

# *CURRICULUM VITAE:*



**Family Name:** Elena Fito      **Given Name:** Santiago F.

**Passport Number:** 25 396 106 N

**Date and Place of Birth:** 1967 April 17<sup>th</sup>, in València (Spain)

**Profession:** Biologist

**Professional Address:** Instituto de Biología Molecular y Celular de Plantas, CSIC-UPV. CPI 8E lab. 3.0.4, CL.

Ingeniero Fausto Elio s/n, 46022 València, Spain

**Phone:** (34) 963 877 895    **FAX** 963 877 859

**e-mail:** sfelena@ibmcp.upv.es

### 1.- ACADEMIC FORMATION:

1. B. Sc. in Biology, Universitat de València. 1985-1990.
2. M. Sc. in Biochemistry. Dissertation thesis titled "Phylogenetic analysis of viroids and viroidlike RNA satellites. Study of its variability". Universitat de València. 1990.
3. Postgraduate Course in "Networks and databases in Molecular Biology". Universitat de València. 1992.
4. Ph. D. in Molecular and Evolutionary Genetics. Dissertation thesis titled "Evolution of biological fitness in experimental populations of vesicular stomatitis virus". Universitat de València. 1991-1995.

### 2.- PROFESSIONAL EXPERIENCE

1. 1991 System Manager, Bioinformatics Service, Universitat de València
2. October 1<sup>st</sup>, 1991 to September 30<sup>th</sup>, 1995. PhD Student Fellow, Department of Genetics, Universitat de València
3. June 1<sup>st</sup> to August 31<sup>st</sup>, 1994. Visiting scientist, Department of Biology, University of California San Diego.
4. October 1<sup>st</sup>, 1995 to September 30<sup>th</sup>, 1997. Postdoctoral Fellow, Center for Microbial Ecology, Michigan State University.
5. October 1<sup>st</sup> to December 10<sup>th</sup>, 1997. Associate Researcher, Center for Microbial Ecology, Michigan State University.
6. October 17<sup>th</sup>, 1997 to September 3<sup>rd</sup>, 2001. Assistant Professor of Genetics and Evolution, Department of Genetics, Universitat de València.
7. September 3<sup>rd</sup>, 2001 to June 31<sup>st</sup>, 2002. Associate Professor of Population Genetics, Institut *Cavanilles* de Biodiversitat i Biologia Evolutiva, Universitat de València. Leave of absence.
8. July 1<sup>st</sup>, 2002 to May 1<sup>st</sup>, 2006. Senior Scientist, Instituto de Biología Molecular y Celular de Plantas, Consejo Superior de Investigaciones Científicas.
9. July 8<sup>th</sup>, 2002 to October 8<sup>th</sup>, 2002. Visiting Professor, Department of Microbiology and Molecular Genetics, Michigan State University.
10. Since May 2<sup>nd</sup>, 2006. Research Professor, Instituto de Biología Molecular y Celular de Plantas, Consejo Superior de Investigaciones Científicas.
11. Since June 1<sup>st</sup>, 2008. External Professor, Santa Fe Institute, Santa Fe (NM), USA.

### 3.- PUBLICATIONS:

Hirsch's *h* index: 36 (as in September 1<sup>st</sup>, 2011)

1. Rodríguez-Cerezo, E., Elena, S.F., Moya, A. and García-Arenal, F. (1991) High genetic stability in natural populations of the plant RNA virus U5-TMV. *J. Mol. Evol.* **32**: 328-332.

2. Elena, S.F., Dopazo, J., Diener, T.O., Flores, R. and Moya, A. (1991) Phylogeny of viroids, viroid-like satellite RNAs and the viroid-like domain of Human Hepatitis Delta virus" *Proc. Natl. Acad. Sci. USA* **88**: 5631-5634.
3. Elena, S.F. and Moya, A. (1991) Some evolutionary parameters of viroids and viroidlike satellite RNAs. *Rev. Ciènc.* **8**: 9-15.
4. Elena, S.F., González-Candelas, F. and Moya, A. (1992) Does the VP1 gene of Foot-and-Mouth Disease Virus behave as a molecular clock?. *J. Mol. Evol.* **35**: 223-229.
5. Hernández, C., Elena, S.F., Moya, A. and Flores, R. (1992) Pear blister canker viroid is a member of the apple scar skin subgroup (apscaviroids) and has also sequence homologies with viroids from other subgroups. *J. Gen. Virol.* **73**: 2503-2507.
6. Quinones, S., Bernal, D., García-Sogo, M., Elena, S.F. and Saus, J. (1992) Exon/intron structure of the human  $\alpha 3(\text{IV})$  gene encompassing the Goodpasture antigen ( $\alpha 3(\text{IV})\text{NC1}$ ): Identification of a potentially antigenic region at the triple helix/NC1 domain junction. *J. Biol. Chem.* **267**: 19780-19784. A correction in *J. Biol. Chem.* **269**: 17358 (1994).
7. Hernández, C., Daròs, J.A., Elena, S.F., Moya, A. and Flores, R. (1992) The strands of both polarities of a circular RNA from carnation self-cleave *in vitro* through alternative double- and single- hammerhead structures. *Nucl. Acids Res.* **20**: 6323-6329.
8. Clarke, D.K., Duarte, E.A., Moya, A., Elena, S.F., Domingo, E., and Holland, J.J. (1993) Genetic bottlenecks and population passages cause profound fitness differences in RNA viruses. *J. Virol.* **67**: 222-228.
9. Duarte, E. A., Clarke, D.K., Moya, A., Elena, S.F., Domingo, E. and Holland, J.J. (1993) Many trillionfold amplification of single RNA virus particles fails to overcome the Muller's ratchet effect. *J. Virol.* **67**: 3620-3623.
10. Elena, S.F., Marcos, J.F., Dopazo, J., Flores, R. and Moya, A. (1994) The viroid sequences showed intramolecular correlataion and the hability to form pseudoknots and tetraloops. In *Biología Computacional*, A. Moya (ed.), pp: 163-175. Servei de Publicacions, Universitat de València. ISBN 8437013208.
11. Clarke, D.K., Duarte, E.A., Elena, S.F., Moya, A., Domingo, E. and Holland, J.J. (1994) The Red Queen reigns in the kingdom of RNA viruses. *Proc. Natl. Acad. Sci. USA* **91**: 4821-4824.
12. Duarte, E.A., Novella, I.S., Ledesma, S., Clarke, D.K., Moya, A., Elena, S.F., Domingo, E. and Holland, J.J. (1994) The subclonal components of consensus fitness in an RNA virus clone. *J. Virol.* **68**: 4295-4301.
13. Duarte, E.A., Novella, I.S., Weaver, S.C., Domingo, E., Wain-Hobson, S., Clarke, D.K., Moya, A., Elena, S.F., de la Torre, J.C. and Holland, J.J. (1994) RNA virus quasispecies: significance for viral disease and epidemiology. *Infect. Agents Dis.* **3**: 201-214.
14. Novella, I.S., Elena, S.F., Moya, A., Domingo, E. and Holland, J.J. (1995) Size of genetic bottleneck leading to virus fitness loss is determined by mean initial population fitness. *J. Virol.* **69**: 2869-2872.
15. Novella, I.S., Duarte, E.A., Elena, S.F., Moya, A., Domingo, E. and Holland, J.J. (1995) Exponential increases of RNA virus fitness during repeated transmission. *Proc. Natl. Acad. Sci. USA* **92**: 5841-5844.
16. González-Candelas, F., Elena, S.F. and Moya, A. (1995) Approximate variance of nucleotide divergence between two sequences when restriction fragment data are available. *Genetics* **140**: 1443-1446.
17. Novella, I.S., Clarke, D.K., Quer, J., Duarte, E.A., Lee, C.H., Weaver, S.C., Elena, S.F., Moya, A., Domingo, E. and Holland, J.J. (1995) Extreme fitness differences in mammalian and insect hosts after continuous replication of vesicular stomatitis virus in sandfly cells. *J. Virol.* **69**: 6805-6809.

18. Elena, S.F., González-Candelas, F., Novella, I.S., Duarte, E.A., Clarke, D.K., Domingo, E., Holland, J.J. and Moya, A. (1996) Evolution of fitness in experimental populations of vesicular stomatitis virus. *Genetics* **142**: 673-679.
19. Elena, S. F. (1996) Evolution of biological fitness in experimental populations of vesicular stomatitis virus. Servei de Publicacions, Universitat de València. ISBN 8437022223.
20. Elena, S.F., Cooper, V.S. and Lenski, R.E. (1996) Punctuated evolution caused by selection of rare beneficial mutations. *Science* **272**: 1802-1804.
21. Domingo, E., Escarmís, C., Sevilla, N., Moya, A., Elena, S.F., Quer, J., Novella, I.S. and Holland, J.J. (1996) Basic concepts in RNA virus evolution. *FASEB J.***10**: 859-864.
22. Novella, I.S., Celnis, M. Elena, S.F., Kohn, J., Moya, A., Domingo, E. and Holland, J.J. (1996) Large population passages of vesicular stomatitis virus in interferon-treated cells select variants of only limited resistance. *J. Virol.***70**: 6414-6417.
23. Novella, I.S., Elena, S.F., Moya, A., Domingo, E. and Holland, J.J. (1996) Repeated transfer of small RNA virus populations leading to balanced fitness with infrequent stochastic drift. *Mol. Gen. Genet.* **252**: 733-738.
24. Elena, S.F., Cooper, V.S. and Lenski, R.E. (1996) Mechanisms of punctuated evolution—Reply. *Science* **274**: 1749-1750.
25. Elena, S.F., Moya, A. and González-Candelas, F. (1996) About the simulation of Molecular Evolution processes: considerations about the derivation and checking of a nucleotide divergence variance estimator when restriction fragment data are available. *Qüestió* **20**: 327-344.
26. Elena, S.F., Miralles, R. and Moya, A. (1997) Frequency-dependent selection in a mammalian RNA virus. *Evolution* **51**: 984-987.
27. Miralles, R., Moya, A. and Elena, S.F. (1997) Is group selection a factor modulating the virulence of RNA viruses?. *Genet. Res., Camb.* **68**. 165-172.
28. Elena, S.F. and Lenski, R.E. (1997) Long-term experimental evolution in *Escherichia coli*. VII. mechanisms maintaining the genetic variability within populations. *Evolution* **51**: 1058-1067.
29. Elena, S.F. and Lenski, R.E. (1997) Test of synergistic interactions between deleterious mutations in bacteria. *Nature* **390**: 395-398.
30. Elena, S.F., Dávila, M., Novella, I.S., Holland, J.J., Domingo, E. and Moya, A. (1998) Evolutionary dynamics of fitness recovery from the debilitating effects of Muller's ratchet. *Evolution* **52**: 309-314.
31. Elena, S.F., Ekunwe, L., Hajeela, N., Oden, S.A. and Lenski, R.E. (1998) Distribution of fitness effects caused by random insertion mutations in *Escherichia coli*. *Genetica* **102-103**: 359-367. Reedited in *Contemporary Issues in Genetics and Evolution*. (Eds. R.C. Woodruff and J.N. Thomson, Jr.). Kluwer Academic Publishers.
32. Miralles, R., Moya, A. and Elena, S.F. (1999) Effect of population patchiness and migration rates on the adaptation and divergence of vesicular stomatitis virus quasispecies populations. *J. Gen. Virol.* **80**: 2051-2059.
33. Miralles, R., Gerrish, P.J., Moya, A. and Elena, S. F. (1999) Clonal interference and the evolution of RNA virus. *Science* **285**: 1745-1747.
34. Elena, S.F. and Moya, A. (1999) Rate of deleterious mutation and the distribution of its effects on fitness in vesicular stomatitis virus. *J. Evol. Biol.* **12**: 1078-1088.

35. Elena, S.F. (1999) Little evidence for synergism among deleterious mutations in a non-segmented RNA virus. *J. Mol. Evol.* **49**: 703-707.
36. Elena, S.F., Miralles, R., Cuevas, J.M., Turner, P.E. and Moya, A. (2000) The two faces of mutation: extinction and adaptation in RNA viruses. *IUBMB Life.* **49**: 5-9.
37. Miralles, R., Moya, A. and Elena, S.F. (2000) Diminishing returns of population size in the rate of RNA virus adaptation. *J. Virol.* **74**: 3566-3571.
38. de la Peña, M., Elena, S.F. and Moya, A. (2000) Effect of deleterious mutation-accumulation on the fitness of RNA bacteriophage MS2. *Evolution* **54**: 686-691.
39. Moya, A., Elena, S.F., Bracho, M.A., Miralles, R. and Barrio, E. (2000) The evolution of RNA viruses: Population Genetics view. *Proc. Natl. Acad. Sci. USA.* **97**: 6967-6973. Reedited in *Variation and Evolution in Plants and Microorganisms*. (Eds. F.J. Ayala, W.M. Fitch and M.T. Clegg). National Academy of Sciences Press.
40. Turner, P.E. and Elena, S.F. (2000) Cost of host radiation in an RNA virus. *Genetics.* **156**: 1465-1470.
41. Elena, S.F., Dopazo, J., de la Peña, M., Flores, R., Diener, T.O. and Moya, A. (2001) Phylogenetic analysis of viroid and viroid-like satellite RNAs from plants: a reassessment. *J. Mol. Evol.* **53**: 155-159.
42. Elena, S.F., Sanjuán, R., Bordería, A.V. and Turner, P.E. (2001) Transmisión bottlenecks and the evolution of fitness in rapidly evolving RNA viruses. *Infect. Genet. Evol.* **1**: 41-48.
43. Miralles, R., Ferrer, R., Solé, R.V., Moya, A. and Elena, S.F. (2001) Multiple infection dynamics has pronounced effects on the fitness of RNA viruses. *J. Evol. Biol.* **14**: 654-662.
44. Elena, S.F. and Lenski, R.E. (2001) Epistasis between new mutations and genetic background, and a test of genetic canalisation. *Evolution* **55**: 1746-1752.
45. Elena, S.F. (2001) Evolutionary consequences and costs of plasmid-borne resistance to antibiotics. Chap. 11 in *Antibiotic Development and Resistance*, (eds. D. Hughes y D. Andersson). Harwood Academic Publishers. Pp. 163-180.
46. Elena, S.F. (2001) Evolutionary history conditions the timing of transmission in vesicular stomatitis virus. *Infect. Genet. Evol.* **1**: 151-159.
47. Fares, M.A., Ruiz-González, M.X., Moya, A., Elena, S.F. and Barrio, E. (2002) Endosymbiotic bacteria: GroEL buffers against deleterious mutations". *Nature* **417**: 398.
48. Elena, S.F., Sanjuán, R., Bordería, A.V. and Turner, P.E. (2002) Differential effects of vertical and horizontal transmission in the fitness of an RNA virus: A reanalysis. *Infect. Genet. Evol.* **1**: 307-309
49. Elena, S.F. (2002) Environmental restrictions to viral adaptation: an experimental approach. *Antoine van Leeuwenhoek* **81**: 135-142.
50. Elena, S.F. (2002) Evolution and adaptation of RNA viruses. *Investigación y Ciencia* (spanish edition of *Scientific American*) **313**: 46-55. Reedited in *Temas Investigación y Ciencia. Virus y Bacterias* **48**: 39-47 (2007).
51. Cuevas, J.M., Elena, S.F. and Moya, A. (2002) Molecular basis of adaptive convergence in experimental populations of RNA viruses. *Genetics* **162**: 533-542.
52. Elena, S.F. (2002) Evolution in experimental populations of RNA viruses. Chap. 26 in *Evolución: la base de la Biología*, (ed. M. Soler). Proyecto Sur Ediciones. Pp. 439-451.
53. Bordería, A.V. and Elena, S.F. (2002)  $r$  and  $K$  selection in experimental populations of vesicular stomatitis virus and the adaptation to the multiplicity of infection. *Infect. Genet. Evol.* **2**: 137-143.

