Appendix
Selected Biographies of Mechanicians

Here we call “mechanicians” those academics and researchers who worked in the field of applied and/or theoretical mechanics in departments such as those of Mechanical Engineering, Applied Mechanics, Theoretical Mechanics, Engineering sciences, Applied Mathematics, Aerospace and Aeronautics, etc.

Writing about Darwin in the *London Review of Books* of January 07, 2010, p. 5, the Harvard historian of sciences Steven Shapin says: “The very idea of paying homage to the great scientists of the past is problematic. Scientists are not widely supposed either to be heroes or to have heroes. Modern sensibilities insist on scientists’ moral equivalence to anyone else, and notions of an impersonal Scientific Method, which have gained classical dominance over ideas of scientific genius, make the personalities of scientists irrelevant”. Of course, scientists, if they do not see themselves as heroes, do have heroes. This was the case of all scientists I met, sometimes with the proud posting of their heroes’ portraits on the walls of their office. Now the exercise of writing a short biographical note of contemporary scientists is even more perilous, in particular when speaking about living persons whose personality and ego are often quite strong. There is a prime difficulty in choosing the few words authorized by the exercise. I have been careful in this choice, avoiding any negative bias of the practice or personality of persons who are just human beings not devoid of such a trait. But the result is not exactly hagiography, and I tried to be as neutral as possible except in a few cases where my enthusiasm went much over my caution. All the people cited I have met or, for the older ones, they have had a strong influence on my own works or they left a definite print in my memory. I am obviously parsimonious with my own age class where the choice may seem arbitrary to many, especially to those who are not cited in a list that is necessarily limited. I have remedied this shortcoming to some extent by listing names of younger scientists who have been influenced or mentored by our elders. The list concerns uniquely people active in general continuum mechanics and solid mechanics, so that pure fluid mechanicians, excellent as they obviously are and so close to our community, are not cited unless

they also contributed to general continuum mechanics and/or solid mechanics. Only a very few scientists born after 1950 are listed, and most of those cited in this class died unexpectedly in their fifties or sixties.


**Aifantis** (Αίφνης) Elias C. (born 1950): Greek-American physicist educated in Greece and Minnesota, with a marked interest in diffusion processes and the motion of defects, in particular that of dislocations, and dissipative structures (under the influence of PRIGOGINE’s group). One of the main exponents and developers of the theories of elasticity and plasticity with strain gradients. Professor at the Aristotle University of Thessaloniki and also in Michigan.


**Barenblatt** (Баренблатт) Grigory I. (born 1927): Russian mechanician-applied mathematician, Doctoral degree under A. N. Kolmogorov in Moscow, internationally recognized for his contributions to fracture mechanics (the Barenblatt-Dugdale model), the theory of fluid and gas flows in porous media, the mechanics of non-classical deformable solids, turbulence, self-similarity and intermediate asymptotics, nonlinear waves. Honored by many awards. Influenced, among others, Genady P. Cherepanov.

**Bažant Zdeněk P.** (born 1937): American civil engineer native of Czechoslovakia, formed in Prague. At Northwestern University in Evanston, USA, since 1969. A prolific author of many papers and books with a large number of co-authors. Supervised many Ph.D. Theses including the one of Gilles Pijaudier-Cabot from France. Both a theoretician and an experimentalist with works on the creep of concrete, the stability of structures, and above all scale effects in solid mechanics and a nonlocal theory of damage (with G. Pijaudier-Cabot). A much cited and honoured author in the field.

Bingham Eugene C. (1878–1945): American scientist, who coined the term “rheology” together with Markus Reiner. Was a professor at, and Head of, the Department of chemistry at Lafayette College, Pennsylvania. Bingham viscoplastic fluids are named after him. Both a theoretician and experimentalist in rheology. Founded the Society of Rheology in 1929. Considered to be the father of the science of rheology.

Biot Maurice A. (1905–1985): Belgian-American physicist-geophysicist. Educated at the French speaking University of Louvain (Belgium; D.Sc. 1931), also Ph.D. at Caltech (1932). Worked at various American universities (Harvard, Columbia, Brown) and for a number of agencies and companies. An original but somewhat lonely researcher, he is famous for his theory of poro-elasticity (so-called “Biot theory”), but also for his various works on variational principles, the incremental theory of deformable solid mechanics, and irreversible thermodynamics.


Bridgman Percy W. (1882–1961): American physicist who studied at Harvard (AB, AM, PhD) and was a Professor of mathematics and natural philosophy there until his retirement. A specialist of high-pressure deformation and flow (plasticity), he was the one who experimentally proved that plastic behaviour is essentially due to slip (or shear) strain (for nonporous metals). He is the author of a famous book “The nature of thermodynamics” (1941) that poses correctly the interpretation of irreversible thermodynamics in continua, in fact proposing the consideration of internal variables of state. He received the Nobel prize in Physics for 1946, probably the only “mechanician”, together with Lord Rayleigh (NP, 1904), to have been honoured by this prize.

Budiansky Bernard (1925–1999): American mechanician, Ph.D. Brown 1950, With NACA at Langley (1950–1955) and then Professor at Harvard University from 1955. Author of seminal contributions to the mechanics of solids and materials, and micromechanics. Influenced the whole school of mechanical engineering in the USA.

Carathéodory (Χαράθεωδορη) Constantin (1873–1950): Born in Berlin of Greek parents. Educated in Belgium (Lycée, Engineering military school). Worked as a civil engineer in Egypt while educating himself in mathematical analysis. Completed his formal education in mathematics in Berlin and then Göttingen under the supervision of Herrmann Minkowski. Published in 1909 a celebrated axiomatics of thermodynamics introducing the notion of thermodynamic adiabatic accessibility, a work acclaimed by Max Planck and Max Born. Professor (1908–1920) in Bonn, Hannover, Breslau, Göttingen, and Berlin. Then taught in Smyrna, Athens, Munich and finally Berlin until 1950. Published famous mathematical works in analysis with many theorems and conjectures bearing his name.

