PROFESSOR ALEX B. GERASIMOV (1936 – 2019): LONG AND GREAT LIFE IN SCIENCE

G. I. Japaridze [1], L. S. Chkhartishvili [2]

[1] Georgian National Academy of Sciences
Department of Mathematics and Physics
Tbilisi, Georgia
giajaparidze@gmail.com
[2] Georgian Technical University
Department of Engineering Physics
Tbilisi, Georgia
levanchkhartishvili@gtu.ge

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Abstract

The main milestones of the biography of Professor Alex B. Gerasimov, outstanding scientist, organizer of high-tech industry and educator of generations of researchers, is discussed.

Family

Alex (Alexei) Gerasimov was born on April 26, 1936 in Tbilisi, Georgia, in the family of Boris Gerasimov and Barbara Nemsadze.

His father Professor of Chemistry Boris (Borya) Alex Gerasimov (April 26, 1903 – June 7, 1993), a participant in the Great Patriotic War, worked for 62 years at the Georgian Agriculture Institute, where he was the Head of the Department of Analytical and Inorganic Chemistry for 27 years.

In young years Boris was excellent sportsman, active member of first Georgian sport union "Shewardeni", one of the pioneers of basketball and light athletics in Georgia, participant and winner of the first championship of Georgia in basketball in 1924 (team "Sinatle"), and owner of the national record in javelin throw (1928). It is notable that his record maintained 20 years, till 1948.

Alex's mother Barbara (Babo) Sergo Nemsadze (1905 – 1978), with higher education, worked at the Institute of Silk Production of Georgia and was a housewife after Alex's birth dedicated the whole life to the family, to her son and later granddaughter Nana. As Alex's school mates remember, aunt Babo (as they call her) was "mammy" for the whole class: looking after them, "solving problems" with teachers if somebody was not excellent in marks or behavior. In 1961 Alex merried his fellow student and colleague Elene Japaridze. In 1963 their single doughter, afterwards prominent painter and desiner, Nana was born.

Alex's father Boris Gerasimov in 1980th.

Babo, Borya and Nana in 1974.

Alex's daughter, painter Nana Gerasimova.

Grandfather Professor Alex F. Gerasimov (1885 – 1952) was born in Moscow, Russia. From 1899, rather young he became a student of the Physics and Mathematics Department of the Moscow University. However soon, in 1902, A. F. Gerasimov has been expelled from the university due to the participation in an illegal student organization. In 1902, he left Russia and continued his education in Switzerland, studying natural sciences at the University of Geneva. In Geneva, he met his future wife, Tamara Sakvarelidze at that time student at the University of Geneva, grandmother of Alex B. Gerasomov.

Prof. A. F. Gerasimov (1885 – 1952).

In 1905, A. F. Gerasimov started work in Russia as an assistant at the Laboratory of Inorganic Chemistry of the Kazan University. At Kazan University, he was Privatdozent (from 1910) and Professor (from 1919) of the Department of Chemistry. From 1930 to 1952, A. F. Gerasimov is Head of the Department of Physical and Colloidal Chemistry.

School years and sports

In 1943 – 1954, Alex studied at the Tbilisi 7th Secondary School for Boys, which he graduated with a gold medal. School years' main fields of activity for young Alex are preparing for science and sports.

At that time, Alex is intensively studying physics attending special classes at the Tbilisi Pioneers and Pupils Palace, where his first supervisors in physics became great pedagogs, Mr. Kote Totibadze and Mr. Tarasi Abzianidze. It is worth to note that many years later, in 2013, Alex Gerasomov discovered handwritten versions of Abzianidze's books about Newton's and Einstein's mechanics, became their editor and finally published them in single volume:

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● T. Abzianidze. Criticism of Newton's Laws and Construction of Keplerian Ellipse. On Special and General Theories of Relativity by Einstein. Editor A. B. Gerasimov, 2016, Tbilisi, Intellect Publishing, 192 pp.

In this way Alex Gerasimov had payid tribute to his beloved teacher.

Tbilisi Palace of Pioneers and Pupils.

Tbilisi State University basketball team.

1958, Bakuriani. Kahka Tskhovrebadze, Alex Gerasimov and Gogita Eristavi. Together with classmate girls.

Alex Gerasimov was a highly promising young sportsman. In 1951 – 1958 while still a schoolboy and then a university student, he was a member of the junior and then the men's basketball teams of Georgia. In 1952, as a member of the junior team he became champion of the Spartakiad of Peoples of the USSR. Tennis was also his hobby. The spirit of a true sportsman followed Alex Gerasimov throughout his life.