54. Fares, M.A., Elena, S.F., Ortiz, J., Moya, A. and Barrio, E. (2002) A sliding window-based method to detect selective constraints in protein-coding genes and its application to RNA viruses. *J. Mol. Evol.* **55**: 509-521.
55. Saldaña, J., Elena, S.F. and Solé, R.V. (2003) Coinfection and superinfection in RNA virus populations: a selection-mutation model. *Math. Biosci.* **183**: 135-160.
56. Cuevas, J.M., Moya, A. and Elena, S.F. (2003) Evolution of RNA virus in spatially-structured heterogeneous environments. *J. Evol. Biol.* **16**: 456-466.
57. Elena, S.F., Codoñer, F.M. and Sanjuán, R. (2003) Intra-clonal variation in RNA viruses: generation, maintenance and consequences. *Biol. J. Linn. Soc.* **79**: 17-26.
58. Elena, S.F. and Lenski, R.E. (2003) Evolution experiments with micro-organisms: dynamics and genetic bases of adaptation. *Nat. Rev. Genet.* **4**: 457-469.
59. Elena, S.F., Codoñer, F.M., Cuevas, J.M. and Sanjuán, R. (2003) Adaptive dynamics during experimental evolution of RNA viruses. *Biology Int.* **44**: 75-77.
60. Elena, S.F. and de Visser, J.A.G.M. (2003) Environmental stress and the effects of mutation. *J. Biol.* **2**: 12.
61. de Visser, J.A.G.M., Hermisson, J., Wagner, G.P., Ancel-Meyers, L., Bagheri-Chaichian, H., Blanchard, J.L., Chao, L., Cheverud, J.M., Elena, S.F., Fontana, W., Gibson, G., Hansen, T.F., Krakauer, D., Lewontin, R.C., Ofria, C., Rice, S.H., von Dassow, G., Wagner, A. y Whitlock, M.C. (2003) Evolution and detection of genetic robustness. *Evolution* **57**: 1959-1972. Pre-printed *SFI Working Paper* 03-03-015.
62. Elena, S.F. and Sanjuán, R. (2003) Climb every mountain?. *Science* **302**: 2074-2075.
63. Sanjuán, R., Moya, A. and Elena, S.F. (2004) The distribution of fitness effects caused by single-nucleotide substitutions in an RNA virus. *Proc. Natl. Acad. Sci. USA* **101**: 8396-8401.
64. Sanjuán, R., Codoñer, F.M., Moya, A. and Elena, S.F. (2004) Natural selection and the organ-specific differentiation of HIV-1 V3 hypervariable region. *Evolution* **58**: 1185-1194.
65. Sanjuán, R., Moya, A. and Elena, S. F. (2004) The contribution of epistasis to the architecture of fitness in an RNA virus. *Proc. Natl. Acad. Sci. USA.* **101**: 15376-15379.
66. Cuevas, J.M., Sanjuán, R., Moya, A. and Elena, S.F. (2005) Mode of selection and experimental evolution of antiviral drugs resistance in vesicular stomatitis virus. *Infect. Genet. Evol.* **5**: 55-65.
67. Cooper, T. F., Lenski, R. E. and Elena, S. F. (2005) Parasites and mutational load: an experimental test of a pluralistic theory for the evolution of sex. *Proc. R. Soc. B.* **272**: 311-317.
68. Elena, S.F. and Sanjuán, R. (2005) RNA viruses as complex adaptive systems. *Biosystems* **81**: 31-41.
69. Elena, S.F. and Bracho, M.A. (2005) Origin and evolution of viruses. *Mètode* **45**: 95-104.
70. Sanjuán, R., Cuevas, J.M., Moya, A. and Elena, S.F. (2005) Epistasis and the adaptability of an RNA virus. *Genetics* **170**: 1001-1008.
71. Elena, S.F., and Sanjuán, R. (2005) Adaptive value of high mutation rates in RNA viruses: separating causes from consequences. *J. Virol.* **79**: 11555-11558.
72. Codoñer, F.M., Cuevas, J.M., Sánchez-Navarro, J.A., Pallás, V. and Elena, S.F. (2005) Molecular evolution of the plant virus family *Bromoviridae* based on RNA 3 encoded proteins. *J. Mol. Evol.* **61**: 697-705.

73. Elena, S.F., Whittam, T.S., Winkworth, C.L., Riley, M.A. and Lenski, R.E. (2005) "Genomic divergence of *Escherichia coli* strains, with evidence for horizontal transfer and variation in mutation rates". *Int. Microbiol.* **8**: 271-278.
74. Codoñer, F.M., and Elena, S.F. (2006) Evolutionary relationships among members of the *Bromoviridae* deduced from whole proteome analysis. *Arch. Virol.* **151**: 299-307.
75. Elena, S.F., Carrasco, P., Daròs, J.A. and Sanjuán, R. (2006) Mechanisms of genetic robustness in RNA viruses. *EMBO Reports* **7**: 168-173.
76. Codoñer, F.M., Fares, M.A., and Elena, S.F. (2006) Adaptive covariation between the coat and movement proteins of prunus necrotic ringspot virus. *J. Virol.* **80**: 5833-5840.
77. Daròs, J.A., Elena, S.F., and Flores, R. (2006) Viroids: an Ariadne's thread into the RNA labyrinth. *EMBO Reports* **7**: 593-598.
78. Sanjuán, S.F., Forment, J., and Elena, S.F. (2006) *In silico* predicted robustness of viroids RNA secondary structures. I. The effect of single mutations. *Mol. Biol. Evol.* **23**: 1427-1436.
79. Rico, P., Ivars, P., Elena, S.F., and Hernández, C. (2006) Insights into the selective pressures restricting pelargonium flower break virus genome variability: evidences for host adaptation. *J. Virol.* **80**: 8124-8132.
80. Sanjuán, R. and Elena, S.F. (2006) Epistasis correlates to genome complexity. *Proc Natl. Acad. Sci. USA* **103**: 14402-14405. Scored as *exceptional* (9) by Faculty1000.
81. Sanjuán, R., Forment, J. and Elena, S.F. (2006) *In silico* predicted robustness of viroids RNA secondary structures. II. Interaction between mutation pairs. *Mol. Biol. Evol.* **23**: 2123-2130.
82. Codoñer, F.M., Daròs, J.A., Solé, R.V. and Elena, S.F. (2006) The fittest versus the flattest: experimental confirmation of the quasispecies effect with subviral pathogens. *PLoS Pathog.* **2**(12):e136.
83. Carrasco, P., Daròs, J.A., Agudelo-Romero, P. and Elena, S.F. (2007) A real-time RT-PCR assay for quantifying the fitness of tobacco etch virus in competition experiments. *J. Virol. Meth.* **139**: 181-188.
84. de Visser, J.A.G.M. and Elena, S.F. (2007) The evolution of sex: empirical insights into the roles of epistasis and drift. *Nat. Rev. Genet.* **8**: 139-149.
85. Elena, S.F., Wilke, C.O., Ofria, C. and Lenski, R.E. (2007) Effects of population size and mutation rate on the evolution of mutational robustness. *Evolution* **61**: 666-674.
86. Martin, G., Elena, S.F. and Lenormand, T. (2007) Distribution of epistasis in microbes fit predictions from a fitness landscape model. *Nat. Genet.* **39**: 555-560.
87. Beerenwinkel, N., Pachter, L., Sturmfels, B., Elena, S.F. and Lenski, R.E. (2007) Analysis of epistatic interactions and fitness landscapes using a new geometric approach. *BMC Evol. Biol.* **7**: 60.
88. de la Iglesia, F. and Elena, S.F. (2007) Fitness declines in tobacco etch virus upon serial bottleneck transfers. *J. Virol.* **81**: 4941-4947.
89. Carrasco, P., de la Iglesia, F. and Elena, S.F. (2007) The distribution of fitness and virulence effects caused by single-nucleotide substitutions in tobacco etch virus. *J. Virol.* **81**: 12979-12984. Scored as *recommended* (3) by Faculty1000.
90. Elena, S.F. and Sanjuán, R. (2007) Virus evolution: insights from an experimental approach. *Annu. Rev. Ecol. Syst. Evol.* **38**: 27-52.

91. Elena, S.F., and Codoñer, F.M. (2007) Bioinformatic tools in phytopathology. Chap. 2 in *Herramientas Biotecnológicas en Fitopatología*, (eds. V. Pallás, P. Rodríguez-Valenzuela, J.F. Marcos, and C. Escobar) pp: 109-134. Mundi Prensa.
92. Sardanyés, J., Elena, S.F. and Solé, R.V. (2008) Simple quasispecies models for the survival-of-the-flattest effect: the role of space. *J. Theor. Biol.* **250**: 560-568. Pre-printed *SFI Working Paper* 07-11-041.
93. Herranz, M.C., Al Rwahnih, M., Sánchez-Navarro, J.A., Elena, S.F., Choueiri, E., Myrta, A. and Pallás, V. (2008) Low genetic variability in the coat and movement proteins of *American plum line pattern virus* from different geographic origins. *Arch. Virol.* **153**: 367-373.
94. Agudelo-Romero, P. and Elena, S.F. (2008) The degree of plant resilience to infection correlates with virus virulence and host-range. *Span. J. Agricult. Res.* **6**: 160-169.
95. Fiore, N., Fajardo, T.V.M., Prodan, S., Herranz, M.C., Aparicio, F., Montealegre, J., Elena, S.F., Pallás, V. y Sánchez-Navarro, J. (2008) Genetic diversity of the movement and coat protein genes of South American isolates of *Prunus necrotic ringspot virus*. *Arch. Virol.* **153**: 909-919.
96. Elena, S.F., Agudelo-Romero, P., Carrasco, P., Codoñer, F.M., Martín, S., Torres-Barceló, C. and Sanjuán, R. (2008) Experimental evolution of plant RNA viruses. *Heredity* **100**: 478-483.
97. Duran-Vila, N., Elena, S.F., Daròs, J.A., and Flores, R. (2008) Structure and evolution of viroids. Chap. 2 in *Origin and Evolution of Viruses* 2<sup>nd</sup> Edition (eds. E. Domingo, C. Parrish and J.J. Holland) pp: 43-65. Elsevier.
98. Codoñer, F.M., and Elena, S.F. (2008) The promiscuous evolutionary history of the *Bromoviridae* family. *J. Gen. Virol.* **89**: 1739-1747.
99. Agudelo-Romero, P., Carbonell, P., de la Iglesia, F., Carrera, J., Rodrigo, G., Jaramillo, A., Pérez-Amador, M.A. and Elena, S.F. (2008) Changes in the gene expression profile of *Arabidopsis thaliana* after infection with *Tobacco etch virus*. *Virol. J.* **5**: 92.
100. Agudelo-Romero, P., Carbonell, P., Pérez-Amador, M.A., and Elena, S.F. (2008) Virus adaptation by manipulation of host's gene expression. *PLoS ONE.* **3**(6): e2397.
101. Clune, J., Misevic, D., Ofria, C., Lenski, R.E., Elena, S.F., and Sanjuán, R. (2008) Natural selection fails to optimize mutation rates for long-term adaptation on rugged fitness landscapes. *PLoS Comput. Biol.* **4**(9): e1000187.
102. Elena, S.F. and Sanjuán, R. (2008) The effect of genetic robustness on evolvability in digital organisms. *BMC Evol. Biol.* **8**: 284.
103. Torres-Barceló, C., Martín, S., Daròs, J.A. and Elena, S.F. (2008) From hypo- to hyper-suppression: Effect of amino acid substitutions on the RNA silencing suppressor activity of *Tobacco etch virus* HC-Pro. *Genetics* **180**: 1039-1049.
104. Agudelo-Romero, P., de la Iglesia, F. and Elena, S.F. (2008) The pleiotropic cost of host-specialization in *Tobacco etch potyvirus*. *Infect. Genet. Evol.* **8**: 806-814.
105. Sardanyés, J., Solé, R.V. and Elena, S.F. (2008). Robustness to mutations depends on whether RNA virus replication occurs geometrically or via a stamping machine. *SFI Working Paper* 08-12-050.
106. Lin, S.S., Wu, H.W., Elena, S.F., Chen, K.C., Niu, Q.W., Yeh, S.D., Chen, C.C. and Chua, N.M. (2009). Molecular evolution of a viral non-coding sequence under the selective pressure of amiRNA-mediated silencing. *PLoS Pathog.* **5**(2): e1000312.
107. Gago, S., Elena, S.F., Flores, R. and Sanjuán, R. (2009). Extremely high mutation rate of a hammerhead viroid. *Science.* **323**: 1308. Scored as *must read* (6) by Faculty1000.