Cattaneo Carlo (1911–1979): Italian mathematical physicist. A student of Antonio Signorini. Main works in elasticity, thermoelasticity and relativistic continuum mechanics. The heat conduction equation called the Cattaneo-Vernotte equation yielding a finite velocity of heat disturbances is named after him and the French engineer Vernotte. Was a professor at the University of Rome (now Roma I—La Sapienza).

Cherepanov (Черепанов) Genady P. (born 1937): Russian born American mechanician. Ph.D., Moscow, 1962, Dr of Sc. Moscow 1964 (the youngest ever in Mechanics in the former Soviet Union); a student of G. I. Barenblatt. Internationally known for his seminal work in the theory of deformation and fracture of materials and structures; one of the creators of configurational mechanics with the original introduction of invariant and path-independent integrals in fracture science. Immigrated to the USA in 1990 and taught at Florida International University before retirement.

Ciarlet Philippe G. (born 1938): French applied mathematician in the French “Lions” line. Educated at Ecole Polytechnique and School of Ponts & Chaussées (ENPC), Paris; Ph.D., Cleveland (1966). Renowned specialist of finite-element techniques and the mathematics of elasticity with an interest in plates and shells, and the so-called “zoom” technique (with Ph. Destuynder), allowing passing from 3d to 2d or 1d schemes for structural elements. Developed more recently an interest in differential geometry. Professor at the University of Paris 6 and then at the City University of Hong Kong, after retirement.

Coleman Bernard D. (born 1930): American chemical engineer turned “rational mechanician” at the contact of Clifford A. Truesdell and Walter Noll; Ph.D. Yale 1954. Author of most influential fundamental works in rational continuum thermomechanics and modern rheology (e.g., media with fading memory, the “Coleman-Noll” thermodynamics of continua, etc). Recently interested in biological structures such as DNA. First at Carnegie-Mellon in Pittsburg and then at Rutgers University in New Jersey.

Cosserat Eugène (1866–1931) and Cosserat François (1852–1914): Respectively, French mathematician-astronomer (Professor at the University of Toulouse) and French civil engineer (“Corps des Ponts et Chaussées”), brothers, authors of the celebrated book “Théorie des corps déformables” (1909) considered to be a pioneers’ vision of generalized continua (introduction of couple stresses). “Cosserat media” and “Cosserat spectrum” (in 2d elasticity) are named after them. Among the first scientists to have introduced the notion of groups in continuum mechanics (see their “Euclidean action”), and thus much acclaimed by Elie Cartan, the famous geometer.


Drucker Daniel C. (1918–2001): American applied mechanician. Taught at Brown University, the University of Illinois, and the University of Florida. A foremost authority on the theory of plasticity (e.g., Drucker’s postulate).

Duhem Pierre (1861–1916): Prolific French mathematician and historian of sciences, epistemologist, who pioneered many aspects of the rational mechanics and thermomechanics of continua (a precursor of the Truesdellian School). Considered as an “energetist” as opposed to “atomist”. A friend of Henri Poincaré and Jacques Hadamard. Spent most of his career in Bordeaux, having definitively alienated himself from Parisian authorities after his justified but premature criticisms of the theories of Marcelin Berthelot (a “republican hero” of science, but also an excellent scientist).


Edelen Dominic G. B. (1929–2010): American mathematician, Ph.D. Johns Hopkins 1956, Worked first as a researcher at the Rand Corporation, Santa Monica, and then taught mathematics at Lehigh University and mechanics at Texas A&M university. An original and powerful thinker with many works in general relativity, astrophysics, geometry, exterior calculus, the mathematical theory of defects, gauge theory, the nonlocal theory of elasticity, thermomechanics, and transformation methods for nonlinear partial differential equations. Author or co-author of many books in these fields.

Epstein Marcelo (born 1944): Canadian mechanician of Argentine origin and applied mathematician interested in both applications (structural members, biomechanics) and the abstract rigorous framework of continuum mechanics with a strong interest in modern differential geometry. Civil Engineer (Buenos Aires, 1967). Ph.D. at the Technion in Haifa (1972), and professor at the University of Calgary, Alberta, since 1976. Visited many research centres in the world. An excellent amateur musician, and an intellectual in the best sense interested in languages and humanities. Seminal works in co-operation with Marek Elzanowski, Manuel de Leon and Gerard A. Maugin (Differential geometry, Material inhomogeneities, Eshelby stress, configurational forces, theory of material growth).

Ericksen Jerald Laverne (born 1924): American mechanician/physicist. Was a professor at the Johns Hopkins University, Department of Mechanics (1957–1982)—after war service in the US Navy and Ph.D. at Bloomington (1951) and spending some time at the US. Naval Research Laboratory (NRL)—and then joined the University of Minnesota (1982–1999) before retirement. Made important contributions to the fields of mechanics and elasticity. He is best known for his work on anisotropic fluids and liquid crystals, plates and shells, solid crystals and their phase transitions viewed in thermomechanics. An original thinker; somewhat outside main chapels. Many results and objects bear his name—e.g., Rivlin-Ericksen tensors, Rivlin-Ericksen fluids, Baker-Ericksen...


Eshelby John (“Jock”) Douglas (1916–1981): British physicist educated in Bristol, worked in Cambridge, and taught in Sheffield (first as a reader and then as a professor in 1971), Faculty of (the theory of) materials. Best known for his original work on dislocation motion, the driving force on a material inhomogeneity and on a field singularity, the continuum theory of lattice defects, and the “Eshelby” inclusion problem. The material Eshelby stress tensor, the spatial part of the energy-momentum tensor, is named after him (coinage by G. A. Maugin and C. Trimarco, 1989–1992).

Föppl August (1854–1924): German physicist-civil engineer, Professor of Technical Mechanics and statistical graphics at TU Munich (1893–1922). Interested in mathematical physics. Introduced Heaviside’s Maxwell electrodynamics to Germany in 1894 in a book that influenced Albert Einstein. Arnold Sommerfeld highly valued him. Ludwig Prandtl was one of his first students. Influenced several generations of mechanicians in Germany through his books.

