Preface

Vladimir Igorevich Arnold is one of the most influential mathematicians of our era. Arnold launched several mathematical domains (such as modern geometric mechanics, symplectic topology, and topological fluid dynamics) and contributed, in a fundamental way, to the foundations and methods in many subjects, from ordinary differential equations and celestial mechanics to singularity theory and real algebraic geometry. Even a quick look at a (certainly incomplete) list of notions and results named after Arnold is telling:

- KAM (Kolmogorov–Arnold–Moser) theory
- The Arnold conjectures in symplectic topology
- The Hilbert–Arnold problem for the number of zeros of abelian integrals
- Arnold's inequality, comparison, and complexification method in real algebraic geometry
- Arnold–Kolmogorov solution of Hilbert's 13th problem
- Arnold's spectral sequence in singularity theory
- Arnold diffusion
- The Euler–Poincaré–Arnold equations for geodesics on Lie groups
- Arnold's stability criterion in hydrodynamics
- ABC (Arnold–Beltrami–Childress) flows in fluid dynamics
- Arnold–Korkina dynamo
- Arnold's cat map
- The Liouville–Arnold theorem in integrable systems
- Arnold's continued fractions
- Arnold's interpretation of the Maslov index
- Arnold's relation in cohomology of braid groups
- Arnold tongues in bifurcation theory
- The Jordan–Arnold normal forms for families of matrices
- Arnold's invariants of plane curves

Arnold wrote several hundreds of papers, and many books, including 10 university textbooks. He is known for his lucid writing style which combines mathematical rigor with physical and geometric intuition. Arnold's books *Ordinary Differential Equations* and *Mathematical Methods of Classical Mechanics* have become mathematical bestsellers and integral parts of the mathematical education throughout the world.

Here is a brief biography and a list of distinctions of V. I. Arnold.[1]

V. I. Arnold was born on June 12, 1937, in Odessa, USSR. The family lived in Moscow, and Arnold graduated from the Moscow school #59. Later in life, on

[1] Adapted from Arnold's own CV, the Preface to his "Collected Works", Springer, 2009, and the website of the MCCME.

numerous occasions, he warmly recalled his mathematics teacher Ivan Vassilievich Morozkin. From 1954–1959, he was a student at the Department of Mechanics and Mathematics of the Moscow State University.

His M.Sc. diploma work was entitled "On mappings of a circle to itself." The degree of a "candidate of physical-mathematical sciences," an analogue of the Ph.D. degree in the West, was conferred on him in 1961 by the Keldysh Applied Mathematics Institute, Moscow; his thesis advisor was A.N. Kolmogorov. Arnold's thesis described the representation of continuous functions of three variables as superpositions of continuous functions of two variables, thus completing the solution of Hilbert's 13th problem. Arnold obtained this result back in 1957, being a third year undergraduate student (by then, A.N. Kolmogorov had shown that continuous functions of more variables could be represented as superpositions of continuous functions of only three variables).

The degree of "doctor of physical-mathematical sciences," an analogue of the Habilitation degree, was awarded to him in 1963 by the Keldysh Applied Mathematics Institute, Moscow. (The same Institute where Arnold completed his thesis on the stability of Hamiltonian systems, which subsequently became a part of what is now known as KAM theory.)

After graduating from Moscow State University in 1961, Arnold worked there until 1986. He then worked at the Steklov Mathematical Institute and later at the Paris Dauphine University.

Arnold became a corresponding member of the USSR Academy of Sciences in 1986 and a full member in 1990. He was an honorary member of the London Mathematical Society (1976), a member of the National Academy of Sciences of the Unites States (1983), the French Academy (1984), the American Academy Arts and Sciences (1987), the Royal Society (1988), the Accademia dei Lincei (1989), the American Philosophical Society (1990), the Russian Academy of Natural Sciences (1991), and the European Academy of Sciences (1991).

Arnold received a degree of Doctor Honoris Causa from the following universities: P. et M. Curie, Paris (1979), Warwick (1988), Utrecht (1991), Bologna (1991), Madrid (1994), and Toronto (1997). Arnold served as a vice-president of the International Mathematical Union from 1995–1998.

Arnold was a recipient of many awards, among them the Lenin Prize (1965, jointly with A. N. Kolmogorov), the Crafoord Prize (1982), the Lobachevsky Prize of the Russian Academy of Sciences (1992), the Harvey Prize (1994), the Dannie Heineman Prize for Mathematical Physics (2001), the Wolf Prize in Mathematics (2001), the State Prize of the Russian Federation (2007), and the Shaw Prize in Mathematical Sciences (2008).

One of Arnold's most unusual distinctions is that there is a small planet, Vladarnolda, discovered in 1981 and registered under #10031, named after him, Vladimir Arnold.

V. Arnold died suddenly in Paris on June 3, 2010, and he was buried in Moscow.

This book is a tribute to Vladimir Arnold, the mathematician, the teacher, and the person. Most of the memory articles included in this book were published in two issues of the *Notices of American Mathematical Society* in 2012. The reader will also find here three additional memories, by L. Polterovich, A. Vershik, and S. Yakovenko.

The book begins with a full translation into English of the interview that Arnold gave to the Russian magazine "Kvant" in 1990 (to the best of our knowledge, only excerpts from the full interview have appeared in English before). This is followed by reprints of Arnold's lecture at the Fields Institute in 1997 (at a conference in honor of his 60th birthday) and his article "Polymathematics". We also include a reprint of his "Mathematical Trivium", a collection of 100 mathematical problems that, in Arnold's opinion, delineate standards of undergraduate mathematical education. The problems are commented upon by the editors of this book. This commentary is followed by Arnold's article about V. Rokhlin (never translated into English before). The rest are articles written by Arnold's colleagues, students, and friends.

A few words about the front and back covers. The front cover illustrates Arnold's love for outdoor activities. Some articles in the second half of the book describe this side of his personality in detail. The back cover reproduces the napkin Arnold wrote on at a meal with Emmanuel Ferrand. This is what Ferrand says about this: "Arnold wrote on this napkin at the occasion of a private meal at IHES (Institut des Hautes Etudes Scientifiques), Bures sur Yvette near Paris, France. As far as I remember, it was in February of 2006... Most of what is written here is related to the question of the enumeration of the topological types of Morse functions on surfaces. The two drawings with the letters A, B, C correspond to two of his favorite examples: the height functions of the Stromboli and Etna, two famous volcanos in Italy."

Vladimir Arnold has made a deep and lasting impression on everyone who knew him, and his impact on mathematics is there to stay. We hope that the reader will share our admiration of this remarkable man of science.

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