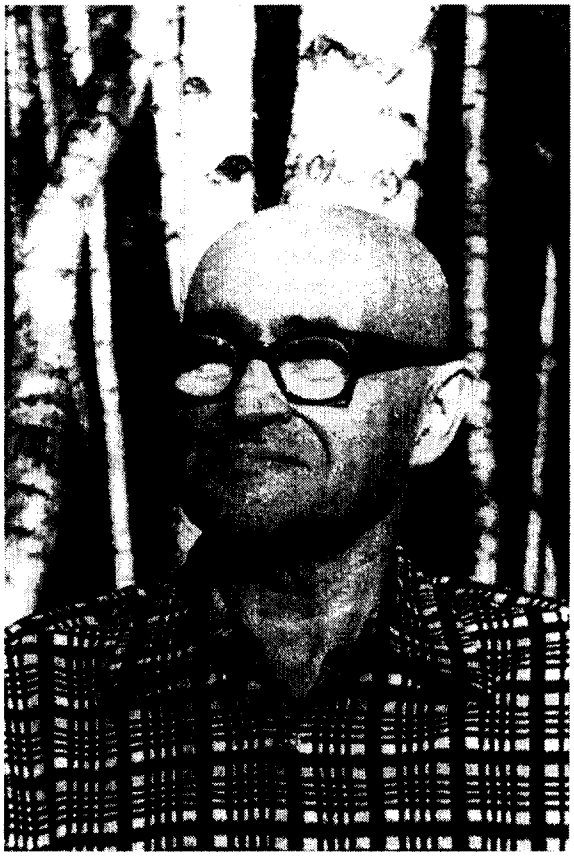
Pergamon
www.elsevier.com/locate/jappmathmech
PII: S0021-8928(02)00069-2
J. Appl. Maths Mechs, Vol. 66, No. 4, pp. 519–521, 2002

0021-8928/02/$—see front matter

LEV ALEKSANDROVICH GALIN (ON THE NINETIETH ANNIVERSARY OF HIS BIRTH)†



On 28 September 2002 an outstanding academic in the area of mechanic, Lev Aleksandrovich Galin (1912–1981), who headed the editorial board of the journal *Prikladnaya Matematika i Mekhanika* for more than 20 years (1959–1981), would have been 90 years old.

L. A. Galin was born in Bogorodsk, in the Nizhrii Novgorod district. His father was an engineer. After leaving school, he worked as a librarian and then studied Mechanical and Energy Management of Light Industry Enterprises at the Moscow Technological Institute of Light Industry, which he completed in 1939, specializing in footwear enterprises. At the Institute, he studied by an individual programme, since the lecturers immediately noticed his unusual talent. In the year he graduated from the Institute, his first scientific paper "The solution of boundary-value problems of elasticity theory by point interpolation", was published in the journal *Prikladnaya Matematika i Mekhanika*. From this time on, his scientific activity was connected with the Institute of Mechanics of the USSR Academy of Sciences, which he entered as a post-graduate student in 1939. His great interest in research, his devotion to science and his highly distinctive talent determined the future direction of his life. In 1942 he successfully defended his Master's thesis, devoted to methods of solving the mixed problems of elasticity theory and problems of elastoplastic torsion of rods of polygonal section, and, after only 3 years, his Doctoral thesis. N. Ye. Kochin and N. I. Muskhelishvili, who were his scientific tutors during his doctoral studies, rated his results very highly, noting the complete independence of the young scientist in his scientific research. In 1946, Galin was awarded the scientific degree of Doctor of Sciences in Physics and Mathematics, in 1951 he became a Professor, and in 1953 he was elected a corresponding member of the USSR Academy of Sciences.

†*Prikl. Mat. Mekh.* Vol. 66, No. 4, pp. 531–533, 2002.

Galin's scientific work has been devoted to a variety of problems of continuum mechanics: elasticity, plasticity and viscoelasticity theory, gas dynamics, subterranean hydromechanics, cavitation theory and fracture mechanics.

He was one of the creators of an important area of mechanics of solids – the contact mechanics. He investigated a large number of two- and three-dimensional problems concerning the interaction of elastic bodies with complicated boundary conditions, taking into account anisotropy, the forces of inertia, etc. For example, he obtained an elegant solution of the problem of the indentation of a punch into an elastic half-plane when there are areas of adhesion and slip in the contact region ("Galin's problem"), based on reducing Hilbert's problem for two functions to a certain problem of conformal mapping. Methods were proposed for solving three-dimensional contact problems concerning the indentation into an elastic half-space of bodies of round, elliptical, wedge and rectangular shape in plan, a general expression was obtained for the pressure under a smooth punch of circular cross-section, the effect of an additional load applied outside the contact region on the distribution of the contact pressures was investigated, and the problem of the indentation of a punch into an elastic plate was solved. On the basis of the solution of the problem for a narrow punch pressing on an elastic half-space, the limits of applicability of the Zimmermann–Winkler hypothesis were established.