Germain Paul (1920–2009), French mathematician (ENS alumnus) with early successful works in various branches of theoretical fluid mechanics (transonic flows, flows around delta-wings, structure of shock waves in fluids and MHD; consideration of generalized functions and asymptotic methods in problems of fluid mechanics), introduced a curriculum in continuum mechanics that influenced the teaching of the matter in all institutions in France. Then turned to general continuum thermomechanics and various applications in dissipative solids. Revived the interest for the formulation using the principle of virtual power in the modelling of complex continua and structures. Has shown a remarkable open-mindedness towards various theories. Influenced, among others, Jean-Pierre Guiraud, Georges Duvaut, Patrick Muller, Francois Sidoroff, Monique Piau,
Gérard A. Maugin, Alain Gérard, Raymonde Drouot, and Pierre Suquet. Professor at the Sorbonne and then University of Paris 6 (now Université Pierre et Marie Curie) and the celebrated Ecole Polytechnique. One of the founders of the “Journal de Mécanique (Paris)” that was to become the “European Journal of Mechanics A/B”. He also created the Laboratoire de Mécanique Théorique in association with CNRS (1975), to become the Laboratoire de Modélisation en Mécanique (1985), and then integrated in the Institut Jean Le Rond d’Alembert by G. A. Maugin (2007). Président of IUTAM (1984–1988). Member of main National Academies of Sciences (Paris, USA, USSR, Poland, Royal Society, Lincei, Pontificial Academy).


Grioli, Giuseppe (born 1912, reached a hundred in the spring of 2012): Italian mathematician, Long time Professor of Mathematics (Rational mechanics) at the University of Padova. A follower of Antonio Signorini. Specialist of mathematical problems in elasticity and media with couple stresses.

Hamel Georg (1887–1954): German mechanician-applied mathematician, professor in Berlin. Proposed an axiomatization of mechanics and formed many German mechanicians through his influential books.

Hellinger Ernst (1883–1950): German mathematician. Author of a noted (Felix Klein) Encyclopedia article on continuum mechanics (1914) and another article with O. Toeplitz on analysis. Also known in mechanics for the Hellinger-Reissner (two-field, displacement and stress) variational principle. Educated in Heidelberg, Breslau and Göttingen with David Hilbert. He was professor in Frankfurt am Main but left for the USA in 1939 and then taught at Evanston. Most works in integral and spectral theories.

Herrmann George (1921–2007): Swiss/American mechanical engineer with Russian as one of his native tongues (was born in Moscow which he left in his teens). Educated at ETH Zurich; Doctoral degree in 1949 with William Prager. Left Switzerland for North America in 1949, first in Montreal, then at Columbia University, New York, and Northwestern University, Evanston. Professor of

Hetnarsky Richard B. (born 1928): Polish/American applied mathematician. Fundamental contributions to problems of thermoelasticity. Created the “Journal of Thermal Stresses” and founded a series of international conferences under the title of “Thermal stresses”. Author of encyclopaedic books on thermoelasticity. In the USA was a professor at Rochester, New York State, before retirement.


Hutter Kolumban (born 1941): Swiss theoretical mechanician, Dipl. Civil Engineer Zurich (1964), Ph.D. Cornell (1973, with Y. -H. Pao). Habilitation in Vienna with Heinz Parkus. Worked first at the Hydraulics, Hydrology and Glaciology Research Laboratory of ETH Zurich, and then as a Professor of Mechanics at TU Darmstadt (1987–2006). Retired in Zurich. Prolific author of papers and books, with a marked interest in geophysical mechanics with applications in the dynamics of glaciers and ice sheets, the mechanics of granular materials, avalanching flows of snow, debris and mud, physical limnology, but also in the foundations of continuum mechanics and thermodynamics, and even electrodynamics of continua. Founder and first Editor-in-Chief of “Continuum Mechanics and Thermodynamics”. Max Planck Prize (1994), Alexander von Humboldt Prize (1998). Recognized as one of the most creative and successful applicants of modern continuum mechanics to glaciology.

Ilyushin (ИЛЬЮШИН) А. А. (1911–1995): Russian mechanical engineer. Author of fundamental works in elasto-plasticity. Rector of the University of St Petersburg (then Leningrad) after WWII and then Professor of continuum mechanics at the Lomonosov State University of Moscow, Chair of elasticity. Introduced Ilyushin’s principle in plasticity.

Kestin Joseph (1913–1993): Polish-American thermodynamicist in the UK and then the USA, Brown University. The most knowledgeable specialist on all aspects of thermodynamics. Contributed fundamentally to the modern vision of the thermodynamics with internal state variables (one of the possible avenues to the description of many dissipative processes).

Knops Robin J. (born 1932): British applied mathematician (B.Sc. Nottingham, 1955; Ph.D. with Rodney Hill, 1960). Then visitor to the USA (Brown), lecturer and reader in Newcastle (1962–1971), and finally Professor of Mathematics and Head of Department at Heriot-Watt University in Edinburgh until his retirement. Both an efficient organizer and a highly productive applied mathematician with many works on the mathematics of elasticity (uniqueness theorems, ill-posed problems, stability, Saint-Venant’s principle). Many works co-authored with L. E. Payne from Cornell University.


Kröner Ekkehart (1919–2000): German mathematical physicist who studied Physics in Stuttgart in 1948–1954 after the Second World War where he was a long time prisoner of war in the Soviet Union. Professor in Clausthal and then at the university of Stuttgart. A deep thinker and pioneer in the geometric approach to defective crystals introducing there notions such as the incompatibility tensor and the Einstein tensor. Definite works in elasto-plasticity of crystals (multiplicative decomposition of deformation gradient), materials with stochastic properties, homogenization techniques. Mentored K. H. Anthony (in defect theory) and F. W. Hehl (in modern gravitation theory). Influenced many others, including W. Noll, I. A. Kunin, M. Berveiller, and G. A. Maugin.

