1. Record Nr. UNINA9910494560603321

Autore	Maesschalck Peter De
Titolo	Canard cycles : from birth to transition / / Peter De Maesschalck, Freddy Dumortier, Robert Roussarie
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2021] ©2021
ISBN	3-030-79233-1
Edizione	[1st ed. 2021.]
Descrizione fisica	1 online resource (XXI, 408 p. 101 illus., 42 illus. in color.)
Collana	Ergebnisse der Mathematik und ihrer Grenzgebiete ; ; Band 73
Disciplina	515.392
Soggetti	Singular perturbations (Mathematics) Vector fields Bifurcation theory Pertorbacions singulars (Matemàtica) Camps vectorials Teoria de la bifurcació Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Part I Basic Notions -- 1 Basic Definitions and Notions -- 2 Local Invariants and Normal Forms -- 3 The Slow Vector Field -- 4 Slow-Fast Cycles -- 5 The Slow Divergence Integral -- 6 Breaking Mechanisms -- 7 Overview of Known Results -- Part II Technical Tools -- 8 Blow-Up of Contact Points -- 9 Center Manifolds -- 10 Normal Forms -- 11 Smooth Functions on Admissible Monomials and More -- 12 Local Transition Maps -- Part III Results and Open Problems -- 13 Ordinary Canard Cycles -- 14 Transitory Canard Cycles with Slow-Fast Passage Through a Jump Point -- 15 Transitory Canard Cycles with Fast-Fast Passage Through a Jump Point -- 16 Outlook and Open Problems -- Index -- References.
Sommario/riassunto	This book offers the first systematic account of canard cycles, an intriguing phenomenon in the study of ordinary differential equations. The canard cycles are treated in the general context of slow-fast families of two-dimensional vector fields. The central question of controlling the limit cycles is addressed in detail and strong results are

presented with complete proofs. In particular, the book provides a detailed study of the structure of the transitions near the critical set of non-isolated singularities. This leads to precise results on the limit cycles and their bifurcations, including the so-called canard phenomenon and canard explosion. The book also provides a solid basis for the use of asymptotic techniques. It gives a clear understanding of notions like inner and outer solutions, describing their relation and precise structure. The first part of the book provides a thorough introduction to slow-fast systems, suitable for graduate students. The second and third parts will be of interest to both pure mathematicians working on theoretical questions such as Hilbert's 16th problem, as well as to a wide range of applied mathematicians looking for a detailed understanding of two-scale models found in electrical circuits, population dynamics, ecological models, cellular (FitzHugh–Nagumo) models, epidemiological models, chemical reactions, mechanical oscillators with friction, climate models, and many other models with tipping points.