108. Elena, S.F., Agudelo-Romero, P, and Lalic, J. (2009) The evolution of viruses in multi-host fitness landscapes. *Open Virol. J.* **3**: 1-6.
109. Sanjuán, R., Agudelo-Romero, P. and Elena, S.F. (2009). Upper-limit mutation rate estimation for a plant RNA virus. *Biol. Lett.* **5**: 394-396.
110. Martín, S., Sambade, A., Rubio, L, Vives, M.C., Moya, P., Guerri, J., Elena, S.F., and Moreno, P. (2009). Contribution of recombination and selection to molecular evolution of *Citrus tristeza virus*. *J. Gen. Virol.* **90**: 1527-1538.
111. Bernard, L., Duran-Vila, N. and Elena, S.F. (2009). Effect of citrus hosts on the generation, maintenance and evolutionary fate of genetic variability of *Citrus exocortis viroid* (CEVd). *J. Gen. Virol.* **90**: 2040-2049.
112. Elena, S.F., Gómez, G. and Daròs, J.A. (2009) Evolutionary constraints to viroid evolution. *Viruses* **1**: 241-254.
113. Carrera, J., Rodrigo, G., Jaramillo, A., and Elena, S.F. (2009). Reverse-engineering *Arabidopsis thaliana* transcriptional network under changing environmental conditions. *Genome Biol.* **10**: R96.
114. Martín, S. and Elena, S.F. (2009) Application of game theory to the interaction between plant viruses during mixed infections. *J. Gen. Virol.* **90**: 2815-2820.
115. Gómez, P., Sempere, R.N., Elena, S.F., and Aranda, M.A. (2009). Mixed infections of *Pepino mosaic virus* strains modulate the evolutionary dynamics of this emergent virus. *J. Virol.* **83**: 12378-12387.
116. Sardanyés, J., Solé, R.V. and Elena, S.F. (2009). Replication mode and landscape topology affect differentially RNA virus mutational load and robustness. *J. Virol.* **83**: 12579-12589.
117. Torres-Barceló, C., Daròs, J.A. and Elena, S.F. (2010). HC-Pro hypo- and hypersuppressor mutants: differences in viral siRNA accumulation *in vivo* and siRNA binding activity *in vitro*. *Arch. Virol.* **155**: 251-254.
118. Torres-Barceló, C., Daròs, J.A. and Elena, S.F. (2010). Compensatory molecular evolution of HC-Pro, an RNA-silencing suppressor from a plant RNA virus". *Mol. Biol. Evol.* **27**: 543-551.
119. Rodrigo, G., Carrera, J., Elena, S.F. and Jaramillo, A. (2010). Robust dynamical pattern formation from a multifunctional minimal genetic circuit. *BMC Syst. Biol.* **4**: 48.
120. Elena, S.F. and Froissart, R. (2010) Preface: New experimental and theoretical approaches towards the understanding of the emergence of viral infections. *Phil. Trans. R. Soc. B* **365**: 1867-1869.
121. Lalic, J., Agudelo-Romero, P., Carrasco, P. and Elena S.F. (2010). Adaptation of *Tobacco etch potyvirus* to a susceptible ecotype of *Arabidopsis thaliana* capacitates it for systemic infection of resistant ecotypes. *Phil. Trans. R. Soc. B* **365**: 1997-2008.
122. Sardanyés, J. and Elena, S.F. (2010). Error threshold in RNA quasispecies models with complementation. *J. Theor. Biol.* **265**: 278-286.
123. Rodrigo, G., Carrera, J. and Elena, S.F. (2010). Network design meets *in silico* evolutionary biology. *Biochimie* **92**: 746-752.
124. Elena, S.F. (2010). Evolutionary and systems biology of plant RNA virus emergence. *Phytopathology* **100**: S149.
125. Elena, S.F., Solé, R.V. and Sardanyés, J. (2010). Simple genomes, complex interactions: epistasis in RNA virus. *Chaos* **20**: 026106.

126. Tromas, N. and Elena, S.F. (2010). The rate and spectrum of spontaneous mutations in a plant RNA virus. *Genetics* **185**: 983-989.
127. Elena, S.F. (2010) "Evolución viral: desentrañando los papeles de la mutación, la selección y el azar". En *Encuentros con la Ciencia II. Del Macrocosmos and Microcosmos* (ed. E. Viguera, A. Grande-Pérez & J. Lozano) pp: 27-38. Servicio de Publicaciones Málaga University.
128. Elena, S.F. (2011) Evolutionary constraints on emergence of plant RNA viruses. Chap. 14 in *Recent Advances in Plant Virology*, (eds. C. Caranta, M.A., Aranda M. Tepfer & J.J. López-Moya) pp: 283-300. Caister Academic Press.
129. Rodrigo, G., Carrera, J., Jaramillo, A. and Elena, S.F. (2011). Optimal viral strategies for bypassing RNA silencing. *J. R. Soc. Interface.* **8**: 257-268.
130. Castaño, A., Ruiz, L., Elena, S.F. and Hernández, C. (2011). Population differentiation and selective constraints in *Pelargonium line pattern virus*. *Virus Res.* **155**: 274-282.
131. Elena, S.F., Bedhomme, S., Carrasco, P., Cuevas, J.M., de la Iglesia, F., Lafforgue, G., Lalic, J., Prósper, Á., Tromas, N. and Zwart, M.P. (2011). The evolutionary genetics of emerging plant RNA viruses. *Mol. Plant-Microb. Interact.* **24**: 287-293.
132. Wu, B., Blanchard-Letort, A., Liu, Y., Zhou, G., Wang, X. and Elena, S.F. (2011). Dynamics of molecular evolution and phylogeography of *Barley yellow dwarf virus-PAV*. *PLoS ONE.* **6**: e16896.
133. Rodrigo, G. and Elena, S.F. (2011). Structural discrimination of robustness in transcriptional feedforward loops for pattern formation. *PLoS ONE.* **6**: 16904.
134. Bedhomme, S. and Elena, S.F. (2011). Virus infections suppresses *Nicotiana benthamiana* adaptive phenotypic plasticity. *PLoS ONE.* **6**: e17275.
135. Lafforgue, G., Sardanyés, J. and Elena, S.F. (2011). Differences in accumulation and virulence determine the outcome of competition during *Tobacco etch virus* coinfection. *PLoS ONE.* **6**: e17917.
136. Hasiów-Jaroszewska, B., Czerwoniec, A., Pospieszny, H., Elena, S.F. (2011). Tridimensional model structure and patterns of molecular evolution of *Pepino mosaic virus* TGBp3 protein. *Viol. J.* **8**: 318.
137. Zwart, M.P., Daròs, J.A. and Elena, S.F. (2011). One is enough: *In vivo* effective population size is dose-dependent for a plant RNA virus. *PLoS Pathog.* **7**: e1002122.
138. Martínez, F., Sardanyés, J., Elena, S.F. and Daròs, J.A. (2011). Dynamics of a plant RNA virus intracellular accumulation: stamping machine vs. geometric replication". *Genetics* **188**: 637-646.
139. Elena, S.F., Carrera, J. and Rodrigo, J. (2011). A systems biology approach to the evolution of plant-virus interactions. *Curr. Op. Plant Biol.* **14**: 372-377.
140. Lafforgue, G., Martínez, F., Sardanyés, J., de la Iglesia, F., Niu, Q.W., Lin, S.S., Solé, R.V., Chua, N.H., Daròs, J.A., and Elena, S.F. (2011). Tempo and mode of plant virus escape from RNAi-mediated resistance. *J. Virol.* **85**: 9686-9695.
141. Sardanyés, J. and Elena, S.F. (2011). Quasispecies spatial models for RNA viruses with different replication modes and infection strategies. *PLoS ONE* **6**: e24884.
142. Acosta-Leal, R., Duffy, S., Xiong, Z., Hammond, R.W. and Elena, S.F. (2011). Advances in plant virus evolution: translating evolutionary insights into better disease management. *Phytopathology* **101**: 1136-1148.
143. Zhang, X., Ryu, S.H., Xu, Y., Elbaz, T., Zekri, A.R.N., Abdelaziz, A.O., Abdel-Hamid, M., Thiers, V., Elena, S.F., Fan, X. and Di Bisceglie, A.M. (2011). The Core/E1 domain of *Hepatitis C virus* genotype 4a

in Egypt does not contain viral mutations or strains specific for hepatocellular carcinoma. *J. Clin. Virol.* **52**: 333-338.

144. Lalic, J., Cuevas, J.M., Elena, S.F. (2011). "Effect of host species on the distribution of mutational fitness effects for an RNA virus". *PLoS Genet.* **7**: e1002378.
145. De Visser, J.A.G.M., Cooper, T.F. and Elena, S.F. (2011). The causes of epistasis. *Proc. R. Soc. B* **278**: 3617-3624.
146. Macía, J., Solé, R.V. and Elena, S.F. (2011). The causes of epistasis in genetic networks. *Evolution* doi:10.1111/j.1558-5646.2011.01451.x. Pre-printed *SFI Working Paper* 11-07-027.
147. Rodrigo, G., Carrera, J., Ruiz-Ferrer, V., del Toro, F., Llave, C., Voinnet, O., Elena, S.F. (2011). Characterization of the *Arabidopsis thaliana* interactome targeted by viruses. *SFI Working Papers* 11-10-049.
148. Sardanyés, J., Martínez, F., Daròs, J.A., and Elena, S.F. (2012). Dynamics of alternative modes of RNA replication for positive-sense RNA viruses. *J. R. Soc. Interface* doi:10.1098/rsif.2011.0471.
149. Gallet, R., Cooper, T.F., Elena, S.F., and Lenormand, T. (2012). "Measuring selection coefficients below  $10^{-3}$ : method, questions and prospects". *Genetics* doi:10.1534/genetics.111.133454.
150. Bedhomme, S., Lafforgue, G., and Elena, S.F. (2012). "Multihost experimental evolution of a plant RNA virus reveals local adaptation and host specific mutations". *Mol. Biol. Evol.* doi:10.1093/molbev/msr314.

#### 4.- CONFERENCES:

1. Rodríguez-Cerezo, E., Elena, S.F., Moya, A. and García-Arenal, F. (1989) Variability and evolution of field isolates of plant RNA viruses. 2<sup>nd</sup> International Symposium on Positive Strand RNA Viruses. Viena (Austria).
2. Elena, S.F., Dopazo, J., Flores, R. and Moya, A. (1990) A first phylogeny of viroids. II Congreso Nacional de Virología. Valladolid (Spain).
3. Dopazo, J., Elena, S.F., Flores, R. and Moya, A. (1990). A first phylogeny of viroids and viroid-like satellite RNAs. International Meeting on Biology: Genome expression and pathogenesis of plant RNA viruses. Fundación Juan March. Madrid (Spain).
4. Elena, S.F., Dopazo, J., Flores, R., Diener, T.O. and Moya, A. (1990) A phylogenetic reconstruction for viroids and viroid-like satellite RNAs. VIII<sup>th</sup> International Congress of Virology (ICV-90). Berlin (Germany).
5. Elena, S.F., Flores, R. and Dopazo, J. (1990) Study of the intraspecific variability of viroids. XXV Jornadas de Genética Luso-Españolas. Alcalá de Henares (Spain).
6. González-Quintanilla, M., Elena, S.F., Buades, C., Dopazo, J. and Moya, A. (1990) Analysis of the variability of viroids and viroidlike RNA satellites. XXV Jornadas de Genética Luso-Españolas. Alcalá de Henares (Spain).
7. Elena, S.F., Rubio, L., González-Candelas, F., Domingo, E. and Moya, A. (1991) Does the phylogeny of Foot-and-Mouth Disease Virus behave as a molecular clock?. International Meeting on Biology: Workshop on Coevolution of viruses, their hosts and vectors. Fundación Juan March. Madrid (Spain).

8. Elena, S.F., Marcos, J.F., Dopazo, J., Flores, R. and Moya, A. (1992) The sequences of viroids shown intramolecular correlation and the potential to form pseudokonts and tetraloops. III Congreso Nacional de Virología. Barcelona (Spain).
9. Elena, S.F., Muñoz, A., Domingo, E. and Moya, A. (1992) A stochastic model to predict the genetic variability during a viral infection. III Congreso Nacional de Virología. Barcelona (Spain).
10. Hernández, C., Elena, S.F., Moya, A. and Flores, R. (1992) The peach blister cranker viroid has the central conserved region of *apscaviroids* and homologous sequences with other viroidal subgroups. III Congreso Nacional de Virología. Barcelona (Spain).
11. Nieto, A., Elena, S.F., Sentandreu, R. and del Castillo, L. (1992) Isolation and sequentiation of *SEC18* gen of *Candida albicans*. Biotec-92. Santiago de Compostela (Spain).
12. Member of the organization comitee of the I Reunión Nacional about "Computational analysis of the structure and evolution of biological macromolecules". Valencia (Spain), (1992).
13. Moya, A., Buades, C., Elena, S.F., González-Candelas, F., Barrio, E. and Latorre, A. (1992) The resolution of three evolutionary problems by means of the maximum-likelihood phylogenetic reconstruction method. I Reunión Nacional about "Computational analysis of the structure and evolution of biological macromolecules". Valencia (Spain).
14. Moya, A., Latorre, A., González, A., Carrió, R., Elena, S.F., Fernández-Pedrosa, V. and Martínez-Torres, D. (1993) The Population Genetics as the theoretical framework of Molecular Evolution: some examples. IX Seminarios de Genética de Poblaciones y Evolución. Granada (Spain).
15. Elena, S.F., Flores, R. and Moya, S. (1993) Phylogenetic evidence supports the concept that viroid and viroidlike satellite RNAs are relics of the RNA world. 7<sup>th</sup> ISSOL Meeting, 10<sup>th</sup> International Conference on the Origin of Life. Barcelona (Spain).
16. Elena, S.F., Flores, R. and Moya, A. (1993) Statistical evaluation of recombination events in viroids evolution. IX<sup>th</sup> International Congress of Virology (ICV-93). Glasgow (Scotland).
17. Elena, S.F., Clarke, D.K., Duarte, E.A., Domingo, E., Holland, J.J. and Moya, A. (1993) Rate of fitness evolution of VSV under different population dynamics. IX<sup>th</sup> International Congress of Virology (ICV-93). Glasgow (Scotland).
18. Moya, A., Bracho, A. and Elena, S.F. (1994) How much experimental confirmation of Population Genetical theories could be obtained with RNA viruses as model?. XXIX Jornadas de Genética Luso-Españolas. Lleida (Spain).
19. Assistance to the X Seminarios de Genética de Poblaciones y Evolución. Miraflores de la Sierra (Spain), (1995).
20. González-Candelas, F., Elena, S.F. and Moya, A. (1995) About the simulation of molecular evolutionary processes. V Conferencia española de Biometría. Valencia (Spain).
21. Elena, S.F., Cooper, V.S. and Lenski, R.E. (1996) Punctuated equilibria of quantitative characters caused by periodic selection in experimental populations of *Escherichia coli*. 19<sup>th</sup> Midwest Ecology and Evolution Conference. East Lansing, MI (USA).
22. Elena, S.F., Cooper, V.S. and Lenski, R.E. (1996) Punctuated equilibria of quantitative characters caused by periodic selection in experimental populations of *Escherichia coli*. 50<sup>th</sup> Annual Meeting of the American Sociaties for the Study of Evolution and Systematic Biologists. Saint Louis, MO (USA).