Kruskal Martin D. (1925–2006): American applied mathematician, not exactly a mechanician, but with so many fields of interest. Formed at the University of Chicago and then in New York (NYU, Courant Institute: Ph.D. 1952). Worked on the Matterhorn project and controlled thermonuclear fusion. Internationally known for his seminal work on plasma instabilities and on soliton theory (he coined the word; with co-workers he introduced the inverse-scattering method in this field) and asymptotic methods; also, “Kruskal coordinates” in general relativity in the study of black holes. Long time professor of astrophysics and applied mathematics at Princeton University (1951–1989) and then at Rutgers University. National Medal of Science of the USA.


Lemaitre Jean (born 1934): French mechanical engineer with D.Sc. from the University of Paris. Became professor of mechanics at this University while creating the Laboratoire de Mécanique et Technologie at the Ecole Normale Supérieure de Cachan (suburb of Paris) after applied research on fatigue and viscoelasticity at O.N.E.RA. One of the main contributors to the continuum theory of damage in a thermomechanical framework basing on original ideas of Kachanov and Rabotnov. Co-author with Jean-Louis Chaboche of a pioneering book on damage mechanics (1985).

Leslie Frank M. (1935–2000): British (Scottish) applied mathematician, educated in Dundee and Manchester (Ph.D. 1961 with James Lighthill), FRS, Professor in Newcastle and then in Glasgow at Strathclyde University. Especially known for his theory of dissipative liquid crystals (1968, with Jerald L. Ericksen).


Maugin Gerard A. (born 1944): French mechanical-aeronautical engineer with an American education (Ph.D. Princeton, 1971) and a marked interest in mathematical physics; D.Sc. in Mathematics, Paris, 1975. Successive works in relativistic continuum mechanics, foundations of the electrodynamics of continua, the mechanics of ferroic states (ferromagnetism and ferroelectricity), nonlinear waves in lattices and continuum models of solids, such as shock waves and solitons, surface waves on structures, configurational mechanics of defects, growth of biological tissues, and dynamic materials.

Mindlin Raymond D. (1906–1978): American mechanical engineer, educated and then Professor at Columbia University, New York, where he mentored many students, among them Y. -H. Pao, Harry F. Tiersten, P. C. Y. Lee, and Raymond Parnes. Internationally recognized scientist for his works in structural mechanics, photo-mechanics, vibrations of plates, piezoelectricity and its dynamic applications to signal processing (cf. the celebrated US Army monograph on the vibrations of plates), and the mechanics of continua with microstructure including granular materials.

Moreau Jean-Jacques (born 1924): French mathematician-mechanician, Educated at Ecole Normale Supérieure, Paris; Thesis in Mathematics, Université de Paris, (1949). Professor at University of Montpellier, France. An analyst, with first works in hydrodynamics and theoretical fluid mechanics, and then in convex analysis, and a strong interest in numerical simulations for problems with unilateral constraints for which he developed special algorithms. Was instrumental in introducing convex analysis in problems of solid mechanics (friction, plasticity, viscoplasticity, flow of granular materials) in the 1960–1980s. Influenced Bernard Nayroes, Michel Fremond, Michel Jean, Pierre Suquet and many others.


Noll Walter (born 1925): German/American scientist who, with Clifford A. Truesdell and Bernard D. Coleman, formulated the bases of the modern thermomechanics of continua. Also author of a famous encyclopaedia article (with C. A. Truesdell in 1965) and a theory of uniformity of materials that influenced some later works by C. C. Wang, M. Epstein and G. A. Maugin. Formed in Berlin, Paris and Bloomington, Indiana. Professor at Carnegie Mellon, Pittsburgh.

Nowacki Witold (1911–1996): Polish engineer-mathematician, who, after WWII, contributed to the creation of a successful Polish school of continuum mechanics working in elasticity, thermoelasticity, structural mechanics, Cosserat solids (asymmetric elasticity), plasticity, and electroelasticity.


Ogden Ray W. (born 1943): English Applied mathematician, Education at Cambridge (BA, Ph.D. with Rodney Hill), FRS. Professor of mathematics at the University of Glasgow. Best known for his works in nonlinear elasticity with applications to elastomers and biological tissues.

Odqvist Folke K. G. (1899–1984): Swedish mechanical engineer, known for his work on creep and plasticity, 1934, (Odqvist parameter, now identified with the hardening parameter that is the past history of the magnitude of the plastic strain). Was Professor at the Royal Institute of Technology (K.T.H) in Stockholm (1936–1966).

Oldroyd James H. (1921–1982): British mathematician and noted rheologist. FRS. Educated at Cambridge University. Worked at Courtaulds Research Laboratory after WWII before teaching mathematics at Swansea (1953–1965) and then at the University of Liverpool (1965 until retirement). A rather parsimonious writer, he published in 1950 a landmark paper in theoretical rheology, introducing the celebrated Oldroyd model of visco-elasticity of a non-Newtonian fluid.


Podio-Guidugli Paolo (born 1939): Italian civil engineer with a marked interest in applied mathematics. Educated in Pisa. Many works of high standards in continuum thermomechanics, often in cooperation, or in the line of, Morton Gurtin. Professor of Civil Engineering at University of Roma-II.

Prager William (1903–1980): German born American applied mathematician and mechanician. Educated at TU Darmstadt (Ph.D. 1926), he became the Director of the Institute of applied mathematics in Göttingen at the early age of 26. Then a professor at TU Karlsruhe. Left Germany in 1934 and first taught in Istanbul before immigrating to the USA and joining Brown University in 1941 to stay there until his retirement in 1973. He established there the Division of Applied Mathematics in 1946 and founded the Quarterly Journal of Applied Mathematics in 1943. He was the driving force behind the incredible success of mechanics at Brown. One of the prominent figures in the theory of plasticity.

Reiner Markus (1886–1976): Polish/Israeli civil engineer (TH Vienna) who coined the term “rheology” together with Eugene C. Bingham and co-created the Society of Rheology. Moved to Palestine after WWI. Became a Professor at the TECHNION, Haifa, after the independence of Israel. Bear his name: the Buckingham-Reiner Equation and the Reiner-Rivlin Equation. Introduced the Deborah number as measuring the characteristic relaxation time of flows of viscous fluids. For ever one of the creators of the science of rheology.

