

Short Curriculum of Armengol Gasull Embid,. DNI: 33864719W. Born 05/05/1959 in Barberà del Vallès (Barcelona) Spain.

Professor of Applied Mathematics at Universitat Autònoma de Barcelona, from March 2002.

Phd "Estudi qualitatiu d'algunes classes d'equacions diferencials al pla" Universitat Autònoma de Barcelona, 1986. Advisor: J. Llibre

#### MAIN INTERESTS

My main interest is the understanding of the global behavior of dynamical systems. During the last years many local tools have been developed to study mathematical problems. I have advanced on the creation of global analytical tools. In my research, apart of methods of dynamical systems, I often use techniques of analysis, geometry, algebra, algebraic geometry, numerical analysis and simulation. One of my strengths is to face problems by using different mathematical techniques.

These are my research lines:

**QUALITATIVE THEORY OF DIFFERENTIAL EQUATIONS.** Study of the number of limit cycles of several families of smooth and non-smooth vector fields; theory of bifurcations; Abelian integrals; Chebyshev families; Melnikov functions; center-focus problem and cyclicity of critical points; Darboux theory of integrability; the period function. I have introduced tools to study the probability of appearance of the different phase portraits.

**NON-AUTONOMOUS DIFFERENTIAL EQUATIONS.** Study of some special solutions of non-autonomous differential equations, like Abel type equations. Study of so called Composition Conjecture related with the Center problem for these equations.

**DISCRETE DYNAMICAL SYSTEMS.** I have characterized the global dynamics of several difference equations, described the dynamics near parabolic equilibria, and proved the existence of some dynamical type Poincaré paradoxes, in both continuous and discrete settings. I have studied the set of periods of piecewise linear isometries. I pay special attention on difference equations.

**MISCELLANEOUS.** I have studied some questions about traveling solutions of partial differential equations, differential topology (extension of Kerejarto's Thm), celestial mechanics (central configurations), injectivity of maps (around Jacobian Conjecture) and probability. I have introduced the use of Poincaré-Miranda Thm and rational parameterizations to study dynamical systems.

**POPULARIZING MATHEMATICS.** I have contributed to the spread of mathematics with papers addressed to different readers: from beginners to mathematicians.

#### SOME MERITS:

I am or I have been editor of the journals: Journal of Differential equations, Nonlinear Analysis: Real World Applications, Electronic J. of Qualitative Theory of Differential Equations,

Mediterranean J. of Mathematics, Qualitative Theory of Dynamical Systems, Butlletí de la Societat Catalana de Matemàtiques and Main Editor of the electronic popularizing journal: Materials Matemàtics.

I have participated in the solution of several conjectures: the Markus-Yamabe Conjecture about global asymptotic stability of dynamical systems, open since 1960; the Composition Conjecture appearing in the study of Abel equations; a conjecture E. C. Zeeman about the existence of rational 9-periodic points for the Lyness recurrence; and Perko's conjectures about the bifurcation curve of the Bogdanov-Takens system.

I have 70 coauthors, being 35 of them from Spain and the others from Austria, Brazil, Chile, China, France, Mexico, Netherlands, Portugal, Romania, South Africa, USA, and Uruguay.

I often attend as invited speaker to international meetings (more than 70) and I have organized several of them.

I have directed 9 Phd Theses, being the last three defended in 2017, 2021 and 2025 and the first one in 1994.

My paper "A. Cima, A. Gasull, V. Mañosa. Basin of attraction of triangular maps with applications, J. of Difference Eq. and Appl. 20(3) 2014" has been declared as best paper of the year in that journal. My paper "A. Gasull.

Some open problems in low dimensional dynamical systems. SeMA J., 78, 233-269. 2021" has also been declared as the best paper of the year in that journal.

I have a research positive evaluation of 7 periods (both from CNEAI and AQU):1982-1987, 1988-1993, 1994-1999, 2000-2005, 2006-2011, 2012-2017, 2018-2023.

## PUBLICATIONS

I publish my papers in the best journals on Dynamical Systems and Differential Equations and occasionally in general mathematical journals. I am proud to say that the journal where I have more publications is Journal of Differential Equations, with 38 papers, 6 during the last 5 years.

I have almost 200 indexed publications being around half of them in the first quartile.

According MathSciNet I have been quoted 2597 times by 1016 different authors. According Zentralblatt I have been quoted 2765 times According Google Scholar I have been quoted 5630 times and 2107 times since 2020 (Nov. 2025).

Ten selected current publications (2020-2025) together with a very brief abstract:

A. Gasull, P. Santana. A note on Hilbert 16th problem. Proc. Amer. Math. Soc., 153(2), 669-677. 2025. We prove that the Hilbert number  $H(n)$  is an increasing function (whenever it is finite) and it is attained by structurable stable vector fields.

M. J. Álvarez, B. Coll, A. Gasull, R. Prohens. More limit cycles for complex differential equations

with three monomials. *J. Differential Equations*, 416, 1071–1098. 2025. We study the number of limit cycles of planar differential equations that in complex equations have exactly 3 monomials.

A. Gasull, P. Santana. On a variant of Hilbert's 16th problem. *Nonlinearity*, 37, 125012. 2024. We study a similar problem to the Hilbert one, but taking into account the number of real monomials, instead of the degree.

B. Coll, A. Gasull, R. Prohens. Probability of existence of limit cycles for a family of planar systems. *J. Differential Equations*, 373, 152-175. 2023. We present some families of planar vector fields for which the probability of having some limit cycle can be computed analytically.

A. Gasull, H. Giacomini. Number of limit cycles for planar systems with invariant algebraic curves. *Qual. Theory Dyn. Syst.*, 22(2), 44:1-28. 2023. We study the number of limit cycles of several families of planar vector fields that possess an invariant algebraic curve. We pay special attention to the quadratic case.

A. Cima, A. Gasull, V. Mañosa, F. Mañosas. Pointwise periodic maps with quantized first integrals. *Commun. Nonlinear Sci. Numer. Simul.*, 108, 106150:1-26. 2022. We study the global dynamics of some planar discontinuous discrete dynamical systems that are pointwise periodic.

A. Gasull, L. Hernández-Corbato, F. R. Ruiz del Portal. Parrondo's paradox for homeomorphisms. *Proc. Roy. Soc. Edinburgh Sect. A*, 152, 817-825. 2022. We show that alternating discrete dynamical systems we can stabilize unstable fixed points, giving rise to a dynamical Parrondo's paradox.

A. Gasull, A. Geyer, V. Mañosa. Persistence of periodic traveling waves and Abelian integrals. *J. Diff. Equations*, 293, 48-69. 2021. We introduce the concept of persistent travelling wave by studying the structural stability of certain dynamic behaviours of the phase portraits associated to ODE obtained from the corresponding PDE.

A. Gasull, H. Giacomini. Effectiveness of the Bendixon-Dulac theorem. *J. Diff. Equations*, 305, 347-367. 2021. We provide constructive methods to obtain Dulac functions and by using them we give upper bounds for the number of limit cycles of several planar ODE.

J. D. García-Saldaña, A. Gasull and H. Giacomini. A new approach for the study of limit cycles. *J. Diff. Equations*, 269, 6269-6292, 2020. We give a new way of studying the limit cycles of planar vector fields. They can be seen as heteroclinic solutions of a new associated differential equation. As an application, for first time, we can systematically study the perturbation of reversible centers.