23. Elena, S.F. and Lenski, R.E. (1996) Mechanisms maintaining the genetic variability within populations in *Escherichia coli*. Forum on Environmental Remediation & Environmental Toxicology and Microbial Ecology Forum. Lansing, MI (USA).
24. Oden, S.A., Elena, S.F. and Lenski, R.E. (1996) Synergistic interactions and distribution of mutational effects on the fitness of *Escherichia coli*. Forum on Environmental Remediation & Environmental Toxicology and Microbial Ecology Forum. Lansing, MI (USA).
25. Elena, S.F., Cooper, V.S. and Lenski, R.E. (1996) Punctuated evolution caused by selection of rare beneficial mutations. Forum on Environmental Remediation & Environmental Toxicology and Microbial Ecology Forum. Lansing, MI (USA).
26. Moya, A., Bracho, A., Miralles, R., Barrio, E. and Elena, S.F. (1996) The population genetics of RNA viruses. Workshop on RNA viral quasispecies. International Meeting on Biology. Fundación Juan March. Madrid (Spain).
27. Miralles, R., Elena, S.F. and Moya, A. (1996) Is group selection a factor modulating the virulence of RNA viruses?. International Meeting on Biology. Workshop on RNA viral quasispecies. Fundación Juan March. Madrid (Spain).
28. Elena, S.F. and Lenski, R. E. (1997) Test of synergistic interactions among deleterious mutations in bacteria. 51<sup>th</sup> Annual Meeting of the American Societies of Naturalists, Systematic Biologists and for the Study of Evolution. Boulder, CO (USA).
29. Elena, S.F. and Lenski, R. E. (1997) Distribution of fitness effects caused by the random insertion of transposons into the genome of *Escherichia coli*. Gordon Research Conferences on Microbial Population Biology. Plymouth, NH (USA).
30. Gerrish, P.J. and Elena, S.F. (1998) Life history evolution of HIV. Alcalá 1<sup>st</sup> International Conference on Mathematical Ecology. Alcalá de Henares (Spain).
31. Elena, S.F., Lenski, R.E. and Moya, A. (1998) Deleterious mutations and their effect on the fitness of microbes. XII Seminarios de Genética de Poblaciones y Evolución. Begur (Spain).
32. Elena, S.F., Miralles, R., Gerrish, P.J. and Moya, A. (1999) Clonal interference and the evolution of RNA virus. VII European Society for Evolutionary Biology Congress. Barcelona (Spain).
33. Miralles, R., Moya, A. and Elena, S.F. (1999) Differences in the evolutionary outcome induced by dynamics of coinfection and superinfection in Vesicular Stomatitis Virus. VII European Society for Evolutionary Biology Congress. Barcelona (Spain).
34. Cuevas, J.M., Miralles, R., Moya, A. and Elena, S.F. (1999) Efecto de la tasa de migración y la estructura poblacional en la adaptación y divergencia del virus de la estomatitis vesicular. II Congreso de la Sociedad Española de Genética. A Coruña (Spain).
35. Member of the organization comitee of the meeting "Evolution: from molecules to ecosystems". Valencia (Spain), (2000).
36. Elena, S.F., Turner, P.E., Cuevas, J.M. and Moya, A. (2000) Adaptive radiation of RNA viruses: host-range expansion. XIII Seminarios de Genética de Poblaciones y Evolución. Baiona (Spain).
37. Cuevas, J.M., Elena, S.F. and Moya, A. (2001) Evolutionary convergence in experimental populations of RNA viruses. VIII<sup>th</sup> Congress of the European Society for Evolutionary Biology. Aarhus (Denemark). Poster.
38. Elena, S.F. (2001) Environmental restrictions to viral adaptation. An experimental approach. 9<sup>th</sup> International Symposium on Microbial Ecology. Amsterdam (The Netherlands). Invited talk.

39. Elena, S.F. (2001) Exploring the role of symbionine (GroEL) in buffering deleterious mutational effects during vertical transmission of bacteria. ESF/LESC Exploratory Workshop: "Long Term Evolution with Microbes". Aussois (France). Invited speech.
40. Member of the organization comitee of the "VII Congreso de la Sociedad Española de Virología". Valencia (Spain) (September 2001).
41. Cuevas, J.M., Moya, A. and Elena, S.F. (2001) Effect of migration rate and host-heterogeneity in the divergence and adaptation of the vesicular stomatitis virus. VII Congreso Nacional de Virología. Valencia (Spain). Poster.
42. Sanjuán, R., Bordería, A.V., Turner, P.E. and Elena, S.F. (2001) Bottlenecks during ribovirus transmission: evolution of biological fitness. VII Congreso Nacional de Virología. Valencia (Spain). Poster.
43. Fares, M.A., Elena, S.F., Moya, A. and Barrio, E. (2001) A new method for analyzing selective constraints in protein-coding genes based on sliding windows. III Congreso de la Sociedad Española de Genética. Seville (Spain). Poster.
44. Elena, S.F., Codoñer, F.M., and Sanjuán, R. (2002). Evolutionary genetics: lessons from bacteria and RNA viruses. Workshop on "Intraclonal Genetic Variation: Ecological and Evolutionary Aspects", organized by The Linnean Society of London & Royal Entomological Society. London (UK). Invited talk.
45. Workshop on "Detection and Evolution of Genetic Robustness". Santa Fe Institute. Santa Fe, NM (USA). April 2002.
46. Elena, S.F. (2002). Adaptive dynamics during experimental evolution of RNA viruses. International Symposium on "Integrative Biology and Complexity in Natural Systems", organized by IUBS/UNESCO/CNRS. Paris (France). Invited talk.
47. Elena, S.F. (2002). Is viral adaptation a self-organized phenomenon?. 2<sup>nd</sup> Workshop on Viral Evolution, organized by the S. R. Nobel Foundation. Ardmore, OK (USA). Invited talk.
48. Member of the organization comitee of the "XIV Seminarios de Genética de Poblaciones y Evolución". Gandía (Valencia, Spain) (November 2002).
49. 1<sup>st</sup> Workshop of the "Red Nacional de Virología de Plantas". Xàvea (Valencia, Spain) (March 2003).
50. Co-organizer (with G. Bell and J.A.G.M. de Visser) of the symposium "Experimental microbial evolution: the roles of sex, recombination and mutation" within the IX<sup>th</sup> of the European Society for Evolutionary Biology. Leeds (UK) (August 2003).
51. Elena, S.F. and Lenski, R.E. (2003). Experimental evolution of gene regulation and expression: the *tetAR* operon in *E. coli*. IX<sup>th</sup> European Society for Evolutionary Biology Congress. Leeds (UK). Talk.
52. Codoñer, F.M., Cuevas, J.M., Sánchez-Navarro, J.A., Pallás, V. and Elena, S.F. (2003). Molecular evolution of the plant virus family *Bromoviridae* based on RNA 3 encoded proteins. IX<sup>th</sup> European Society for Evolutionary Biology Congress. Leeds (UK). Poster.
53. Sanjuán, R., Moya, A. and Elena, S.F. (2003). Characterization of the distribution of mutational effects for an RNA virus. IX<sup>th</sup> European Society for Evolutionary Biology Congress. Leeds (UK). Poster.
54. Elena, S.F. (2003). Experimental evolution of plant viruses: disentangling the roles of mutation, selection and chance. AAB Advances in Plant Virology. Montpellier (France). Invited talk.
55. Cuevas, J.M., Moya, A. and Elena, S.F. (2003). Adaptive dynamics of RNA viruses in presence of antiviral drugs. VIII Congreso Nacional de Virología. Barcelona (Spain) Talk.

56. Codoñer, F.M., Cuevas, J.M., Sánchez-Navarro, J.A., Pallás, V. and Elena, S.F. (2003). Molecular evolution of the plant virus family *Bromoviridae* based on RNA 3 encoded proteins. VIII Congreso Nacional de Virología. Barcelona (Spain) Talk.
57. Elena, S.F., Cooper, T.F. and Lenski, R.E. (2004). Parasites and mutational load: an experimental test of a pluralistic theory for the maintenance of sex. 2<sup>nd</sup> PARTNER Workshop: Origin and spread of asexuals. European Science Foundation. Valencia (Spain). Invited talk.
58. Elena, S.F. (2004). How can microbial experimental evolution help to understand pathogens natural evolution?. VII International Meeting on Molecular Epidemiology and Evolutionary Genetics of Infectious Diseases. Valencia. Organizer.
59. Elena, S.F. (2004). Distribution of mutational effects and contribution of epistasis to fitness architecture in RNA viruses. Experimental Evolution Workshop. University of Fribourg. Fribourg (Switzerland). Invited talk.
60. Workshop on “Robustness of specialist/generalist strategies”. Santa Fe Institute. Santa Fe, NM (USA). October 2004.
61. Sanjuán, R., Moya, A. and Elena, S.F. (2004). The distribution of fitness effects caused by single-nucleotide substitutions in an RNA virus. 3<sup>rd</sup> Workshop on Viral Evolution. S. R. Nobel Foundation. Ardmore, OK (USA). Talk.
62. Sanjuán, R., Moya, A. and Elena, S.F. (2004). The contribution of epistasis to the architecture of fitness in an RNA virus. 3<sup>rd</sup> Workshop on Viral Evolution. S. R. Nobel Foundation. Ardmore, OK (USA). Talk.
63. Carrasco, P., Agudelo-Romero, P., Daròs, J.A. and Elena, S.F. (2004). Quantifying the fitness of tobacco etch Potyvirus by jeans of competition assays based on RT-qPCR with TaqMan. 3<sup>rd</sup> Workshop on Viral Evolution. S. R. Nobel Foundation. Ardmore, OK (USA). Poster.
64. Elena, S.F., Agudelo-Romero, S.P., Carrasco, M.P., Codoñer, F.M. and Daròs, J.A. (2004). Experimental evolution of plant viruses: ongoing projects and perspectives. XV Seminarios de Genética de Poblaciones y Evolución. Sigüenza (Spain). Talk.
65. Elena, S.F. (2005). Deleterious mutations, epistasis and the evolution of genome robustness in RNA viruses. 10<sup>ème</sup> Rencontres de Virologie Végétale. Aussois (France). Invited talk.
66. Elena, S.F. (2005). Experimental evolution of RNA phytoviruses. 5<sup>th</sup> EMBO Young Investigator Program Meeting. Heidelberg (Germany). Talk.
67. EMBO Young Investigator Program 3<sup>rd</sup> Symposium on Quantitative Biology. Heidelberg (Germany) (June 2005).
68. Codoñer, F.M., Daròs, J.A., Solé, R.V. and Elena, S.F. (2005). Selection for fitness versus selection for robustness in subviral RNA phytopathogens. Congreso de la Sociedad Española de Genética. Almería. Invited talk.
69. Elena, S.F. (2005). Deleterious mutations, epistasis and the evolution of genome robustness in riboviruses. V EMBO-Spain meeting. Alicante. Invited talk.
70. Elena, S.F. (2005) What can we learn about the mechanisms of genome evolution using viroids as model system? Mathematical Biosciences Institute Workshop on Aspects of Self-Organization in Evolution. Ohio State University, Columbus, OH (USA). Invited talk.
71. Elena, S.F. (2005) Individual hypersensitivity versus population robustness in RNA viruses. Workshop on Frontiers in Evolutionary Ecology. MPI für Limnologie, Plön (Germany). Invited talk.