Reissner Eric (1913–1996): German born (the son of an eminent physicist working in general relativity and gravitation—cf. the celebrated Reissner-Nordström metric) American applied mathematician. Originally Educated at TU Berlin (Doctoral degree, 1935 in Applied Mechanics). Immigrated to the USA in 1937. Ph.D. at MIT (1938) where he conducted his research, becoming Professor of Mathematics there (1949–1969), and then at the university of California at San Diego (from 1969). Published more than 300 papers in scientific journals, many dealing with the elastic theory of beams, plates and shells (e.g., shear-deformation plate theory) that led to significant advances in civil and aeronautical engineering. Much professional recognition.

Rice James R. (born 1940): Education at Lehigh University, Ph.D. in applied mathematics 1964. Professor of Theoretical and Applied Mechanics at Brown University (1964–1981) and then Professor of Engineering Sciences and Geophysics at Harvard University (since 1981). One of the most creative, reputed and honoured American mechanician. Seminal works in theoretical mechanics, civil-environmental engineering and materials physics. Known for his
works in crack propagation in elastic-plastic metals, path-independent integrals in elasticity (the celebrated J-integral of fracture), the structure of inelastic constitutive equations, microscopic mechanisms of cleavage and ductile or creep rupture, deformation localization into shear zones, landslides, with applications to geophysics, earthquake studies, fault systems in geology, etc.

**Rivlin Ronald S.** (1915–2005): British born, later American citizen, applied mathematician, Education at Cambridge University, Ph.D. 1952. First worked as a physicist for the British Rubber Producers Research Association, and then Professor of Applied Mathematics at Brown University (1953–1967), and Director of the Centre for the Application of Mathematics at Lehigh University (1967–1980). Developed the basic mathematical theory of large elastic deformations which became the foundation of the mechanics of rubber elasticity. Are named after him: the Reiner-Rivlin fluids, the Rivlin-Ericksen fluids, the Mooney-Rivlin energy formula for incompressible solids. Influenced a full generation of researchers in continuum mechanics.


**Schottky Walter H.** (1886–1976): German physicist, Ph.D. Berlin 1912 under Max PLANCK. Taught at Jena, Würzburg and Rostock and then joined Siemens Research Laboratories until retirement. Best known for his works in quantum physics, thermodynamics, and above all semi-conductors. Book on Thermodynamics, Berlin 1929.

**Sedov (CE/IOB) Leonid I.** (1907–1999): Leading and powerful Russian mechanician; Specialist of continuum mechanics, theoretical fluid mechanics (explosions, hydrodynamics, hydrofoils), solid mechanics, general principles of continuum physics, gravitational field, asymptotic and similarity methods. Developed also a genuine interest in variational formulations on basic principles. Author of classic textbooks on two-dimensional problems in fluid mechanics, similarity and dimensional analysis, and on general continuum mechanics in Russian with many influential translations. Mentored, among many, V. Z. Parton, Zhelnorovich, Victor L. Berdichevsky, and Lev M. Truskinovsky, etc. During WWII he devised the so-called SedovSimilarity Solution for a blast wave (also attributed to G. I. Taylor in the West). He was also the first chairman of the USSR Space Exploration program. President of the International Astronautical federation (1959–1961). Until recently, it had been thought that L. I. Sedov was the principal Soviet scientist behind the Sputnik project. He admitted to the author that he was just placed there as a figure head (“every great national project needs an official representative”). Nonetheless a true great scientist.
Sidoroff François (born 1943): French mechanical engineer with D.Sc. from Paris University (1976). One of the scientists much influenced by Paul Germain. A specialist of anelastic materials, large deformations and thermomechanics. Formed with Patrick Muller, Raymonde Drouot, Monique Piau and Gérard A. Maugin the initial group of continuum thermomechanics under the leadership of Paul Germain at Paris 6. Became a professor of mechanics at the Ecole Centrale de Lyon (Mechanical engineering) until his retirement.


Soós Eugen (1937–2001): Highly productive Romanian applied mathematician. PhD 1972 with Caius JACOB in Bucharest. Worked as a Professor in the Department of Mathematics of the University of Bucharest and the Institute of Mathematics of the Romanian Academy of Sciences. Marked interest in many facets of continuum mechanics including anelasticity, the mechanics of composites, electromagnetism, the structure of mechanics, tensor and spinor algebra.


Stroh Alan Neil (1926–1962): Formed (B.Sc., M.Sc.) initially in his native South Africa, moved to the UK in 1951, and obtained his Ph.D. (1953) in Bristol under the supervision first of J. D. Eshelby and then of Sir Nevill Mott. Then spent one year at Cavendish Laboratory in Cambridge. Taught at Sheffield (1955–1958), and moved to M.I.T. (USA) in 1958. Killed in a car accident in 1962 while joining his new position on the West coast of the USA. A very original thinker with creative works in the dynamics of dislocations, cracks and plasticity. The inventor of the rightly celebrated “Stroh” formalism in anisotropic elasticity that greatly helps the formulation of boundary and transmission conditions.

(existence of solutions, functions with bounded variations), nonlinear homogenization, and others. Member of the French Academy of Sciences (Paris).


**Tiersten Harry F.** (1936–2006): American mechanical engineer, a student of Raymond D. Mindlin at Columbia. Worked at Bell Labs and then became Professor of Mechanical Engineering at the Rensselaer Polytechnic Institute. Author of many creative works on polar continua, linear piezoelectricity, and more generally coupled fields and the electrodynamics of deformable solids with applications to electro-mechanical devices and signal processing.