At Tbilisi State University

In 1954 – 1959, Alex Gerasimov studied at the Faculty of Physics of Tbilisi State University (TSU) and completed his MSc in Physics with specialty Solid State Physics. In 1959 – 1962, he is a PhD Student, i.e. Aspirant, at the TSU Department of Solid State Physics under the supervision of Prof. Iona Mirtskhulava, the Department Chair. In 1962 – 1965, he held a Junior Scientist position at the same Department.

Tbilisi State University. Faculty of Physics was located in Campus 2.

Prof. Iona Mirtskhulava.

In Leningrad

In frames of a fellowship program, Alex Gerasimov worked (1962 – 1974) in the Laboratory of Non-Equilibrium Phenomena of the Leningrad (St.-Petersburg), Russia, A. I. Ioffe Physical-Technical Institute, the USSR largest institution for research in solid state physics and microtechnologies, under the leadership of Prof. Solomon M. Rivkin, the Laboratory Head.

A. I. Ioffe Physical-Technical Institute.

Prof. Solomon M. Rivkin.

1964, Leningrad. Nodar Chelidze, Nugzar Dolidze and Alex Gerasimov.

Leningrad. Ilya Yaroshetskij and Alex Gerasimov.

Tbilisi Research Institute for Physics of Semiconducting Devices

In 1965 – 1976, Alex Gerasimov worked at the Tbilisi Research Institute for Physics of Semiconducting Devices.[1] The Director of the Institute at that time was Professor I. Mirtskhulava and it was his initiative to establish in the institute the Laboratory to study the influence of radiation on semiconductors and semiconducting devices and to make Alex B. Gerasimov the first chief of this laboratory.

[1] Since 1970, the Research Institute "Mion" and since 1976, the Scientific-Research Institute "Mion" with Factory.

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In Laboratory of Semiconducting Technologies (Tbilisi Research Institute for Physics of Semiconducting Devices): Alexander Basman, Nugzar Dolidze, Alex Gerasimov and Niko Kakhidze.

Laboratory team together with colleagues from Leningrad: Alexander Basman, Nugzar Dolidze, Marina Mtskhvetadze, Sergei Abagian, Alex Gerasimov, B. M. Konovalenko (sitting), [unknown], Alexandre Davituri, Niko Kakhidze and Levan Jukharidze.

1966, Tbilisi. Research Institute for Physics of Semiconducting Devices – "Mion". First members of Laboratory headed by Alex Gerasimov. From left: Alex Gerasimov, Nugzar Dolidze, Ekaterina Safina, Gogita Eristavi, Nodar Chelidze and Niko Kakhidze.

Nugzar Dolidze, Alex Gerasimov and Niko Kakhidze.

Back to TSU: Chair of Semiconductor Microelectronics

By the initiative of Academician Irakli Gverdtsiteli in 1980 at the TSU has been established a new research and academic unit, Department of Semiconductor Microelectronics. Alex B. Gerasimov from the very beginning became the Professor at this unit, and from 1982, by the recommendation of Acad. I. Gverdtsiteli, he became the Chair of this Department and the Head of the Scientific-Research Laboratory of Physical Foundations of Semiconductor Microelectronics (from 1983). He led them until 2006.

Acad. Irakli Gverdtsiteli.

Tariel Abashidze, Sergo Nodia, Zurab Jibuti, Alex Gerasimov, Zurab Gogua and Merab Pkhakadze.

Scientific-Research Laboratory of Physical Foundations of Semiconductor Microelectronics at Department of Semiconductor Microelectronics (TSU) in 1985.

Merab Pkhakadze, Alex Gerasimov, Zurab Gogua and Zurab Jibuti.

Zurab Jibuti, Alex Gerasimov and Zurab Gogua.

Tariel Abashidze, Sergo Nodia, Zurab Jibuti, Alex Gerasimov, Zurab Gogua and Merab Pkhakadze.

Zurab Jibuti, Alex Gerasimov and Merab Pkhakadze.

Alex Gerasimov, Zurab Gogua and Zurab Jibuti.

Zurab Jibuti and Alex Gerasimov.

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It was very productive period of Gerasimov's scientific activity: time for summarizing many results accumulated in past years; preparing books and lecture courses for students; starting work in nanophysics and nanotechnology and developing his own view on nano-scale phenomena; publishing more than 130 research papers and 2 monographs, obtaining up to 10 invention patents; etc.

In 1998, the International Committee on Scientific Discovers recognized Alex Gerasimov's work "Exoelectronic emission of solids" as a scientific discovery.

"Mion"

Alex Gerasimov has been involved in the materials research for about 60 years working not only in the academia, but also in microelectronic industry of the former Soviet Union. In 1976 – 1980 and 1980 – 1982, he was Deputy Director for Science of the Scientific-Research Institute "Mion" with Factory and Chief Engineer of the Industrial-Scientific Association "Mion", respectively; Head of Laboratory and Head of Department of the Scientific-Research Institute "Mion" with Factory.

