

Antonio García-Bellido

Professor of Research "Ad honorem" of the CSIC, Spain.

DATE AND PLACE OF BIRTH: 30 April 1936. Madrid (Spain)

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TITLES

Research Assistent of the C.S.I.C. (1965).
Research Member of the C,S.I.C. (1970).
Professor of Research of the C.S.I.C. (1974).
Honorary Professor Universidad Autónoma (1978-1980).
Associate Professor "Ad Honorem" of the C.S.I.C. (2006 -).

FORMATIVE PERIOD:

Fellow Department Experimental Biology, University of Cambridge (with Profesor W.B. Wigglesworth) 1959-1960.
Forschung Assistent, Zoologisches Institut, Univ. Zürich (with Profesor E. Hadorn) 1962-1965.
Gosney Postdoctoral Fellow, California Institute of Technology (with Profesors A.H. Sturtevant and E.B. Lewis) 1967-1969.

PRESIDENCIES

- Honorary President of the Sociedad Española de Biología del Desarrollo (SEBD).
- President of the Scientific Council of the Centre de Gènetique Molèculaire CNRS Paris),, 1989-93.
- President of V International Congress on Cell Biology. Madrid, July, 1992.
- President of the European Developmental Biology Organization (EDBO), (1999 - ..).

DIRECTOR

- Director Instituto de Genética y Antropología (CSIC) Madrid, Spain, 1976-79.
- Director Centro de Biología Molecular "Severo Ochoa" (CSIC) Madrid, Spain, 1980-81.

ACADEMIES

- Member of the Real Academia de Ciencias Exactas Físicas y Naturales. Spain, 1984
- Foreign Member American Academy of Arts and Sciences (USA) 1985
- Foreign Member Royal Society (London),, 1986
- Foreign Member of the Nat. Acad. of Sciences USA (Washington), 1987
- Founder Member of the Academia Europaea, 1988.
- Foreign Member of the Nat. Acad. of Sciences of France, 1995.
- Member of the Pontifical Academy of Science, Vatican City, 2003.
- Member of the European Academy of Sciences (EAS). 2004.

PRIZE

- Prize "Príncipe de Asturias" de Investigación Científica (Spain), 1984.
- Prize "Leopold Mayer" de l'Academie des Sciences de Paris, France, 1986.
- Prize García Cabrerizo Foundation, Spain, 1989.
- National Prize of Scientific Research "Santiago Ramón y Cajal". Spain, 1995.
- Chair "Severo Ochoa" in Biology. Section: *Rresearch abroad*. Spain, 1996.
- Prize of Research "Comunidad Autónoma de Madrid" Spain, 1998.
- Medal of Research "Rey Jaime I". Valencia Spain 1998.
- Encomienda con Placa de la Orden Civil de Alfonso X el Sabio, 2005.
- Prize Mexico de Ciencia y Tecnología 2006. Mexico, 2007.
- National Prize of Genetic. Spanish Society of Genetic, 2009
- Lifetime Achievement Award" Society for Developmental Biology (SBD), 2012

VISITING PROFESSORSHIPS:

- Gosney Fellow (California Institute of Technology), 1966-69.
- Fairchild Distinguished Scholar (Cal. Inst. of Technology), 1974-75.
- Miller visiting Professor, (Berkeley, USA), 1985.
- Fairchild Distinguished Scholar (Cal. Inst. of Technology), 1990-91.

DOCTOR HONORIS CAUSA

- Doctor Honoris Causa Academy of Sciences URSS. (Moscow), 1990.
- Doctor Honoris Causa University of La Coruña, Spain, 1996.
- Doctor Honoris Causa University of Barcelona, Spain, 1996.
- Doctor Honoris Causa University of Oviedo, Spain, 1997.
- Doctor Honoris Causa University of Salamanca, Spain, 1998.
- Doctor Honoris Causa University of Elche, (Alicante). Spain,, 2001.
- Doctor Honoris Causa University of Malaga, (Alicante). Spain,, 20015.

LECTURES

- Jenkison Lecturer (Univ. Oxford, U.K), 1981.
- FEBS Lecturer, 1984.
- Steinhaus Lecturer (Univ. Calif. Irvine), 1985.
- Jesup Lecturer (Columbia University), 1987.
- Lección "Novoa Santos" de la Univ. de Santiago de Compostela (España), 1988.

SCIENTIFIC ADVISOR

- Scientific advisor CIBA Foundation (London, UK) (1976-2001)
- Scientific advisor Inst. di Biol. Cellulare (CNRS), Roma, Italy. (1978 - ..)
- Scientific advisor Ministry of Education et Science of France, (1989-1992)
- Patrono of the "Residencia de Estudiantes" (CSIC). Spain (1990- ..)
- Scientific advisor del Institut Jacques Monod. Université de Paris, France (1991-1993)
- Scientific advisor del World Institute of Science (Belgica, Bruxelles), (1991 - ..)
- Scientific advisor Juan March Foundation, Spain (1992-1996)