**Toupin Richard A.** (born 1926): Ph.D. Thesis at Syracuse with Melvin LAX. A co-worker of Jerald L. Ericksen and Clifford A. Truesdell who spent most of his career at IBM. Co-author of the celebrated Handbuch article on the classical theory of fields with C. A. Truesdell (1960). Also works in generalized continuum mechanics (gradient theory, couple stresses) and a pioneer in the study of nonlinear elastic electrically polarized materials. Acousto-elasticity (Bernstein-Toupin), and fundamental problems of continuum mechanics.


**Wilmanski Krzysztof** (1940–2012): Internationally renowned Polish/German applied mathematician with an initial formation in Łódź (PhD 1965) and a Habilitation in Warsaw (1970). At the I.P.P.T. of the Polish Academy of Sciences (1966–1986) and then in various places in Germany (Berlin, Paderborn, Hamburg-Harburg, Essen, Weierstrass Institute in Berlin), and finally in Zielona-Gora in Poland.
Multiple scientific interests including early the axiomatics of thermodynamics and more recently poroelasticity in which he introduced new modellings accounting for finite strains, thermal effects, and tortuosity, and considered wave propagation and applications in geophysics. Works in thermomechanics in the line of the Trusdellian school and Ingo Müller.

**Ziegler Hans** (1910–1985): Swiss mechanical engineer educated (mechanics, physics) at the Swiss Federal Institute of Technology, ETH Zurich. D.Sc. with E. Meissner (Switzerland) and R. Grammel (Germany). Professor at ETH from 1942 to his retirement in 1977. A well known specialist of structural and dynamical stability (1948–1956). Switched to the plasticity of solids under the influence of William Prager during a one-year visit at Brown University—cf. the Prager-Ziegler hardening rule. Then developed a strong and creative interest in irreversible thermodynamics and the generalization of Onsager’s reciprocity relations to the nonlinear case; introduction of a principle of orthogonality. His deep thoughts on the matter are exposed in his book entitled “An introduction to thermomechanics” (1986).

**Zorski Henryk** (1927–2003): Polish scientist with various interests in mathematical problems of continuum mechanics, the theory of defects, and nonlinear waves. Refugee in the Soviet Union during WWII, he also studied in the UK, and then back in Poland. Like many other Polish scientists of the period, worked first at the Military Academy and then at the Institute of Fundamental Technical Research (IPPT) of the Polish Academy of Sciences. A rather parsimonious writer of papers, but with a large knowledge of mathematical physics and an original thinker, he nonetheless influenced many scientists in theoretical mechanics and materials science, both in Poland and outside, among them Dominik Rogula, and Milan V. Mićunović from Serbia.
Deformable magnetized bodies, 162
Deformable microstructure, 227
Deformable piezoelectrics, 158
Deformable semiconductors, 217
Determinism, 66
Detonation waves, 25
Dielectric, 213
Differential geometry, 111
Dilatational elasticity, 228
Dimensional analysis, 173
Director frame, 106
Directors (unit vectors), 226
Discontinuity surfaces, 257
Discontinuity waves, 174
Dislocation, 23, 84, 87, 157, 172, 174, 286
Dislocation theory, 84
Dissipation potential, 106
Distributions, 181
Distribution theory, 150
Domain of elasticity, 22
Double-normal force, 232
Driving force, 251, 258
Drucker inequality, 55
Drucker’s stability postulate, 55
Dual I-integral, 252
Dual integral equations, 83
Dynamic fracture, 144, 157, 159
Dynamics of magnetic spin, 188
Dynamics of propagating phase boundaries, 55
Dynamics, 24

E
Ecole Nationale des Ponts et Chaussées (E.N.P.C.), 100
Ecole Normale Supérieure (ENS), 101
Ecole Polytechnique, 5, 7, 10, 20, 100, 105, 118, 122, 138
Einstein tensor, 268
Einstein–Cartan space, 236
Elastic energy, 8
Elastic limit, 22
Elastic media with microstructure, 187
Elasto-plasticity, 121, 162, 175, 182
Elasto-plastic materials, 119
Elasto-plastic polycrystals, 112
Electricity conductors, 174, 175
Electrodynamics of continua, 141
Electrodynamics of moving bodies, 268
Electrodynamics of moving media, 205
Electro-elasticity, 57
Electromagnetic bodies, 162
Electromagnetic constitutive equations, 201
Electromagnetic continua, 105, 151, 153

D
Damage, 41, 177, 182
Damage mechanics, 150
Defective elastic crystals, 153
Index

Electromagnetic energy, 202
Electromagnetic internal degrees of freedom, 212
Electromagnetism in continua, 153
Electromagnetism, 199
Electro-magneto-deformable media, 119
Electro-magneto-elasticity, 162, 187, 190
Electro-magneto-mechanical interactions, 217
Electromechanical devices, 200
Electro-mechanical interactions, 213
Electromotive intensity, 204
Electronic-spin continua, 229
Electro-rheological materials, 160
Electrostriction, 91
Energetic stress, 9
Energy–momentum tensor, 270, 272
Energy-release rate, 82, 252
Engineering mechanics, 21
Entropy flux, 70
Epistemological rupture, 26
Equation of internal energy, 68
Ergodic hypothesis, 91
Eshelbian continuum mechanics, 261
Eshelby material stress tensor, 246
Eshelby’s contributions, 87
Euclidean invariance, 25, 113
Euler–Cauchy equations, 32
Eulerian, 4
Euler–Lagrange equations, 250
Existence theorems in nonlinear elasticity, 92
Existence, 25
Extended thermodynamics of continua, 140
Extended thermodynamics, 70, 132
Extra entropy flux, 70

Fluid mechanics, 102, 110, 179
Format of Piola–Kirchhoff, 247
Formation of shear bands, 145
Fourier heat-conduction law, 11
Fractal sets, 236
Fractional calculus, 153, 155
Fractional derivatives, 237
Fracture mechanics, 177, 178
Fracture of metals, 83
Fracture, 158, 247
French masters, 99
Frenkel–Kontorova model, 172, 188
Friction, 21
Frictional materials, 142
Functional analysis, 103
Functional form, 66
Functionally graded materials, 159
Fung’s elastic material, 41