Industrial-Scientific Association "Mion". Campus 1.

Leader of Georgian SSR Eduard Shevardnadze in "Mion".

"Mion". Alex Gerasimov, Avtandil (Dili) Tsertsvadze, Leila Berdzenishvili, Marina Imerlishvili and Alisa Bastatskaya.

Liquid Light Inc

In 2006 – 2010, Alex Gerasimov was Scientific Director of the Liquid Light Inc. (Seattle, USA) Representative Office in Georgia named as Gerasimov Research Laboratory worked on novel thin film technologies.

Gerasimov Research Laboratory.

Georgian Technical University

In 2010, Alex Gerasimov joined the Georgian Technical University (GTU). Until the end of his life (2019), he was a Professor of the Department of Engineering Physics, Faculty of Informatics and Control Systems, GTU.

Prof. Alex Gerasimov at GTU (2018).

At the GTU, Prof. Alex Gerasimov led several important courses of lectures: General Physics, Low-Temperature Semiconductor Technology, New Physical Foundations of Molecular-Potential Theory, Nanophysics and Nanotechnology, etc.

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He combined such a rich pedagogical activity with the continuation of research. The three university scientific-research grant projects that were carried out under his leadership in these years are worth mentioning:

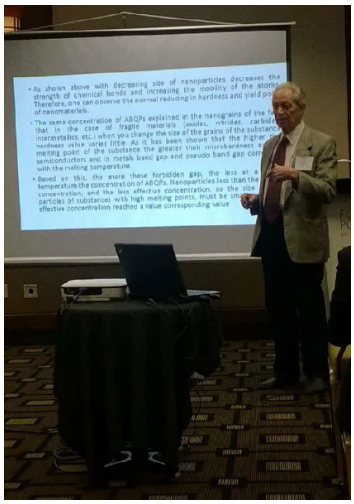
■ "Determination of Nature of Dependency of Nanoparticles' Properties on Their Sizes" (2011). The posed problem was solved in the frames of the Gerasimov's Molecular-Potential Theory.

■ "Reduction of Cost of Si Photocells Production Technology" (2013 – 2014). Project realization yielded in designing and constructing of the device for effective light exposing silicon films.

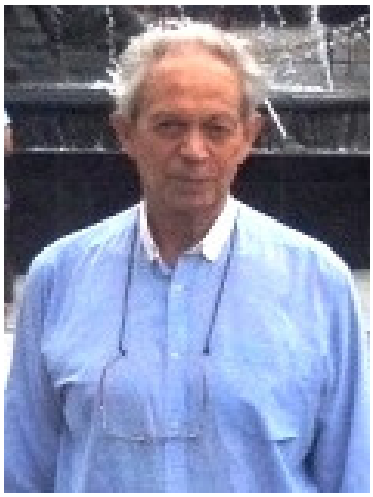
■ "Creation of Test Heater Model with Maximum Performance Efficiency" (2016). A hypothesis was proposed that the heater, as a quasiclosed physical system, allows inflow of energy released during exothermic reactions associated with certain changes in chemical bonding in the working body material.

Recognition

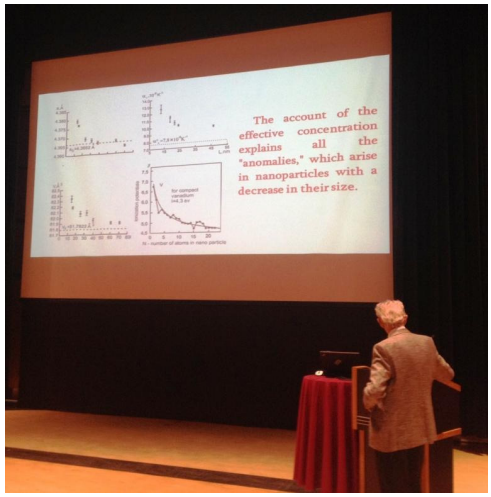
Gerasimov's Electron-Potential Theory of Substance, previously called as Molecular-Potential Theory, has gained its recognition at ICANMs (International Conferences & Exhibitions on Nano & Advanced Materials), the too representative world nanoforums annually held in Canada. He delivered Invited Lectures at 5th (2017 August 7 – 9, Toronto) and 6th (2018 August 6 – 8, Quebec-City) ICANMs.



At ICANM 2017.



Prof. Alex Gerasimov in Quebec-City, Canada (2018).



At ICANM 2018.