SOCIETIES

- Elected Member of European Molecular Biology Organization (EMBO), 1975.
- Elected Member, International Cell Research Organization (ICRO), 1978.
- Elected Member Scientific Council of the EMBO, 1988.
- Elected Member of the Human Genome Organization, (Geneve, Switzerland), 1989
- Honorary Member Sociedad Española Interdisciplinar de Criobiología. (Oviedo, Spain), 1992.
- Honorary Member Sociedad Española de Biología Celular. Spain, 1992.
- Member of the InterAmerican Medical and Health Association. (USA), 1993.
- Elected Member of the European Science and Tecnolog Assembly. Brussels, 1994.
- Honorary Member Sociedad Española de Genética. Spain, 1995.
- Elected Member of the Neuroscience Institute. USA, 2001.
- Honoary Member Sociedad Española de Biología Evolutiva, 2005.
- Honorary Member to the Vavilov Society of Russian Geneticists, 2006
- Member of the Colegio Libre de Eméritos (Spain), 2014

VISITING PROFESSORSHIPS:

Department of Genetics, Cambridge University, G.B. (1972, 2 meses)
Zoologisches Institut, Univ. Zürich (1973, 2 meses)
Fairchild Distinguished Scholar, CalTech (1974-1975, 1 año)
Institute of Genetics, Univ. of Copenhagen (1976, 2 meses)
Department of Biology, Univ. Chicago (1977, 3 meses)
Cell Biology Division, CSIRO, Sidney, Australia (1982-1983, 1 año)
Dep. of Molecular Biology, Univ. California, Berkeley (1985, 2 meses)
Fairchild Distinguished Scholar, CalTech (1990-1991, 1 año)
Dipart. di Genetica e Biol. Molec. "C.Darwin".Univ. di Roma "La Sapienza". Italy (1997-98, 1 año).

SUMMARY OF SCIENTIFIC ACCOMPLISHMENTS

From the beginning of his career the field of interest of Dr. A. García-Bellido has been morphogenesis. His studies with Profs. V.B. Wigglesworth, E. Hadorn, A.H. Sturtevant and E.B. Lewis have provided him with the conceptual bases for a physiological, developmental and genetic approaches to morphogenesis in *Drosophila*.

Classical developmental genetics was dominated by an "epigenetic notion". In this notion morphogenetic (regulatory) fields of diffusible growth factors, determine the differentiation of genetically equivalent cells at specific concentration levels. The work of Dr. A. García-Bellido has been pioneer and prevalent in exploring an opposite "apogenetic" notion, in which the genome, distinctively active in the individual cells, determines specific cell behaviour and this in turn the organization of cells in supracellular systems. This change of perspective is based on the following findings.

Cell autonomy:

- Cell dissociation and aggregation experiments with imaginal discs of *Drosophila* revealed the existence of cells individually determined for specific cuticular cell types and endowed with specific cell recognition labels characteristic of their position in the anlage.
- Genetic mosaics of cell differentiation and morphogenetic mutations show phenotypic cell autonomy, indicating that the realm of action of the corresponding genes is limited to the cell and its next neighbours.

Somatic cell genetics. Cell autonomy permits us to carry the genetic analysis to the cellular level. This allows the analysis of zygotic lethals (the null form of most of the genetic loci) in somatic clones, defining: a) the time of action of genes; b) the effect of mutations upon cell behaviour during proliferation and final differentiation and 3) in general, the exploration of morphogenetic events in the "eclipse period", intermediary between the formation of the zygote and the final organism. This genetic analysis at the cellular level permits us to postulate specific hypothesis about the "function" of individual genes, and the operational nature of regulatory nets of genes, hypothesis which are now testable at the molecular level.

Cell lineages and compartments. Clonal analysis has discovered the existence of developmental decisions taken by single cells or by groups of cells, compartments (polyclonal in origin) which are maintained in their clonal offspring, generating fixed inventories of cell territories and corresponding patterned cell differentiations. The segregation of these lineages is binary, defining two alternative specifications by the on/off state of genes specific to these lineages or compartments. Successive segregations of lineages acquire combinatorial specifications using a minimum of regulatory genes to define many final states. Homologies found in other organisms (e.g. nematods, vertebrates) suggest a general validity of this strategy of genetic control of animal development. Cell proliferation patterns are different between and within regions of developmental compartments. These proliferation properties are correspondingly changed in mutants.

Genetic specification genetic of developmental patterns. Three model morphogenetic systems have been under developmental, genetic and molecular analyses in García-Bellido's laboratory. They correspond to a) the specification of territories, b) the patterned distribution of single cell derivatives (sensory elements) on the epidermis and c) the patterned differentiation of wing veins. From these studies derives the notion of "selector" and "realizator" genes, categories of genes, which convert specific genetic signals into developmental operations and spatial cell differentiation. The unraveling of such hierarchical relationships is fundamental to an understanding of morphogenesis.

In the first system the laboratory studied the *bithorax* complex and *engrailed* genes and their *trans*-regulatory genes specifying (segmental or territorial) differences in developmental programs. The second system is related to the activity of the *achaete-scute* complex in which the laboratory studied the genetic organization of the complex and identified *trans*-acting genes that control its spatial patterned expression (cell patterning). The third developmental system is that of wing morphogenesis. The genetic and mosaic analysis of a large variety of genes, known to encode transmembrane, signal transduction and transcriptional regulators, starts providing a wealth of information on the genetic mechanisms and operations involved in the generation of wing size, shape and vein patterning. It is a promising model system to study morphogenesis *sensu strictu*, the mechanisms generating the constant form and size of species and their variations in evolution.