G
Galilean approximation, 206, 207
Galilean invariant, 207
Gauge theory of dislocations, 187
Gauss–Poisson’s equation, 204
General relativity, 120, 269
Generalized continua, 10, 155
Generalized continuum mechanics, 121, 129, 154, 158, 183, 218, 223
Generalized elastic continua, 56
Generalized functions, 181
Generalized Mooney–Rivlin materials, 40
Generalized standard materials, 73, 106, 111
Generating function, 258
Geometric theory of the continuous distribution of dislocations, 88
Geometrical theory of defects, 183
Ginzburg–Landau theory of phase transitions, 232
Global stability criterion, 176
Gradient elasticity, 154, 157
Gradient materials, 162
Gradient models of materials, 142
Gradient plasticity, 157
Gradient theories, 224, 230
Gradient theories of the n-th order, 231
Grades écôles, 20, 99
Granular materials, 94, 111, 154, 159
Green function, 7
Green reciprocity theorem, 7
Green theorem, 7
Green’s elasticity, 66

F
Fading memory, 24
Fatigue, 182
Ferroelectric crystals, 215
Fibre-reinforced materials, 40, 282
Field theory, 2
Finger strain, 36
Finite-element computations, 248
Finite-element method, 123, 130
Finite-element scheme, 259
Finite-strain elastoplasticity, 104
Finite-strain viscoelasticity, 104
Finite-volume scheme, 259
First law of thermodynamics, 9, 14
First Piola–Kirchhoff stress, 4
Griffith’s theory, 81
Grinfeld instability, 180
Group theory, 150, 186
Gyromagnetic effects, 217

H
Handbuch der physik, 103
Hellinger–Reissner variational principle, 54
Helmholtz operator, 234
Hereditary processes, 153
Hill principle of macrohomogeneity, 91
Hill–Mandel principle, 91
Hill–Mandel principle of macrohomogeneity, 106
History of the principles of mechanics, 132
Homogeneity, 66
Homogenisation, 26
Homogenisation of composites, 109
Homogenization techniques, 156
Hooke’s law, 6
Hooke–Duhamel constitutive equation, 6
Huber–Mises criterion, 119
Hyperelastic materials, 36
Hyperelastic, 213
Hyperstresses, 228, 231
Hypo-elasticity, 46, 63, 162, 273
Hysteresis phenomena, 155
Hysteretic properties, 143

I
Ilyushin’s postulate, 175
Incompressibility, 38
Incremental approach, 141
Inelastic discontinuities, 256
Inelasticity of crystals, 148
Inequality of Clausius, 68
Ingénieur–Savant, 9
Inhomogeneous elasticity, 249
Inhomogeneous thermoelastic material, 255
Inhomogeneous waves, 153
Initial stresses, 187
Integral equations, 174
Integral transforms, 83
Integro-differential equation, 24
Intermediate configuration, 245
Internal degrees of freedom, 25, 148, 154, 217, 226
Internal variables of state, 46, 106, 154
International Centre of Mechanical Sciences (CISM), 121, 130, 150, 163

International Journal of Solids and Structures, 53
Intrinsic material force, 256
Irreversible thermodynamics, 119
Isotropic bodies, 37
Isotropic elasticity, 5
Isotropic response, 22

J
Jaumann co-rotational time derivative, 216
Jaumann time derivative, 46
J-integral, 250, 251
J-integral of fracture, 179
Journal of Applied Mechanics, 52
Journal of the Mechanics and Physics of Solids, 89

K
Kelvin continuum, 183
Killing’s theorem, 271
Kinematic hardening, 55
Kinetic theory of gases, 10, 155
Kinetic theory, 70
Kolosov–Muskhelishvili approach, 189
Korteweg–de Vries (KDV) equation, 191
Kutta–Zhukovsky circulation theorem, 170

L
Lagrangian, 4
Lamé coefficients, 32
Landau curriculum, 172
Latent microstructure, 154
Lattice dynamics, 215
Law of normality, 73
Lee–Eringen theory of liquid crystals, 229
Lie derivative, 273, 275
Lie groups, 25
Lie group theory, 261
Linear elasticity, 31
Linear irreversible processes, 28
Linear piezoelectricity, 213
Linear visco-elasticity, 44
Liquid crystals, 154, 184, 226
Local action, 66
Local balance law for electric fields, 214
Local material rearrangement, 253
Local stability criterion, 176
Local structural rearrangements, 236, 286
Localization of nonlinear waves, 185
O
Odgen model, 41
Odqvist parameter, 144
Office national d’etudes et de recherches aéronautiques (ONERA), 103, 109
Oldroyd’s time derivative, 45
Onsager’s reciprocity relations, 139
Onsager’s symmetry relations, 145
Operational calculus, 182
Orthogonal group, 4

P
Path-independent integrals, 56, 84, 247
Peach–Koehler force, 188
Perfect fluids, 2, 270
Perfectly elastic solids, 2
Phase transformations, 160, 283
Phase-transition fronts, 154, 174
Phenomenological physics, 66
Phenomenological thermodynamics, 123
Phonons, 260
Photo-elasticity, 56, 111
Physical acoustics, 81
Physical mechanics, 21
Piezoelectric bodies, 159
Piezoelectric structures, 174
Piezoelectricity, 57, 174, 200
Piola transformation, 4, 211
Piola–Kirchhoff format, 12
Piola–Kirchhoff stress, 211, 253
Plastic flow, 22
Plastic regime, 22
Plastic-forming, 284
Plasticity of anisotropic bodies, 151
Plasticity of soils, 23, 94
Plasticity theory, 73
Plasticity, 22, 55, 119, 282
Plasto-mechanics, 130
Plasto-mechanik, 131
Point defects, 186
Polar continua, 149
Polar fluids, 65
Polar materials, 276
Polar media, 150, 153, 156, 159
Polarization gradients, 57
Poly-convexity, 92
Ponderomotive couple, 208
Ponderomotive force, 208
Population dynamics, 24
Poro-elastic solids, 107
Poroelasticity, 141, 283
Porous media, 123, 134, 151, 154
Postulate of macroscopic determinability, 176
Potential function, 8
Potential of dissipation, 72
Poynting effect, 43
Poynting–Umov theorem, 202
Principle of equipresence, 64
Principle of isotropy, 176
Principle of isotropy of space, 65
Principle of material-frame indifference, 65
Principle of maximal dissipation, 90
Principle of objectivity, 65
Principle of orthogonality, 139
Principle of virtual power, 104, 217, 231, 233
Propagating discontinuities, 25
Pseudo material inhomogeneities, 236
Pseudo-elastic bodies, 123
Pseudo-elastic type, 41
Pseudo-inhomogeneity, 248
Pseudo-plastic effects, 236
Pseudo-plasticity, 248