72. Elena, S.F. (2005) Some thoughts about virus origin and the mechanisms of viral evolution. II Simposium *Omnis Cellula* Origin of Life and Evolution. Societat Catalana de Biologia, Barcelona. Invited talk.
73. Elena S.F. March 2005 Mechanisms of genetic robustness in RNA viruses. Workshop on New Directions in Infection Biology and Immunity. MPI für Infektionsbiologie, Berlin (Germany). Invited talk.
74. Elena, S.F. May 2006. The fittest versus the flattest: experimental confirmation of the quasispecies effect with subviral pathogens. 6<sup>th</sup> EMBO YIP Meeting. Vienna (Austria). Talk.
75. Co-organizer (with A. Buckling) of the symposium "Evolutionary Ecology" within the XI<sup>th</sup> International Symposium on Microbial Ecology-ISME 11. Vienna (Austria) (August 2006).
76. Elena, S.F., Carrasco, P., Daròs, J.A., and Sanjuán, R. August 2006. Evolution of mutational robustness in RNA viruses. XI<sup>th</sup> International Symposium on Microbial Ecology-ISME 11. Vienna (Austria). Invited talk.
77. Elena, S.F. and de la Iglesia, F. 2006. Fitness declines in tobacco etch virus upon serial bottleneck transfers. 4<sup>th</sup> Workshop on Viral Evolution. S. R. Nobel Foundation. Ardmore, OK (USA). Talk.
78. III Meeting EMBO Young Investigator Program Spain. Valencia, Octubre 2006. Organizer.
79. Elena, S.F. 2006. RNA virus replicate in an always fluctuating world: organ-specific adaptation, gene flow and metapopulation structure. ESF/CONGEN Workshop: "Experimental metapopulations in evolutionary biology". Montpellier (France). Invited Talk.
80. Elena, S.F. 2007. Experimental RNA virus evolution. IX<sup>th</sup> Congreso Nacional de Virología. Zaragoza (Spain). Invited closing conference.
81. Agudelo-Romero, P., Sanjuán, R. and Elena, S.F. 2007. TEV experimental evolution: evolutionary dynamics and the molecular basis of adaptation. IX<sup>th</sup> Congreso Nacional de Virología. Zaragoza (Spain). Poster.
82. Torres-Barceló, C., Martín, S., Daròs, J.A. and Elena, S.F. 2007. RNA silencing suppression as an adaptive strategy of plant RNA viruses. IX<sup>th</sup> Congreso Nacional de Virología. Zaragoza (Spain). Poster.
83. Elena, S.F., Torres-Barceló, C., Martín, S. and Daròs, J.A. 2007. "The evolution of silencing suppression and other ways viruses have to escape from silencing". First BiosafeNET Seminar *Balancing resistance and risk: plant endogenous viral sequences and virus-resistant transgenic plants as possible sources of resistance and virus emergence*. Ca' Tron di Roncade, Italia. Invited Talk.
84. Elena, S.F. 2007. "The evolution of silencing suppression activity in multifunctional proteins encoded by plant RNA viruses". 7<sup>th</sup> EMBO YIP Meeting. Heidelberg (Germany). Talk.
85. Elena, S.F. 2007. "The evolution of silencing suppression and other ways viruses have to escape from silencing". Conferences Jacques Monod on *Evolutionary Genetics of Host-Parasite Relationships*. Roscoff, Francia. Invited Talk.
86. 3<sup>rd</sup> Meeting of the Spanish Systems Biology Network (REBS). Murcia, November 2007. Organizer.
87. Rodrigo, G., Carrera, J., Jaramillo, A. and Elena, S.F. 2007. Modeling and optimization of the interaction between RNA silencing pathway and viral suppressors of silencing. CAMDA 07 Conference. Valencia (Spain). Poster.
88. Agudelo-Romero, P., Carbonell, P., Pérez-Amador, M.A. and Elena, S.F. 2007. Virus adaptation by manipulation of host's gene expression. CAMDA 07 Conference. Valencia (Spain). Poster.

89. Elena, S.F. 2008. Viral adaptation and manipulation of the transcriptome of the host. IIM-CSIC Workshop on Systems Biology. Vigo (Spain). Invited Talk.
90. Elena, S.F. 2008. Virus evolution. 1<sup>st</sup> meeting of the PVYwide Organization. Paris (France). Invited Talk.
91. Elena, S.F. 2008. Virus fitness and host switching. Technical CIDD Workshop on virus adaptation on multi-host fitness landscapes. Center for Infectious Diseases Dynamics, Pennsylvania State University, State College, PA (USA). Invited Talk.
92. Sanjuán, R., Gago, S. and Elena, S.F. 2008. Direct estimation of mutation rate for *Chrysanthemum chlorotic mottle viroid* (CChMVd). Viroid-2008 International conference on viroids and viroid-like RNAs. Berlin (Germany). Talk.
93. Elena, S.F. 2008. Virus adaptation by manipulation of host's gene expression. 5<sup>th</sup> Workshop on Viral Evolution, organized by the S. R. Nobel Foundation. Ardmore, OK (USA). Talk.
94. Torres-Barceló, C., Martín, S., DARòs, J.A. and Elena, S.F. 2008. From hypo- to hyper-suppression: effect of amino acid substitutions on the RNA silencing suppressor activity of Tobacco etch virus HC-Pro. 5<sup>th</sup> Workshop on Viral Evolution, organized by the S. R. Nobel Foundation. Ardmore, OK (USA). Poster.
95. Agudelo-Romero, P., de la Iglesia, F. and Elena, S.F. 2008. The pleiotropic cost of host-range expansion in Tobacco etch potyvirus. 5<sup>th</sup> Workshop on Viral Evolution, organized by the S. R. Nobel Foundation. Ardmore, OK (USA). Poster.
96. Sardanyés, J., Elena, S.F. and Solé, R. 2008 "Simple quasispecies models for the survival-of-the-flattest effect: the role of space". Workshop on Spatial Evolutionary Dynamics, organizado por Institut des Systèmes Complexes. Paris (France). Talk.
97. Santa Fe Institute 2008 Annual Business Network and Board of Trustees' Symposium. Santa Fe, NM (USA). Noviembre 2008. Assistance.
98. Elena, S.F. 2008 "The evolutionary genetics of plant virus emergence". *International Conference Genetic Control of Plant Pathogenic Viruses and their Vectors: Towards New Resistance Strategies*. El Puerto de Santa María (Spain). Invited Talk.
99. 4<sup>th</sup> Meeting of the Spanish Systems Biology Network (REBS). Valencia, December 2008. Organizer.
100. Elena, S.F. 2008 "Virus adaptation by manipulation of host's gene expression". 4<sup>th</sup> Meeting of the Spanish Systems Biology Network (REBS). Valencia (Spain). Talk.
101. Agudelo-Romero, P., Carbonell, P., de la Iglesia, F., Carrera, J., Rodrigo, G., Jaramillo, A., Pérez-Amador, M.A. and Elena, S.F. 2008 "Changes in the gene expression profile of *Arabidopsis thaliana* after infection with *Tobacco etch virus*". 4<sup>th</sup> Meeting of the Spanish Systems Biology Network (REBS). Valencia (Spain). Poster.
102. Rodrigo, G., Carrera, J., Jaramillo, A. and Elena, S.F. 2008 "Modeling and optimization of the interaction between RNA silencing pathway and viral suppressors of silencing". 4<sup>th</sup> Meeting of the Spanish Systems Biology Network (REBS). Valencia (Spain). Poster.
103. Daròs, J.A., Martínez, F., Lafforgue, G., de la Iglesia, F., Chua, N.H. and Elena, S.F. 2009 "Resistencia a virus de plantas mediada por microRNAs artificiales". X<sup>th</sup> Congreso Nacional de Virología. Salamanca (Spain). Talk.
104. Gómez, P., Sempere, R.N., Aranda, M.A. and Elena, S.F. 2009 "Dinámica evolutiva del virus del mosaico del pepino dulce (PepMV) en cultivos de tomate del sureste de España". X<sup>th</sup> Congreso Nacional de Virología. Salamanca (Spain). Talk.

105. Gago, S., Elena, S.F., Flores, R. and Sanjuán, R. 2009 "Un viroide con ribozima de cabeza de martillo presenta la tasa de mutación más elevada descrita para una entidad biológica". X<sup>th</sup> Congreso Nacional de Virología. Salamanca (Spain). Talk.
106. Castaño, A., Ruiz, L., Elena, S.F. and Hernández, C. 2009 "Evolución extremadamente rápida del virus del arabesco del pelargonium en un huésped experimental". X<sup>th</sup> Congreso Nacional de Virología. Salamanca (Spain). Poster.
107. Jacques Monod Conference *Understanding emergence of infectious diseases: focus on new experimental and theoretical approaches to virus evolution*. September 2009. Roscoff (France). President.
108. Elena, S.F. 2009 "Experimental evaluation of the durability of resistance to plant viruses mediated by artificial microRNAs". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Invited talk.
109. Bedhomme, S. and Elena, S.F. 2009 "Interaction between virulence and host intraspecific competition in the early steps of host switching". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
110. Blanchard, A., Delaunay, A., Elena, S.F. and Jacquot, E. 2009 "Importance of recombination during Potato virus Y (PVY) evolution". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
111. Gómez, P., Sempere, R.N., Aranda, M.A. and Elena, S.F. 2009 "Evolutionary dynamics of Pepino mosaic virus during epidemics in Southeastern Spain". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
112. Lafforgue, G., Martínez, F., de la Iglesia, F., Chua, N.H., Daròs, J.A. and Elena, S.F. 2009 "amiR-mediated resistance to virus infection: estimating the likelihood of escape mutants". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
113. Lalic, J., Carrasco, P. and Elena, S.F. 2009 "Adaptation of TEV to the susceptible ecotype *Arabidopsis thaliana* Ler increases its infectivity in other resistant ecotypes". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
114. Lalic, J., Carrasco, P. and Elena, S.F. 2009 "Systemic movement determinants of TEV in *Arabidopsis thaliana*". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
115. Sardanyés, J., Solé, R.V. and Elena, S.F. 2009 "The survival-of-the-flattest: a dynamical systems approach to viroids and RNA viruses evolution". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
116. Tromas, N. and Elena, S.F. 2009 "Experimental evolution of plant viruses: estimating the *in vivo* mutation rate of Tobacco etch potyvirus (TEV)". Conferences Jacques Monod on *Understanding emergence of infectious diseases: Focus on new experimental and theoretical approaches to virus evolution*. Roscoff, France. Poster.
117. XXXVII Congress of the Spanish Genetical Society. Torremolinos, Málaga, September 2009. Scientific board and organizer of the Evolutionary Genetics session.

118. Elena, S.F. 2009 "Virus emergentes y biología de sistemas: identificando las dianas de la adaptación viral". XXXVII Congreso de la Sociedad Española de Genética. Torremolinos, Málaga. Talk.
119. 2<sup>nd</sup> Congress of the Spanish Society of Evolutionary Biology. Valencia, December 2009. Scientific board and chairman in session 6.
120. Bedhomme, S. and Elena, S.F. 2009 "Interaction between virulence and host intraspecific competition in the early steps of host switching". II Congress of the Spanish Society of Evolutionary Biology. València, Spain. Poster.
121. Lafforgue, G., Martínez, F., de la Iglesia, F., Chua, N.H., Daròs, J.A. and Elena, S.F. 2009 "amiR-mediated resistance to virus infection: estimating the likelihood of escape mutants". II Congress of the Spanish Society of Evolutionary Biology. València, Spain. Poster.
122. Lalic, J., Carrasco, P. and Elena, S.F. 2009 "Adaptation of TEV to the susceptible ecotype *Arabidopsis thaliana* Ler increases its infectivity in other resistant ecotypes". II Congress of the Spanish Society of Evolutionary Biology. València, Spain. Talk.
123. Sardanyés, J., Solé, R.V. and Elena, S.F. 2009 "Efecto del modo de replicación y del paisaje adaptativo en la acumulación de mutaciones y en la robustez de virus de RNA". II Congress of the Spanish Society of Evolutionary Biology. València, Spain. Poster.
124. Tromas, N. and Elena, S.F. 2009 "Experimental evolution of plant viruses: estimating the in vivo mutation rate of Tobacco etch potyvirus (TEV)". II Congress of the Spanish Society of Evolutionary Biology. València, Spain. Poster.
125. Member of the organizing committee and *chairman* in on session. 5<sup>th</sup> Meeting of the Spanish Systems Biology Network (REBS). Madrid, Spain. Diciembre 2009.
126. Elena, S.F., Carrera, J. and Rodrigo, G. 2009 "An evolutionary systemic approach to virus-host interaction". 5<sup>th</sup> Meeting of the Spanish Network of Systems Biology (REBS). Madrid, Spain. Invited Talk.
127. Sardanyés, J., Solé, R.V. and Elena, S.F. 2009 "Replication mode and landscape topology differentially affect RNA virus mutational load and robustness". 5<sup>th</sup> Meeting of the Spanish Network of Systems Biology (REBS). Madrid, Spain. Talk.
128. Elena, S.F. 2010 "Experimental evolution of RNA viruses: disentangling the roles of mutation, selection and chance". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Opening conference.
129. Gago Zachert, S., Elena, S.F., Flores, R. and Sanjuán, R. 2010 "Members of both viroid families show different mutation rates". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Oral presentation.
130. Lalic, J., Agudelo-Romero, P., Carrasco, P. and Elena, S.F. 2010 "Adaptation of *Tobacco etch potyvirus* to a susceptible ecotype of *Arabidopsis thaliana* capacitates it for systemic infection of other resistant ecotypes". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Oral presentation.
131. Sardanyés, J. and Elena, S.F. 2010 "Error threshold in RNA quasispecies models with complementation." II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Oral presentation.
132. Bedhomme, S. and Elena, S.F. 2010 "Strategies of adaptation to new hosts and evolution through consecutive host switches". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Poster.

