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Andreĭ Viktorovich Gaponov-Grekhov (on his seventieth birthday)

Andreĭ Viktorovich Gaponov-Grekhov was born on June 7, 1926 in Moscow. Except for the first seven years of his life, A V Gaponov-Grekhov has been linked to Nizhniĭ Novgorod (renamed as Gor'kiĭ city in 1932 – 1991), where his parents Mariya Tikhonovna Grekhova and Viktor Ivanovich Gaponov moved from Moscow in 1933. The relocation of a group of leading figures, which, in addition to his parents, also included the future academician A A Andronov and professor G S Gorelik, turned out to be a major event not only for the Gaponov family. Thanks to their energy, talents and expertise, the city of Gor'kiĭ ceased to be a scientific province and a new time reckoning got under way in allied history of physics. Nowadays, however, A V Gaponov-Grekhov is acknowledged as the leader of the Nizhniĭ Novgorod radiophysical school, which gained an authority both in Russia and over the world.

While studying in high school A V Gaponov-Grekhov was employed at a mechanics workshop of the Gor'kiĭ Institute of Physics and Technology. This was during WW II and he graduated from high school in 1943 having passed examinations without attending lessons. He enrolled later in 1943 at the special faculty of the Gor'kiĭ Industrial Institute, but did not study there for long, since in 1945 he was selected among other newly enlisted students to register at the recently established Radiophysical Department of the Gor'kiĭ State University, the founder and first dean of which was M T Grekhova.

A V Gaponov-Grekhov made his debut in scientific pursuits by working out a theory of electromagnetic emitters in distributed resonance systems. He performed this work under the supervision of M L Levin, who became his good friend for many years to come. The results from this project laid the groundwork for subsequent research involving superhigh frequency electrodynamics and electronics.

In 1949 A V Gaponov-Grekhov graduated from University and began his graduate study under academician A A Andronov supervision. As proposed by the adviser, the topic of his dissertation was the general theory of electromechanical systems. This work, submitted for a degree of Candidate in Physics and Mathematics in 1955, earned A V Gaponov-Grekhov a higher degree of Doctor in Physics and Mathematics.

The next stage in A V Gaponov-Grekhov's scientific biography entails research on wave dynamics in nonlinear media and the theory of oscillations in distributed systems. This research project now deserves recognition as a precursor to the future upraising of nonlinear dynamics. Together with his learners, A V Gaponov-Grekhov discovered and investigated electromagnetic shock waves.

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Andreĭ Viktorovich Gaponov-Grekhov

While working out rigorous and substantiating asymptotic methods for nonlinear wave dynamics, A V Gaponov-Grekhov paved the way for subsequent research concerning dynamic chaos and self-organization in complex dynamic systems.

It would be no easy task to identify the most important of the many trends to which A V Gaponov-Grekhov devoted his know-how as a man of science and organizer, but that the theory of induced radiation of classical nonlinear oscillators, the new principle of generation and amplification of electromagnetic waves in beams of excited nonisochronic oscillators based on this theory, and the application of this principle in electronic devices, are among the foremost, leaves little room for doubt. This constitutes a striking example of theoretical development, experimentation and design of real electronic devices , i.e. powerful generators and amplifiers of centimeter, millimeter and submillimeter spectral ranges, which were carried out in unison. Cyclotron resonance masers — this is precisely what these devices were called — were unrivaled for their power output and efficiency.

In later years A V Gaponov-Grekhov's active scientific interests were augmented by relativistic electronics. Here he also made a number of leading contributions, ranging from basic problems concerning the interaction of relativistic electron beams with electromagnetic waves to the invention of new types of generators and the organization of their industrial output.

Achievements in the field of high-power electronics laid a solid base for plasma and plasmochemical studies along with the development of new techniques which made broad use of the opportunities and advantages offered by heating media with powerful microwave radiation.

The study of new principles and the invention, on their basis, of an entire generation of electronic devices brought A V Gaponov-Grekhov and his collaborators not only wide recognition among the international scientific community, but also official acknowledgements in the form of two State prizes awarded for the research project: "Theoretical and experimental investigation of induced cyclotron radiation" in 1967, and research entitled "High-power millimeter-wave gyrotrons and power assemblies for fusion studies" in 1983.

The Sixties were marked not only by an upsurge in scientific ventures but also high acclaim of A V Gaponov-Grekhov's scientific merits. In 1964 he was elected as a correspondent member of the Academy of Sciences of the USSR and a full-fledged member in 1968.