Q
Quasi-convexity, 92
Quasi-particle, 260
Quasi-plastic processes, 245

R
Radiation stresses, 113, 186
Random media, 184
Rate of strain, 32
Rational extended thermodynamics, 153
Rational mechanics of continua, 5
Rational mechanics, 2, 15, 21, 67, 113
Rational thermodynamics, 66
Rayleigh–Ritz method, 80
Rayleigh–Taylor instability, 87
Reacting media, 63
Reference configuration, 4
Reference crystal, 253
Reiner–Rivlin model, 43
Relativistic continuum mechanics, 145, 157, 267
Relativistic elasticity, 269, 273
Relativistic electrodynamics, 277
Relativistic generalized continuum mechanics, 276
Representative volume element, 90
Rheological models, 44
Rheology and soil mechanics, 108
Rheology, 33, 106, 148
Riemannian geometry, 161
Rigid microstructure, 226
Index

| Rigid-body motions, 271 |
| Rigid-plastic bodies, 23 |
| Rivlin–Ericksen tensors, 43 |
| Rod-climbing effect, 34 |
| Rogue waves, 185 |
| Rubber-like material, 38, 41, 48, 154 |
| Rule of mixtures, 26 |
| Russian Academy of Sciences (RAS), 169 |

**S**

- Saint–Venant principle, 92
- Scuola Normale Superiore, 20
- Second Piola–Kirchhoff, 4
- Second-order effects in elasticity, 159
- Sedov’s variational principle, 174
- Sextic’ formalism, 85
- Shake down, 56, 146, 154, 155
- Shape-memory effects, 131
- Shear deformation in plate theory, 54
- Shear banding, 159
- Shock waves, 25, 175, 276
- Signal processing, 213
- Signorini problem, 47
- Similarity, 173
- Similarity in mechanics, 179
- Simple fluids, 66
- Simple material, 3, 44, 66
- Sine–Gordon equation, 172
- Singular hypersurfaces, 276
- Singular integral equations, 189
- Size effects, 148, 155
- Slender elastic bodies, 190
- Small-strain plasticity, 176
- Smart materials, 147
- Soft biological tissues, 48
- Soft tissues, 154
- Soil mechanics, 108
- Solids, 213
- Solitary wave solutions, 184
- Solitonic structures, 232
- Space and time resolution, 71
- Spatial functionals, 234
- Special relativity, 269
- Spin–lattice relaxation, 216
- Spinor algebra, 151
- Stability of deformable bodies, 187
- Stability of magnetoelastic structures, 218
- Stability of structures, 142, 148
- Statistical theory of fracture, 187
- Stochastic processes in mechanics, 147
- Stokesian fluid, 32
- Stoneley waves, 81
- Strain incompatibility, 88
- Strain-gradient plasticity, 93
- Strength of materials, 53, 120, 129, 142, 152, 153, 175
- Stress-relaxation, 44, 66
- Stress–strain functional, 24
- Stroh formalism, 85
- Stroh’s formulation, 179
- Strongly nonlocal theory, 230, 234
- Structural defects, 84, 218, 233, 236
- Structural mechanics, 139
- Structural optimisation, 145
- Successive approximations, 175
- Superconducting structures, 143, 162
- Surface wave, 80, 178
- Symmetric Cauchy stress, 223
- Symmetric elastic stress, 210
- Symplectic geometry, 75, 275
- Synchronization phenomenon, 186

**T**

- Tensor analysis, 171
- Tensorial analysis, 108
- Tensors, 113
- Theoretical fluid mechanics, 150
- Theory in elastoplasticity, 234
- Theory of chaos, 187
- Theory of cohesive forces, 179
- Theory of composites, 151
- Theory of contact, 15
- Theory of cracks, 144
- Theory of creep, 144, 177, 182
- Theory of damage, 104
- Theory of elastic shells, 189
- Theory of elasticity, 79
- Theory of fracture, 133
- Theory of functions of a complex variable, 189
- Theory of growth, 48
- Theory of homogenization, 90
- Theory of incompatibility, 245
- Theory of irreversible processes, 28, 67
- Theory of irreversible thermodynamics, 148
- Theory of material inhomogeneities, 236
- Theory of mixtures, 158, 159, 285
- Theory of plates and shells, 145
- Theory of polarization gradients, 215
- Theory of slip lines, 90
- Theory of structural defects, 161
- Theory of the first gradient, 231
- Theory of the growth of deformable solids, 188
- Theory of thermo-elasticity, 58
<table>
<thead>
<tr>
<th>U</th>
<th></th>
<th></th>
<th>Y</th>
<th></th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unilateral problems, 157</td>
<td>Variational formulation, 231, 283</td>
<td>Young modulus, 6</td>
<td>Variational inequalities, 103, 119, 157</td>
<td>Zaramba–Jaumann derivative, 119</td>
<td></td>
</tr>
<tr>
<td>Uniqueness problems, 92</td>
<td>Variational methods, 123, 162</td>
<td>Visco-plastic materials, 178</td>
<td>Variational principle, 2, 12</td>
<td>Zener’s one-dimensional models, 44</td>
<td></td>
</tr>
<tr>
<td>University of Paris, 102</td>
<td>Visco-elastic behaviour, 66</td>
<td>Viscoplasticity, 109</td>
<td>Visco-elastic materials, 191</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>