Galin created a new scientific area in the theory of mixed problems – contact wear problems, in the formulation of which the change in the shape of the surface during the wear process is taken into account. Solutions of these problems are widely used in tribology, and also in wear and durability calculations for various joints.

A large number of Galin's studies were devoted to investigating elastoplastic problems. He was among the first to switch from an examination of one-dimensional elastoplastic problems, mainly for thick-walled cylinders and spheres, to two-dimensional problems, expertly using methods of the theory of functions of a complex variable to solve them. He found remarkable solutions of the plane elastoplastic problems of the tension in a plate with a circular hole, and also of the problem of the bending of a beam with a circular hole. An analogy for the plane elastoplastic problem (of the Prandtl–Nadai analogy type) was also proposed, enabling many elastoplastic problems to be solved experimentally.

The wide introduction of polymer materials into industry prompted Galin to examine a number of important contact problems, taking into account the rheological properties of the interacting bodies. Furthermore, he studied the action of a vibrating load on structural elements (for example, rods and beams) of polymer materials, and he solved the inverse problem of the choice of hole contour in a plate of glass fibre reinforced plastic.

Together with colleagues, he proposed the theory of self-sustaining fracture, which describes the dynamics of the fracture of overstressed high-strength glasses, rock burst and other phenomena.

The range of his scientific interests was very broad. His work on hydromechanics mostly covered cavitation, impact theory, and bubbling theory. The initial stage of cavitation – for a streamlined body of polygonal contour – was studied, the size of the cavitation zone was established, and the conditions of its emergence were investigated. A study was made of the process of bubbling, where motion of bubbles occurs in a certain reactor, accompanied by chemical reactions and the release of heat.

In the area of subterranean hydromechanics, the problem of the displacement of the oil zone contour is of considerable importance. Galin obtained a brilliant solution to this problem in a two-dimensional formulation. It was reduced to the problem of finding the function of a complex variable satisfying the non-linear boundary equation on the contour of a single circle. He also examined the problem of the motion of ground waters, taking into account the deformation of the boundary of the region occupied by ground waters, and he solved the important problem of the spread of fresh water over the surface of a saline region.

He obtained interesting results in cybernetics, in research on the propagation of radiation in a scattering medium, and also in a medium whose optical properties vary as a function of the absorbed radiation. In the last years of his life he tackled problems of the application of mathematical methods in biology and in particular in ecology, physiology and genetics.

Professor Galin published about 100 scientific works. His monograph 'Contact Problems of Elasticity Theory' (1953) is well known throughout the world and has been translated into several foreign languages. The result of many years of activity by him and his successors and pupils in the field of contact problems was the review monograph published in 1976 under his editorship "The Development of the Theory of Contact Problems in the USSR'. Research he had carried out in the field of contact problems, including those of viscoelastic bodies and problems taking into account surface microstructure and wear, was reflected in the monograph 'Contact Problems of Elasticity and Viscoelasticity Theory'. In the final year of his life, he completed work on the monograph 'Elastoplastic Problems', which was published

posthumously in 1984. The latter two monographs, containing basic results in the field of the mechanics of solids were awarded the State Prize of the USSR in 1986.

He paid a great deal of attention of the journal *Prikladnaya Matematika i Mekhanika*; from 1950 he was its Executive Secretary and from 1959 its Editor-in-Chief. His teaching and organizational activity was connected with the Institute of Mechanics and the Institute for Problems in Mechanics of the USSR Academy of Sciences, where he worked for over 30 years, with the N. Ye. Zhukovskii Airforce Engineering Academy, and with Moscow State University, where he was a Professor from 1956 onwards. He was a member of the Praesidium of the National Committee of the USSR in Mechanics. For his scientific research and selfless work on strengthening the defence capability of his country, he was awarded the Order of Lenin, three Orders of the Red Banner of Labour and five medals.

Those who had the luck to know L. A. Galin will remember him not only as a gifted scientist but also as an extremely kind and principled man who, besides science, was keen on poetry, history and literature; he himself wrote poetry. The scientific areas opened up by his work are being continued by his pupils and colleagues, who treasure his memory.