, and T. J. Pollock.** 1980. Gene K of bacteriophage  $\phi$ X174 codes for a nonessential protein. *J. Virol.* **33:** 557-560.
130. **Tetart, F., C. Desplats, M. Kutatladze, C. Monod, H.-W. Ackermann, and H. M. Krisch.** 2001. Phylogeny of the major head and tail genes of the wide-ranging T4-type bacteriophages. *J. Bacteriol.* **183:** 358-366.
131. **Thuman-Commike P. A., B. Greene, J. A. Malinski, M. Burbea, A. McGough, W. Chiu, and P. E. Prevelige Jr.** 1999. Mechanism of scaffolding-directed virus assembly suggested by comparison of scaffolding-containing and scaffolding-lacking P22 procapsids. *Biophys. J.* **76:** 3267-77.
132. **Tonegawa, S. and M. Hayashi.** 1970. Intermediates in the assembly of  $\phi$ X174. *J. Mol. Biol.* **48:** 19-42.

133. **Valentine, C. R., B. A. Montgomery, S. G. Miller, R. R. Delongchamp, B. A. Fane, and H. V. Malling.** 2002. Characterization of mutant spectra generated by a forward mutational assay for gene A of  $\phi$ X174 from enu-treated transgenic mouse embryonic cell line PX-2. *Environ. and Mol. Mut.* **39:** 55-68.
134. **Van Masnfeld, A. D., P. D. Baas, and H. S. Jansz.** 1984. Gene A protein of bacteriophage  $\phi$ X174 is a highly specific single-stranded DNA nuclease and binds via a tyrosyl residue to DNA after cleavage. *Adv. Exp. Med Biol.* **197:** 221-230.
135. **Van Mansfeld, A. D., S, A, Langeveld, P. J. Weisbeek , P. D. Baas, G. A. van Arkel, and H. S. Jansz.** 1979. Cleavage site of  $\phi$ X174 gene-A protein in  $\phi$ X and G4 RFI DNA. *Cold Spring Harb. Symp. Quant. Biol.* **43:** 331-4.
136. **Weisbeek P. J., J. H. van de Pol, and G. A. van Arkel.** 1983. Mapping of host range mutants of bacteriophage  $\phi$ X174. *Virology* **52:** 408-16.
137. **Wichman, H, A., L. A. Scott, C. D. Yarber, and J. J. Bull.** 2000. Experimental evolution recapitulates natural evolution. *Philos. Trans. R. Soc. Lond. B. Biol. Sci.* **355:** 1677-84.

138. **Yazaki, K.** 1981. Electron microscopic studies of bacteriophage  $\phi$ X174 intact and "eclipsing" particles, and the genome by the staining, and shadowing method. *J. Virol. Methods.* **2:**159-67.
139. **Young, K.D. and R. Young.** 1982. Lytic action of cloned  $\phi$ X174 gene E. *J. Virol.* **44:** 993-1002.
140. **Young, R.** 1992. Bacteriophage lysis: mechanism and regulation. *Microbiol. Rev.* **56:** 430-81.
141. **Zhou, Z. H., J. S. Macnab, J. Jakana, L. R. Scott, W. Chiu, and F. J. Rixon.** 1998. Identification of the sites of interaction between the scaffold and outer shell in HSV-1 capsids by difference electron imaging. *Proc. Natl. Acad. Sci. USA* **95:** 2778-2783.