133. Tromas, N. and Elena, S.F. 2010 "Estimation of the *in vivo* mutation rate and mutant spectrum of *Tobacco etch potyvirus*". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Poster.
134. Carrera, J., Rodrigo, G. and Elena, S.F. 2010 "An evolutionary systemic approach to virus-host interactions". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Poster.
135. Martínez, F., Lafforgue, G., De la Iglesia, F., Chua, N.H., Elena, S.F. and Daròs, J.A. 2010 "Resistance to plant viruses mediated by artificial microRNAs". II Meeting of the Spanish Network of Plant Virology (REVIPLANT). Puerto de Santa María, Spain. Poster.
136. Sardanyés, J. and Elena, S.F. 2010 "Exploring the interplay between RNA virus replication mode and landscape topologies: theoretical and computational models". XVIII Seminarios de Genética de Poblaciones y Evolución. Guitiriz, Spain. Oral presentation.
137. Elena, S.F. 2010 "Vagaries of ribovirus evolution: durability of plant amiR-mediated resistance". ESF-EMBO Symposium *Antiviral applications of RNA interference*. Sant Feliu de Guíxols, Spain. Invited talk.
138. Martínez, F., Lafforgue, G., Elena, S.F. and Daròs, J.A. 2010 "Fate of artificial microRNA-mediated resistance to plant virus in mixed infections". ESF-EMBO Symposium *Antiviral applications of RNA interference*. Sant Feliu de Guíxols, Spain. Poster.
139. Lafforgue, G., Martínez, F., De la Iglesia, F., Daròs, J.A. and Elena, S.F. 2010 "AmiR-mediated resistance to virus infection: estimating the likelihood of escape mutants". ESF-EMBO Symposium *Antiviral applications of RNA interference*. Sant Feliu de Guíxols, Spain. Poster.
140. Li, S.S., Wu, H.W., Elena, S.F., Chen, K.C., Niu, Q.W., Yeh, S.D. and Chua, N.H. 2010 "Applications of artificial microRNA in plant biotechnology". ESF-EMBO Symposium *Antiviral applications of RNA interference*. Sant Feliu de Guíxols, Spain. Poster.
141. Gago, S., Elena, S.F., Flores, R. and Elena, S.F. 2010 "Nuclear and chloroplastic viroids replicate with different mutation rates". EMBO Workshop *Genomic Approaches to interactions between plant viruses, their hosts and their vectors*. Fenestrelle (Italy). Poster.
142. Lafforgue, G., Martínez, F., De la Iglesia, F., Daròs, J.A. and Elena, S.F. 2010 "AmiR-mediated resistance to virus infection: estimating the likelihood of escape mutants". EMBO Workshop *Genomic Approaches to interactions between plant viruses, their hosts and their vectors*. Fenestrelle (Italy). Poster.
143. Elena, S.F. 2010 "Emerging viruses: changes in viral genome result in a better manipulation of host regulatory networks". Collaborative Research Center Conference *Molecular Basis of Evolutionary Innovations*. Marche-en-Famenne (Belgium). Invited talk.
144. Elena, S.F. 2010 "Evolutionary and Systems Biology of plant RNA virus emergente". American Phytopathological Society 2010 Meeting. Charlotte NC (USA). Invited talk.
145. Elena, S.F. 2010 "Vagaries of ribovirus evolution: durability of plant amiR-mediated resistance". 6<sup>th</sup> Workshop on Viral Evolution, organizado por la S. R. Nobel Foundation. Ardmore, OK (USA). Invited talk.
146. Bedhomme, S., Lafforgue, G. and Elena, S.F. 2010 "Experimental evolution of generalist and specialist lineages of *Tobacco etch virus*". 6<sup>th</sup> Workshop on Viral Evolution, organizado por la S. R. Nobel Foundation. Ardmore, OK (USA). Oral presentation.

147. Lalic, J., Pròsper, A., Cuevas, J.M. and Elena, S.F. 2010 "Evaluating the distribution of mutations fitness effects for *Tobacco etch potyvirus* across hosts species". 6th Workshop on Viral Evolution, organizado por la S. R. Nobel Foundation. Ardmore, OK (USA). Poster.
148. Tromas, N., Lafforgue, G. and Elena, S.F. 2010 "MOI and its relationship to recombination rate for *Tobacco etch potyvirus*". 6th Workshop on Viral Evolution, organizado por la S. R. Nobel Foundation. Ardmore, OK (USA). Poster.
149. Lalic, J., Pròsper, À., Cuevas, J.M. and Elena, S.F. 2010 "Evaluating the distribution of mutations fitness effects for *Tobacco etch potyvirus* across hosts species". X Jornada de Virologia, Societat Catalana de Virologia. Barcelona (Spain). Oral presentation.
150. Sardanyés, J. and Elena, S.F. 2010 "Approaching to virologically realistic quasispecies models: the interplay between space, replication mode, fitness landscape, and superinfection". 6th Meeting of the Spanish Network of Systems Biology (REBS). Barcelona (Spain). Oral presentation.
151. Carrera, J., Rodrigo, G., Elena, S.F. and Jaramillo, A. 2010 "All-genome rewiring of transcription regulation under dynamic environments". International Conference on Synthetic Biology. Université d'Évry-Val-D'Essonne (Francia). Poster.
152. Kavli Institute for Theoretical Physics *Workshop on Bacterial and Viral Evolution*. University of California Santa Barbara (USA), January – March 2011. Organizer.
153. Elena, S.F. 2011 "Presentación del grupo de virología evolutiva y de sistemas (EvolSysVir)". I Reunión de la Red Española Interdisciplinar de Biofísica de Virus (BioFiViNet). Barcelona (Spain). Comunicación oral.
154. Sardanyés, J., Elena, S.F. 2011 "Approaching to virologically realistic quasispecies models: interplay between space, replication mode, fitness landscape, and superinfection". I Reunión de la Red Española Interdisciplinar de Biofísica de Virus (BioFiViNet). Barcelona (Spain). Oral presentation.
155. Elena, S.F., Carrera, J., Rodrigo, G. 2011 "A Systems Biology approach to the evolution of virus-host interactions". XII International Conference on Molecular Systems Biology. Lleida (Spain). Invited talk.
156. XI Congreso Nacional de Virología. Granada (Spain), 2011. Member of the Scientific Committee and chairman of session *Virus Replication (I)*.
157. Martínez, F., Lafforgue, G., Sardanyés, J., de la Iglesia, F., Solé, R.V., Chua, N.H., Elena, S.F., Daròs, J.A. 2011 "Durabilidad de la resistencia al potyvirus del mosaico del nabo mediada por un microRNA artificial". XI Congreso Nacional de Virología. Granada (Spain). Oral presentation.
158. Cuevas, J.M., Grande-Pérez, A., Martín, S., de la Iglesia, F., Elena, S.F. 2011 "Importancia de las citidina-deaminasas como agente mutagénico en virus de plantas". XI Congreso Nacional de Virología. Granada (Spain). Oral presentation.
159. Martínez, F., Sardanyés, J., Elena, S.F., Daròs, J.A. 2011 "Dinámica de la acumulación intracelular de un virus de RNA de plantas: replicación geométrica versus stamping machine". XI Congreso Nacional de Virología. Granada (Spain). Oral presentation.
160. Zwart, M.P., Daròs, J.A., Elena, S.F. 2011 "A single virion can cause systemic infection: a test of the independent action hypothesis model with a plant RNA virus". XI Congreso Nacional de Virología. Granada (Spain). Oral presentation.
161. Bedhomme, S., Lafforgue, G., Elena, S.F. 2011 "Experimental multihost evolution of *Tobacco etch virus*". XI Congreso Nacional de Virología. Granada (Spain). Oral presentation.

162. Sardanyés, J., Martínez, F., Daròs, J.A., Elena, S.F. 2011 "Modeling viral RNA intracellular accumulation under differential replication modes: a dynamical systems approach". XI Congreso Nacional de Virología. Granada (Spain). Poster.
163. Hillung, J., de la Iglesia, F., Cuevas, J.M., Elena, S.F. 2011 "Cuantificación de la infección primaria en un sistema experimental virus-planta". XI Congreso Nacional de Virología. Granada (Spain). Poster.
164. Lalic, J., Pròsper, À., Cuevas, J.M., Elena, S.F. 2011 "Evaluating the distribution of mutational fitness effects for Tobacco etch potyvirus across host species". XI Congreso Nacional de Virología. Granada (Spain). Poster.
165. Tromas, N., Pròsper, A., Elena, S.F. 2011 "Evolution of genetic and functional redundancy in a RNA virus". XI Congreso Nacional de Virología. Granada (Spain). Poster.
166. FEMS2011 4<sup>th</sup> Congress of European Microbiologists. Geneve (Switzerland), 2011. Organizer session *Virus Ecology and Evolution*.
167. Lalic, J., Cuevas, J.M., Elena, S.F. 2011 "Evaluating the distribution of mutational fitness effects of a plant RNA virus across different host species". FEMS2011 4<sup>th</sup> Congress of European Microbiologists. Geneva (Switzerland). Oral presentation.
168. Carrera, J., Elena, S.F., Jaramillo, A. 2011 "All-genome rewiring of transcription regulation under dynamic environments". SB5.0 5<sup>th</sup> International Meeting on Synthetic Biology. Stanford, CA (USA).
169. Gordon Research Conferences on Microbial Population Biology. Andover, NH (USA), 2011. Organizer session *Evolutionary Virology*.
170. Elena, S.F. 2011. "Evolution of virus-host interactions". Gordon Research Conference on Microbial Population Biology. Andover, NH (USA).
171. Clune, J., Misevic, D., Ofria, C., Lenski, R.E., Elena, S.F., Sanjuán, R. 2011. "Natural selection fails to optimize mutation rate for long-term adaptation in rugged fitness landscapes". European Conference on Artificial Life (ECAL 11). Paris (Francia). Oral presentation.
172. XII<sup>rd</sup> Congress of the European Society for Evolutionary Biology. Tübingen (Germany), 2011. Organizer symposium *Origin of Epistasis*.
173. XII<sup>rd</sup> Congress of the European Society for Evolutionary Biology. Tübingen (Germany), 2011. Organizer symposium *Microbe/macrobe experimental evolution*.
174. Lafforgue, G., Elena, S.F., Bedhomme, S. 2011. "Experimental multihost evolution of *Tobacco etch virus* and role of historical contingencies in evolution". XII<sup>rd</sup> Congress of the European Society for Evolutionary Biology. Tübingen (Germany). Oral presentation.
175. Bedhomme, S., Elena, S.F. 2011. "Virus infection supresses *Nicotiana benthamiana* adaptive phenotypic plasticity". XII<sup>rd</sup> Congress of the European Society for Evolutionary Biology. Tübingen (Germany). Poster.
176. Elena, S.F., Macía, J., Solé, R.V. 2011. "The causes of epistasis in genetic networks". XII<sup>rd</sup> Congress of the European Society for Evolutionary Biology. Tübingen (Germany). Poster.
177. Elena, S.F. 2011. "Evaluating the distribution of mutational fitness effects of a plant RNA virus accross different host species". An Evolutionary Journey II. Universidad Carlos III. Madrid (Spain). Invited talk.

178. Lalic, J., Elena, S.F. 2011. "Magnitude and sign epistasis among deleterious mutations in a positive-sense plant RNA virus". XI Jornada de Virologia, Societat Catalana de Biologia. Barcelona (Spain). Oral presentation.

## 5.- PARTICIPATION IN FUNDED RESEARCH PROJECTS:

1. Project PB91-0051-C02-02 "Genetic variability of RNA viruses: Biological fitness of variants and the effect of deleterious mutations accumulation" funded by the Comisión Interministerial de Ciencia y Tecnología, Spain. (1992-1995). PI: Prof. Andrés Moya.
2. Project PB94-0034-C02-02 "Genetic variability of RNA viruses: Population dynamics between viral variants" funded by the Comisión Interministerial de Ciencia y Tecnología, Spain (1995-1998). PI: Prof. Andrés Moya.
3. Project PM97-0060-C02-02 "Genetic variability of RNA viruses: Molecular basis and quantification of biological fitness gains" funded by the Dirección General de Investigación Sanitaria, Spain (1998-2001). PI: Prof. Andrés Moya.
4. Project 1FD97-2328 "Molecular epidemiology of high-prevalence viral diseases: large-scale study of the hepatitis C virus in the Valencian Community" funded by the FEDER program of the European Union (2000-2002). PI: Prof. Andrés Moya.
5. Project GV01-65 "Effect of epistasis and genome complexity in the dynamics of viral evolution" funded by the Generalitat Valenciana, Spain (2002-2003). PI: Dr. Santiago F. Elena.
6. Project BMC2001-3096 "Adaptive evolution and genetic variability in viral coinfections" funded by the Ministerio de Ciencia y Tecnología, Spain (2002). PI: Prof. Andrés Moya.
7. Project BMC2003-00066 "Experimental evolution of plant viruses: characterization of mutational effects and the evolutionary implications of genome segmentation" funded by the Ministerio de Ciencia y Tecnología, Spain (2003 - 2006). PI: Dr. Santiago F. Elena.
8. Project GRUPOS03/064 for R+D consolidated groups funded by the Generalitat Valenciana (2003 - 2004). PI: Prof. Ricardo Flores.
9. Project GV04B280 "PTGS suppression as an adaptive response in plant viruses" funded by the Generalitat Valenciana, Spain (2004-2005). PI: Dr. Santiago F. Elena.
10. EMBO Young Investigator Program - MEC Special actions BFU2004-22607-E and BFU2005-23720-E/BMC (2005 - 2007). PI: Dr. Santiago F. Elena.
11. Joint Action with France HF2005-0284 "Coevolutionary synergistic interactions among phytoviruses" financed by the Spanish Ministerio de Educación y Ciencia (2006 - 2007). Spanish PI: Dr. Santiago F. Elena. French co-PI: Dr. Rémy Froissart (CNRS-INRA-CIRAD, Montpellier)
12. Project BFU2005-24995-E/BMC "Spanish Network for Systems Molecular Biology" funded by the Ministerio de Educación y Ciencia, Spain (2006 - 2007). PI: Santiago F. Elena
13. Project ACOMP2006/015 Complementary funds to R+D Projects funded by the Generalitat Valenciana, Spain (2006). PI: Prof. Santiago F. Elena.
14. Project BFU2006-14819-CO2-01/BMC "Experimental evolution of plant viruses: deleterious mutations, mechanisms of genomic robustness and the evolution of the interaction with plant defence mechanisms" funded by the Ministerio de Educación y Ciencia, Spain (2007-2009). PI: Prof. Santiago F. Elena.