The biography of a personality such as A V Gaponov-Grekhov could not be restricted merely to scientific interests, however far-reaching and impressive these may be. In 1976 the Institute of Applied Physics (IAP) was founded in the Department of General Physics and Astronomy of the AS USSR and active operations got underway beginning in 1977. The permanent director of this Institute from its inception up to the present time has been A V Gaponov-Grekhov. The scientific credo of the IAP hinges on a rational combination of fundamental and applied studies. The curriculum includes hydrophysics and hydroacoustics, the plasma physics and high-power electronics, quantum electronics and nonlinear optics, the physics of millimeter and submillimeter waves, radiophysical methods in medicine. Despite the breadth of the research themes at IAP the main focus unquestionably remains: the dynamics of nonlinear oscillations and waves in systems and media of various physical nature. As A V Gaponov-Grekhov himself describes the driving force which animates the Institute of Applied Physics: "The organizing principle which brings all these trends together is their genetic and functional connection with fundamental radiophysics, a general science on excitation (generation, amplification) of electromagnetic and nonelectromagnetic oscillations and waves, their channelling, emission, propagation and recording, receiving and handling. Such 'generalized radiophysics' naturally combines direct and inverse problems of nonlinear dynamics, on the one hand, with major trends of hydrodynamics, electrodynamics, acoustics, physics of plasma, optics, radio- and microelectronics, and with remote-sensing diagnostics in natural (atmosphere, earth's surface, ocean) and laboratory conditions (plasma, various materials and mechanisms) on the other hand".

In recent years, the Institute of Applied Physics directed by A V Gaponov-Grekhov has become one of the largest institutes of the Russian Academy of Sciences. The fact that IAP ranks 8th on the list of the International Science Foundation, is an evidence for its high rating.

A V Gaponov-Grekhov aptly displayed his multidimensionality as radiophysicist and brilliant organizer at the Scientific Council on the complex problem "Hydrophysics" under the auspices of the Presidium of the Academy of Sciences. After successfully directing the Acoustics Section of the Council, he subsequently became the first deputy Chairman of the Council, which was headed up at the time by academician A P Aleksandrov, and then the Council Chairman. He succeeded not only in mapping out the Council's research priorities but also, in numerous instances, pointing the most effective means for their solution. He linked the skills of leading scientists engaged in many different fields, as well as top-rate industrial design engineers and leading Navy specialists. He also involved his Institute in these scientific endeavours: a large number of major research projects performed under the direct supervision of A V Gaponov-Grekhov and in which he actively participated, made important contributions to the development of low-frequency ocean acoustics, marine acoustics, radiophysical methods for diagnostics of the sea surface.

Throughout his entire life, A V Gaponov-Grekhov has been a staunch advocate of combining scientific practice with pedagogical activity, a position which emphasizes the unity of science and education.

He began teaching while attending Graduate School. After that he taught as a professor at Nizhnii Novgorod Polytechnical Institute and State University. A V Gaponov-Grekhov has always focused much attention on the enhancement of radiophysical education. As director of IAP, attached to the Russian Academy of Sciences, he has consistently stressed the need for continuity in education — from Middle School to High School with a curriculum emphasizing Math and Physics, right on through to Graduate School. This system hinges on the College of General and Applied Physics which is a Faculty of the Nizhniĭ Novgorod State University, on the one hand, and a subdivision of IAP, on the other hand.

It would be impossible to list all of the learners who have worked with A V Gaponov-Grekhov. In addition to his 'direct' learners, for whom he has acted as thesis advisor, dozens of other leading associates at the Institute of Applied Physics look up to him as leader and mentor, as one who is constantly willing to support their work by providing valuable input.

A V Gaponov-Grekhov has been honoured to celebrate other jubilees in the past. His scientific merits, pedagogical ideas and interests have also received just recognition on his fiftieth and sixtieth birthdays. In 1986 he was awarded the honorary title of a Hero of Socialist Labour. Nor did his seventieth birthday go unnoticed: A V Gaponov-Grekhov was recently honoured to become a recipient of the Demidov award.

A few words should also be mentioned about the public activities of A V Gaponov-Grekhov. It would be safe to say that he never regarded his duties in a formal manner as deputy of the Supreme Soviet of the RSFSR, or deputy of the district, city and regional Soviets. Indeed, the majority of votes in the Academy of Sciences given for his election as People's Deputy of the USSR is especially indicative of high academic authority and untainted personal reputation.

Nowadays, science and academia are struggling to survive in Russia and the chances that individual efforts can make a decisive impact seem to be virtually nil. A great many organizational principles are currently being reconceptua-

lized. A V Gaponov-Grekhov has given much serious thought to this state of affairs, is lucidly aware of Russian realia, has thrashed out these issues with colleagues, and has frequently gone public on these matters with the Press. Thanks to his efforts, we are pleased to report that the Institute of Applied Physics in Nizhniĭ Novgorod is being alive and fruitfully working, not simply surviving!

Better means must still be sought out to deal with a number of problem areas, but the battle can and will be won. A V Gaponov-Grekhov stands firmly committed to victory. And as stated 20 years ago: ''Fifty years is the time to draw conclusions. Andreĭ Viktorovich Gaponov-Grekhov is youthful, brimming with creative ideas and plans ... His friends and learners wish him health, longevity and success in all his professional endeavours''. It is truly a joy to see that nothing has changed on the occasion of his 70th birthday.

A F Andreev, F V Bunkin, V L Ginzburg,
A A Gonchar, V E Zakharov, V V Zheleznyakov,
L V Keldysh, A G Litvak, G A Mesyats,
M A Miller, V I Talanov, Ya I Khanin