15. Project ACOMP2007/263 Complementary funds to R+D Projects funded by the Generalitat Valenciana, Spain (2007). PI: Prof. Santiago F. Elena.
16. Joint Action with France HF2007-0098 "The interplay between mutation and adaptation across fixed or variable environments in RNA viruses" financed by the Spanish Ministerio de Educación y Ciencia (2008 - 2009). Spanish PI: Prof. Santiago F. Elena. French co-PI: Dr. Guillaume Martin (CNRS-IRD, Montpellier).
17. Project RGP12/2008 "Evolutionary implications of virus-encoded gene-silencing suppression" financed by the Human Frontier Science Program Organization. 2008-2011. PI: Prof. Santiago F. Elena.
18. Project ACOMP2009/023 Complementary funds to R+D Projects funded by the Generalitat Valenciana, Spain (2009). PI Prof. Santiago F. Elena.
19. Project BFU2009-06993/BMC "Evolutionary systems virology of plant RNA virus emergence" funded by the Ministerio de Ciencia e Innovación, Spain (2010-2012). PI: Prof. Santiago F. Elena.
20. Project ACOMP2010/089 Complementary funds to R+D Projects funded by Generalitat Valenciana (2010). PI: Santiago F. Elena Fito.
21. Project PROMETEO2010/019 "Evolutionary implications of virus-encoded gene-silencing suppression" funded by Generalitat Valenciana (2010-2012). PI: Santiago F. Elena.
22. FORMOSA Joint Action 2010TW0015 "Evaluation of the durability of artificial microRNA-mediated strategies for plant resistance to RNA viruses" funded by CSIC-Taiwan NCS (2011-2013). Spanish PI: José A. Daròs Arnau. Taiwanish co-PI: Dr. Shih-Shun Lin (NCS Institute of Biotechnology).
23. I+D Contract with Laboratorios Hipra SA "Study of the genetic variability of the reproductive and respiratory syndrome virus (PRRSV)". PI: Santiago F. Elena.
24. Project JTF22371 "Experimental evolution of genome architecture and complexity in RNA virus" funded by John Templeton Foundation (2012-2013). PI: Santiago F. Elena Fito.

## **6.- DIRECTION OF THESIS AND SUPERVISSION OF POSTDOCTORAL AND VISITING RESEARCHERS:**

### *PhD Theses*

1. M. Rosario Miralles Borrego. "Efecto del tamaño y estructuración poblacional en poblaciones experimentales del virus de la estomatitis vesicular (VSV)". May 9<sup>th</sup>, 2000. Qualification: Excellent *Cum Laude*.
2. José M. Cuevas Torrijos "Restricciones adaptativas durante la evolución experimental del virus de la estomatitis vesicular (VSV)". September 24<sup>th</sup>, 2003. Qualification: Excellent *Cum Laude*.
3. Rafael Sanjuán Verdeguer. "Robustez genética, epistasia y evolución de los virus de RNA". February 15<sup>th</sup>, 2005. Qualification: Excellent *Cum Laude*.
4. Francisco M. Codoñer Cortés. "Evolución molecular y relaciones taxonómicas de la familia *Bromoviridae* de virus de plantas". September 15<sup>th</sup>, 2006. Qualification: Excellent *Cum Laude*.
5. S. Patricia Agudelo Romero. "Evolución experimental de la gama de huéspedes del virus del grabado del tabaco (TEV)". April 28<sup>th</sup>, 2009. Qualification: Excellent *Cum Laude*.

6. Clara Torres Barceló. "Evolución molecular de la proteína HC-Pro del TEV, supresor del silenciamiento del RNA". September 22<sup>nd</sup>, 2009. Qualification: Excellent *Cum Laude*.
7. Guillermo Rodrigo Tárraga. "Computational design and designability of gene regulatory networks". December 19<sup>th</sup>, 2011. Qualification: Excellent *Cum Laude*.
8. Javier Carrera Montesinos. 2007-.
9. Nicolas Tromas. Fellow from the Spanish Ministerio de Educación y Ciencia, 2007-.
10. Jasna Lalic. Fellow from the JAE-CSIC, 2008-.
11. Guillaume Lafforgue. 2008-.
12. Fernando Martínez García. Fellow from the UPV, 2008-.

#### *Master Theses*

1. M. Rosario Miralles Borrego. "Caracterización de los niveles de selección en poblaciones experimentales del virus de la estomatitis vesicular". December 18<sup>th</sup>, 1995. Universitat de València. Qualification: Excellent.
2. Rafael Sanjuán Verdeguer. "Pruebas estadísticas para filogenias obtenidas mediante matrices de distancias: cómo evaluar las ramas cuando otros métodos no son aplicables". September 15<sup>th</sup>, 2002. Universitat de València. Qualification: Excellent.
3. Francisco Manuel Codoñer Cortés. "Estructura poblacional intra-paciente del HIV-1". September 15<sup>th</sup>, 2002. Universitat de València. Qualification: Excellent.
4. Clara Torres Barceló. "La supresión del silenciamiento génico post-transcripcional como estrategia evolutiva de los virus de plantas". December 14<sup>th</sup>, 2005. Universitat de València. Qualification: Excellent.
5. Josep Sardanyés i Cayuela. "Error threshold and sensitivity to mutations depend on whether RNA virus replication occurs geometrically or via a stamping machine". June 30<sup>th</sup>, 2008. Universitat Pompeu Fabra. Qualification: Excellent.
6. Pablo Hernández Alonso. "Evolution of gene duplications in context of genetic networks of increasing complexity". September 19<sup>th</sup>, 2011. Universidad Politécnica de Valencia. Qualification: Excellent.

#### *Postdoctoral students*

1. Dr. Paul E. Turner. Postdoctoral student. Postdoctoral fellow from the National Academy of Sciences-NATO, 1999.
2. Dr. M. Purificación Carrasco Valero. Postdoctoral associated. September 2003 - Decembre 2007 + November 2008 - .
3. Dr. Rafael Sanjuán Verdeguer. Postdoctoral I3P CSIC research associate. April 2005-December 2007.
4. Dr. Susana Martin García. Postdoctoral fellow from the Juan de la Cierva program (MEC). January 2006 - December 2008.
5. Dr. Alexandra Blanchard-Letort. Postdoctoral fellow from the INRA (France). September 2008 - August 2009.
6. Dr. Stéphanie Bedhomme. JAE-Doc Postdoctoral Associate (CSIC). May 2009 - .

7. Dr. Josep Sardanyés Cayuela. Postdoctoral fellow from UPF. September 2009 - .
8. Dr. Mark Zwart. Postdoctoral fellow RUBICON program, Dutch government. March 2010 - .
9. Dr. José M. Cuevas Torrijos. JAE-Doc Postdoctoral Associate (CSIC). May 2010 - .

*Visiting scientists*

1. Dr. Howard Ochman. Sabbatic from the University of Arizona. August 2000 – January 2001.
2. Antonio V. Bordería Giner. PhD student. Fellow from the Spanish National Institutes of Health (ISCIII), January-July 2001.
3. Sherri Goings. PhD student Michigan State University. January-June 2007.
4. Jeffrey Clune. PhD student. Michigan State University. January-July 2007.
5. Guillaume Lafforgue. FEMS Fellow. September-December 2007.
6. Jasna Lalic. FEMS Fellow. September-December 2007.
7. Dr. Romain Gallet. CNRS. March-May 2009.
8. Dr. Ana Grande-Pérez. University of Málaga. June-September 2009.
9. Dr. Virginia Ruiz-Ferrer. CNRS. June-July 2009.
10. Carme Zaragoza. JAE-Intro Fellow. July-September 2009.
11. Enric Cosme. JAE-Intro Fellow. July-September 2009.
12. Dr. Alfonso Jaramillo, CNRS. August 2008, 2009.
13. Dr. Beata Hasiów-Jaroszewska. Institute of Plant Protection - Polish National Research Institute. EMBO Short Term Fellow, January – March 2011.
14. Dr. Beilei Wu. Institute of Plant Protection – Chinese Academy of Agricultural Sciences. April – June 2011.

**7.- INVITED TALKS:**

1. “Viroids, viroidlike domain of the hepatitis  $\delta$  factor and RNA satellites: study of primitive living forms”. July 30<sup>th</sup>, 1991. Centro de Biología Molecular *Severo Ochoa* (Madrid, Spain).
2. “Evolutionary Biology of RNA viruses”. November 20<sup>th</sup>, 1991. Ecology and Evolutionary Biology Program, Michigan State University (East Lansing MI, USA).
3. “Beneficial and deleterious mutations in microbes”. March 3<sup>rd</sup>, 1999. Instituto Gulbenkian do Ciência (Oeiras, Portugal).
4. “Deleterious mutations, epistasis and sex in bacteria and RNA virus”. March 9<sup>th</sup>, 1999. Centro Nacional de Biología Fundamental, Instituto de Salud Carlos III (Majadahonda, Spain).
5. “Deleterious mutations, epistasis and sex in bacteria and RNA virus”. April 9<sup>th</sup>, 1999. Instituto de Biología Molecular y Celular de Plantas (València, Spain).

6. "The two faces of mutation: extinction and adaptation in viruses". November 22<sup>nd</sup>, 1999. Caja de Ahorros del Mediterráneo (València, Spain).
7. "The two faces of mutation: extinction and adaptation in viruses". March 23<sup>rd</sup>, 2000. Caja de Ahorros del Mediterráneo (Torrent, Spain).
8. "Experimental evolution in viruses: Is there a limit to viral adaptation? We hope so!". October 20<sup>th</sup>, 2000. Institut für Tierzucht und Genetik, Veterinärmedizinische Universität Wien.
9. "Extinction and adaptation in the viral world". February 1<sup>st</sup>, 2001. Department of Ecology and Evolutionary Biology, University of Arizona (Tucson AZ, USA).
10. "Why endosymbiotic bacteria had not got extincted a thousand and one times by genomic mutational load?". February 1<sup>st</sup> 2002. Instituto de Biología Molecular y Celular de Plantas (València, Spain).
11. "Adaptive dynamics during experimental evolution of RNA viruses". May 30<sup>th</sup>, 2002. Centre d'Etudes sur le Polymorphisme des Micro-Organismes (CNRS-IRD, Montpellier, France).
12. "Experimental evolution of RNA viruses: exploring the roles of mutation, selection and chance". March 10<sup>th</sup>, 2004. Instituto de Biomedicina de Valencia (València, Spain).
13. "Experimental RNA virus evolution". May 25<sup>th</sup>, 2004. Friedrich Miescher Institute (Novartis) (Basel, Switzerland).
14. "Distribution of mutational effects and contribution of epistasis to the genetic architecture of RNA virus fitness". April 15<sup>th</sup>, 2005. IRSI-Caixa Foundation (Badalona, Spain).
15. "Individual hypersensitivity versus population robustness in RNA virus". November 9<sup>th</sup>, 2005. Centre d'Ecologie Fonctionnelle et Evolutive (CNRS, Montpellier, France).
16. "Individual hypersensitivity versus population robustness in RNA viruses". February 6<sup>th</sup>, 2006. Sainsbury Laboratory-John Innes Center (Norwich, UK).
17. "Mecanismos de robustez mutacional en virus de RNA". February 10<sup>th</sup>, 2006. Department of Biotechnology, Universidad Complutense de Madrid (Madrid, Spain).
18. "Individual hypersensitivity versus population robustness in RNA viruses". February 17<sup>th</sup>, 2006. Department of Biology, National University of Ireland (Maynooth, Ireland).
19. "Mecanismos de robustez mutacional en virus de RNA". May 11<sup>st</sup>, 2006. Centro Nacional de Biotecnología, CSIC (Madrid, Spain).
20. "Mechanisms of mutational robustness in RNA viruses". July 5<sup>th</sup>, 2006. Amsterdam Medical Center (Amsterdam, The Netherlands).
21. "Mechanisms of genetic robustness in RNA viruses". September 19<sup>th</sup>, 2006. MPI for Developmental Biology (Tübingen, Germany).
22. "Neutrality and robustness in RNA subviral pathogens: *in silico* and *in vivo* studies". September 21<sup>st</sup>, 2006. Institute for Evolution and Biodiversity, University of Münster (Münster, Germany).
23. "Genomic complexity and mutational robustness". November 24<sup>th</sup>, 2006. Centro Andaluz de Biología del Desarrollo, CSIC-UPO (Seville, Spain).
24. "Una aproximación experimental a la evolución viral: desentrañando los papeles de la mutación, la selección y el azar". December 4<sup>th</sup>, 2006. IV<sup>th</sup> Cycle of Conferences "Encuentros con la Ciencia" organized by Ámbito Cultural de El Corte Inglés and the Universidad de Málaga (Málaga, Spain).

25. "Mechanisms of genetic robustness in RNA viruses". October 22<sup>nd</sup>, 2007. Department of Pathobiology, University of Illinois (Urbana IL, USA).
26. "Mechanisms of genetic robustness in RNA viruses". January 11<sup>st</sup>, 2008. Instituto Gulbenkian de Ciência (Oeiras, Portugal).
27. "Mechanisms of genetic robustness in RNA viruses". February 12<sup>nd</sup>, 2008. Evolutionary Biology Program, Ludwig Maximilian University (Munich, Germany).
28. "Experimental RNA virus evolution". May 5<sup>th</sup>, 2008. Rockefeller University (New York, USA).
29. "Evolutionary Biology of host-range expansion in RNA viruses". September 30<sup>th</sup>, 2008. Wageningen University and Research (Wageningen, The Netherlands).
30. "Experimental RNA virus evolution: disentangling the roles of mutation, selection and chance". March 13<sup>rd</sup>, 2009 Santa Fe Institute (Santa Fe NM, USA).
31. "Virus emergentes y Biología de Sistemas: identificando las dianas de la adaptación viral". May 8<sup>th</sup>, 2009. Estación Experimental El Zaidín, CSIC (Granada, Spain).
32. "Darwin meets RNA viruses: what small bugs can tell us about big evolutionary questions?". June 2<sup>nd</sup>, 2009. Plant Research International (Wageningen, The Netherlands).
33. "Biología evolutiva de la expansión de la gama de huéspedes en virus de RNA". June 26<sup>th</sup>, 2009. Instituto Valenciano de Investigaciones Agrarias (Valencia, Spain).
34. "Evolutionary Genetics and Systems Biology of RNA virus emergence". October 13<sup>rd</sup>, 2009. Department of Ecology and Evolutionary Biology, Yale University (New Haven CT, USA).
35. "Evolutionary systems virology of plant RNA virus emergence". November 5<sup>th</sup>, 2009. INRA Toulouse (France).
36. "Mechanisms of genetic robustness in RNA viruses". November 19<sup>th</sup>, 2009. Wageningen Ecology and Evolution Seminars, Wageningen University and Research (Wageningen, The Netherlands).
37. "Evolución a tiempo real: el uso de los virus de RNA como modelos experimentales en Biología Evolutiva". November 24<sup>th</sup>, 2009. Seminarios de Evolución, Universidad de Vigo (Vigo, Spain).
38. "Experimental evolution of RNA viruses: disentangling the role of mutation, selection and chance" March 24<sup>th</sup>, 2010. Institute of Science and Technology Austria, Vienna (Austria).
39. "Darwin y virus de RNA: ¿qué respuestas a grandes cuestiones nos pueden dar estos pequeños seres?". April 16<sup>th</sup>, 2010. Instituto de Bioingeniería, Universidad Miguel Hernández (Elche, Spain).
40. "Silenciamiento del RNAs y evolución de virus". May 28<sup>th</sup>, 2010. Instituto de Hortofruticultura Subtropical y Mediterránea La Mayora, CSIC-U. Málaga (Algarrobo-Costa, Spain).
41. "Causas y consecuencias de la evolución de virus de RNA". June 17<sup>th</sup>, 2010. Laboratorios Veterinarios Hipra S.A. (Àmers).
42. "Mechanisms of mutational robustness in RNA viruses". September 14<sup>th</sup>, 2010. Plant Protection Institute, Chinese Academy of Agronomical Sciences. Beijing (P.R. China).
43. "Evolutionary genetics of host shifting". September 15<sup>th</sup>, 2010. Plant Protection Institute, Chinese Academy of Agronomical Sciences. Beijing (P.R. China).

44. "AmiRNA-mediated resistance to viruses and ways they have to escape". September 17<sup>th</sup>, 2010. Plant Protection Institute, Chinese Academy of Agronomical Sciences. Beijing (P.R. China).
45. "Evolutionary systems virology of plant RNA virus emergence". October 26<sup>th</sup>, 2010. iBEST Program, University of Idaho (Moscow ID, USA).
46. "Evolutionary systems biology of RNA virus host range expansion". November 12<sup>nd</sup>, 2010. Department of Life Science, University of Manchester (Manchester, UK).
47. "The evolutionary genetics of emerging viruses". February 28<sup>th</sup>, 2011. Kavlin Institute of Theoretical Physics, University of California Santa Barbara (Goleta CA, USA).
48. "Biología de sistemas evolutiva de la interacción virus-huésped". May 27<sup>th</sup>, 2011. Centro Nacional de Biotecnología-CSIC (Madrid, Spain).
49. "Biología de sistemas evolutiva de la interacción virus-huésped". June 17<sup>th</sup>, 2011. Centre de Recerca Agrigenòmica, CSIC-IRTA-UAB-UB (Barcelona, Spain).
50. "Darwin meets RNA viruses: what small bugs can tell us about big evolutionary questions?". September 1<sup>st</sup>, 2011. Academia Sinica-National Taiwan University (Taipei, Taiwan).
51. "Eficiencia del silenciamiento del RNA como estrategia antiviral: tu me silencias, yo evoluciono y me escapo". December 1<sup>st</sup>, 2011. Facultat de Ciències Biològiques, Universitat de València (Valencia, Spain).
52. "Sources of unpredictability in viral fitness". December 13<sup>rd</sup>, 2011. The Santa Fe Institute (Santa Fe NM, USA).

#### **8.- STAYS IN OTHER RESEARCH CENTERS:**

1. Centro de Biología Molecular *Severo Ochoa* (CSIC-UAM). Two months (1993). PhD Student. Supervisor: Dr. Esteban Domingo.
2. Department of Biology and Center for Molecular Genetics, University of California at San Diego. Three months (1994). PhD Student. Supervisor: Dr. John J. Holland.
3. Center for Microbial Ecology, Michigan State University. Twenty seven months (from October 3<sup>rd</sup>, 1995 to December 10<sup>th</sup>, 1997). Postdoc. Supervisor: Dr. Richard E. Lenski.
4. Department of Microbiology and Molecular Genetics, Michigan State University. Three months (from July 8<sup>th</sup>, 2002 to- October 8<sup>th</sup>, 2002). Adjunct Visiting Associate Professor. Supervisor: Dr. Richard E. Lenski.
5. Department of Microbiology and Molecular Genetics, Michigan State University. Fifteen days (November 2006). Visiting Associate Professor. Supervisor: Dr. Richard E. Lenski.
6. The Santa Fe Institute. Eighteen days (March 2009). External Professor.
7. Laboratory of Genetics, Wageningen University and Research. Fifteen days (November - December 2009). Visiting Professor. Collaborator: Dr. J. Arjan G. M. de Visser.
8. The Santa Fe Institute. Eighteen days (February 2010). External Professor.

#### **9.- FELLOWSHIPS AND AWARDS:**

1. Scholarship for undergraduate studies from the Ministerio de Educación y Ciencia. Years 1985-86, 1986-87 and 1987-88.
2. Fellowship for undergraduate research assistants from the Ministerio de Educación y Ciencia in the Department of Genetics, Universitat de València. Years 1988-89 and 1989-90.
3. Fellowship from the Universitat de València for graduate students. Year 1991-1992.
4. Fellowship from the Conselleria d'Educació i Ciència de la Generalitat Valenciana. Years 1991-92, 1992-93, 1993-94 and 1994-95.
5. Fellowship from the Conselleria d'Educació i Ciència de la Generalitat Valenciana for a visit to the University of California at San Diego (three months) with Prof. John J. Holland (1994).
6. Extraordinary doctorate award. Universitat de València. 1994-95.
7. Postdoctoral fellowship from the Spanish Ministerio de Educación y Ciencia to stay in the Center for Microbial Ecology (Michigan State University) with Prof. Richard E. Lenski (1995-1997).
8. Award from the National Academy of Sciences of the U.S.A. for attending to the *Colloquium on Genetics and the Origin of Species*. Irvine, CA.
9. Award from the Conselleria de Cultura, Educació i Ciència de la Generalitat Valenciana for attending the *XIII Seminarios de Genética de Poblaciones y Evolución*. Baiona, Spain.
10. Sabbatical (three months) fellowship from the Spanish Ministerio de Educación, Cultura y Deporte to stay in the Center for Microbial Ecology (Michigan State University) with Prof. Richard E. Lenski (2002).
11. Award from the Universidad Politécnica de Valencia for attending the III<sup>rd</sup> Noble Foundation Workshop on Virus Evolution.
12. Award from the Universidad Politécnica de Valencia for attending the IV<sup>th</sup> Noble Foundation Workshop on Virus Evolution.
13. Award from the Universidad Politécnica de Valencia for attending the 2009 Gordon Research Conference in Microbial Population Biology.
14. Elected EMBO Young Investigator in 2005.
15. Elected EMBO Member in 2011.

#### **10.- TEACHING EXPERIENCE:**

1. 1991-1992, Universitat de València: A Practical Course of Genetics (60 hours). Teaching assistant.
2. 1992-1993, Universitat de València: Introduction to networks and data bases in Molecular Biology (25 hours). Teaching assistant.
3. 1993-1994, Universitat de València: Problems and Questions in Genetics (60 hours). Teaching assistant.
4. 1994-1995, Universitat de València: A Practical Course of Genetics (60 hours). Teaching assistant.
5. 1997-1998, Universitat de València: Genetic Analysis Techniques (60 hours). A Practical Course of Molecular Evolution (30 hours). Computational Molecular Biology for graduated students (10 hours). Assistant professor.

6. 1998-1999, Universitat de València: Genetics (25 hours). Evolutionary Biology (30 hours). A Practical Course of Molecular Evolution (30 hours). Computational Molecular Biology for graduated students (10 hours). .Advanced Molecular Evolution for graduated students (10 hours). Microbial Experimental Evolution (Centro de Astrobiología, INTA-NASA; 10 hours). Assistant professor.
7. 1999-2000, Universitat de València: Genetics (37.5 hours). Evolutionary Biology (30 hours). A Practical Course of Genetics (50 hours). A Practical Course of Molecular Evolution (30 hours). Computational Molecular Biology for graduated students (30 hours). Assistant professor.
8. 2000-2001, Universitat de València: Genetics (37.5 hours). Evolutionary Biology (67.5 hours). A Practical Course of Genetics (60 hours). Assistant professor.
9. 2001-2002. Universitat de València: Evolutionary Biology (115 hours). A Practical Course of Genetics (30 hours). Computational Molecular Biology for graduated students (30 hours). Associate professor.
10. 2005-2006. EMBO YIP PhD Course: Experimental Viral Evolution (8 hours).
11. 2010-2011. Master in Virology, Universidad Complutense de Madrid. "Virus-Host Interaction: Evolutionary Biology of emerging RNA viruses" (1 hour).
12. 2011-2012. Master in Virology, Universidad Complutense de Madrid. "Virus-Host Interaction: Evolutionary Biology of emerging RNA viruses" (1 hour).
13. Member of 13 PhD thesis committees, including 5 in foreign countries.
14. Member of the Advanced Studies Diplôme committee for the program Biodiversity and Evolutionary Biology of the Universitat de València. 2004-05, 2005-06, 2006-07.
15. Representative of the IBMCP in the Biotechnology PhD Program Coordinating Committee, Universitat de València (2007-08 to the present).

#### **11.- OTHER PROFESSIONAL EXPERIENCES:**

1. Assistant of Citology and Histology. Department of Microscopical Morphology. Universitat de València. 1986-87.
2. Assistant of Microbiology. Department of Microbiology. Universitat de València. 1987-88.
4. System Manager of the Bioinformatics Unit. Universitat de València. 1991-1995.
5. Coordinator of the Section of Cell and Tissue Cultures of the S.C.S.I.E. Universitat de València. From April 1998 to February 1999.
6. Referee for *Advances in Ecological Research*; *ALife*; *American Journal of Botany*; *American Naturalist*; *Archives of Virology*; *Bioessays*; *Biology Letters*; *BMC Evolutionary Biology*; *BMC Infectious Diseases*; *BMC Microbiology*; *Evolution*; *Genetics*; *Infection, Genetics and Evolution*; *Journal of Biology*; *Journal of Evolutionary Biology*; *Journal of General Virology*; *Journal of Virology*; *Molecular Biology and Evolution*; *Molecular Ecology*; *Nature*; *Nature Review Genetics*; *Phycological Research*; *PLoS Biology*; *PLoS ONE*; *PLoS Pathogens*; *Proceedings of the National Academy of Sciences of the USA*; *Proceedings of the Royal Society B*; *Science*; *Spanish Journal of Agronomical Research*; *The American Naturalist*; *Trends in Ecology & Evolution* and *Trends in Microbiology*; *Virus Research*.
7. Referee for the following founding agencies: Spanish MEC (BMC-BFU Program, 2007, 2010), Spanish ANEP, CNRS program "Maladies Infectieuses Emergentes" (France), FWF of Austria, Wageningen University (The Netherlands), French Ministry of Research and New Technologies (Microbiology

program), EEUU National Science Foundation (Genes and Genome Systems program), The Neatherlands NWO (From Molecule to Organisms ALW), The South African NRF, EMBO Short Term Fellowships.

8. Associated editor of *Infection, Genetics and Evolution* (2001 - 2009); *Evolution* (2002 - 2005); *Frontiers in Virology* (2011 - ); *Journal of Evolutionary Biology* (2002 - 2005); *BMC Evolutionary Biology* (2005 - ); *The Open Genomics Journal* (2007 - ); *The Open Parasitology Journal* (2007 - ); *The Open Virology Journal* (2007 - ); *International Journal of Evolutionary Biology* (2009 - ); *The American Naturalist* (2008 - ); *Proceedings of the Royal Society B* (2010 - ).
9. Faculty member, Faculty of 1000 Microbial Evolution & Genomics section (2011 - ).
10. Editor of the Special Topic Issue "New experimental and theoretical approaches towards the understanding of the emergence of viral infections" of the *Phil. Trans. R. Soc. B* (vol. **365**, number 1548, ISSN 0962-8436)
11. Translation to Spanish of the book "*Evolutionary Analysis 2<sup>nd</sup> edition*" by S. Freeman y J.C. Herron, for Prentice Hall, 2002. In cooperation with Prof. José L. Ménsua Fernández.
12. Head of the Stress Biology Department of the IBMCP (June 1<sup>st</sup>, 2005 - October 23<sup>rd</sup>, 2009).
13. Head of the Virology Department of the IBMCP (January 1<sup>st</sup>, 2011 - ).
14. Co-ordinator Scientific Comission of the IBMCP (June 1<sup>st</sup>, 2005 - October 23<sup>rd</sup>, 2009).
15. Member of the Genetic Variation and Evolution Study Section (Center for Scientific Review), National Institutes of Health, USA. (October 2006 - 2010).
16. Member of the committee "Habilitation à Diriger des Recherches" of Dr. Emmanuel Jacquot, University of Rennes (France). December 19<sup>th</sup>, 2007.
17. Member of the Scientific Advisory Panels of ERASysBio<sup>+</sup> and SysMO2.
18. President Selection Board for a Senior Bioinformatician for the *Isaac Peral* program from the UPM-Fundación BBVA. September 12<sup>nd</sup>, 2011.
19. Member of the ESEB Council from 2003 - 2007 and 2011 - 2015.
20. Member of the ESEB Outreach Committee from 2011 - .

#### **11.- MEMBER OF THE FOLLOWING SCIENTIFIC ORGANIZATIONS:**

1. Member of the Spanish Association of Biologists.
2. Member of the Spanish Society of Virology.
3. Member of the American Society for the Study of the Evolution.
4. Former member of the American Asociation for the Advance of Science (1996 - 2005).
5. Member of the Spanish Society of Genetics.
6. Member of the European Society of Evolutionary Biology (ESEB).
7. Member of the Society of Molecular Epidemiology and Evolutionary Genetics of Infections Diseases.

8. Founder member of the Spanish Society of Evolutionary Biology.
9. Founder member of the Spanish Network for Systems Biology (REBS).
10. Member of the Spanish Network for Plant Virology (REVIPLANT).
11. Member of the Spanish Network for Virus Biophysics (BioFiViNet).