Proceedings of ICANMs are published by the IAEMM (International Academy of Energy, Minerals and Materials). Three papers by A. Gerasimov are published in these Proceedings:

■ A. Gerasimov. The role of chemical bonds in nanophysics and nanotechnology. In: Proc. 5th ICANM, 2017, Toronto, IAEMM, 95-103. – *Invited Lecture*

■ A. Gerasimov, D. Buachidze, K. Gorgadze, G. Kvesitadze, M. Metonidze, T. Sadunishvili, M. Vepkhvadze. Role of chemical bonds in the physical mechanism of heat capacity of nanomaterials. In: Proc. 6th ICANM, 2018, Quebec-City, IAEMM, 39-42.

■ A. Gerasimov. Crisis in modern physics and nanotechnology. In: Proc. 6th ICANM, 2018, Quebec-City, IAEMM, 93-105. – *Invited Lecture*

Besides two more oral presentations were done:

■ A. Gerasimov, G. Chiradze, M. Vepkhvadze, K. Gorgadze. New mechanism of "anomalies" of phenomena associated with atoms' displacements in nanomaterials. – *ICANM 2017*

■ A. Gerasimov. The new mechanism of heat capacity and heat conductivity of nanomaterials. – *ICANM 2018*

Scientific legacy

Scope of scientific interests of Alex Gerasimov was too wide. It included: solid state physics, semiconductors, microelectronics, nanophysics and nanotechnology, radiation physics, etc. In his last years, Alex Gerasimov intensively developed own Molecular-Potential Theory (or Electron-Potential Theory of Substance).

In total, Alex Gerasimov (co)authored about 250 published scientific works. Among them are four monographs:

■ A. Gerasimov. Low Temperature Technology Fabrication of Semiconductor Devices. 2005, Tbilisi, TSU.

■ A. Gerasimov. Introduction to Nanotechnology. 2009, Tbilisi, GTU.

■ A. Gerasimov, M. Vepkhvadze. A New Mechanism for Dependence of Properties of Nanoparticles on Their Size. 2017, Tbilisi, Nekeri.

■ A. Gerasimov. Physical Basis of Molecular-Potential Theory. 2018, Tbilisi, Nekeri.

He participated in around 50 conferences and obtained around 10 invention patents. Alex Gerasimov is author of the scientific discovery: "Exoelectronic Emission of Solids" recognized by the International Committee on Scientific Discoveries in 1998.

Alex Gerasimov led number of research grants projects financed by American Physical Society (1993), Science and Technology Department of Georgia (1996 – 1997 and 2005), Georgian National Scientific Foundation (2008), Georgian Technical University (2011, 2013 – 2014 and 2016), etc.

Alex Gerasimov obtained scientific degrees of Candidate (1975) and Doctor of Physical-Mathematical Sciences (1988) in Solid State Physics at the Tbilisi State University.

He was a member of several academic bodies: Academy of Natural Sciences of Georgia, Academy of Engineering of Georgia, Scientific Council on Physics and Chemistry of Semiconductors at the USSR Academy of Sciences, USSR Methodology Council on Teaching Microelectronics (since 1985, several All-Soviet Union educational-methodological programs have been developed with Gerasimov's co-authorship), etc.

During his work at TSU and GTU, Prof. Alex Gerasimov rose several generations of physicists, up to 25 candidate and doctoral dissertations were completed under his supervision.

In 2005, Alex Gerasimov's scientific-pedagogical work was recognized with the Academician Ilia Vekua Award of the National Academy of Sciences of Georgia.

Georgian Nano Techs

After 1st Georgian Nano Tech held in 2010, Prof. Alex Gerasimov initiated that the next nanoconferences in Georgia be held by the Georgian Technical University regularly, every two years.

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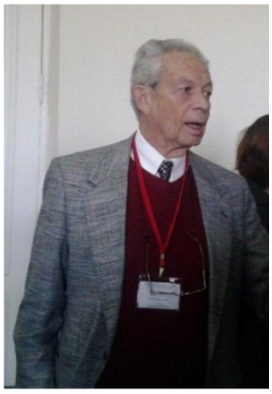
Since the 2nd International Conference "Nanotechnologies" (Nano – 2012) was planned practically in the same period as jubilee conference dedicated to the GTU 90th anniversary, it was decided that Nano – 2012 would be held within the framework of this multidisciplinary international scientific forum – as its one of the sections. Alex Gerasimov was Chairman of the Nano – 2012 Program Committee.

Nano – 2012: Discussion after presentation, Alex Gerasimov and Ilia Lomidze.



Nano – 2014: Alex Gerasimov at registration.

Nano – 2014 Poster Session: Levan Chkhartishvili and Alex Gerasimov.

Nano – 2016 organizers: Alex Gerasimov and Levan Chkhartishvili.

Nano – 2016 Plenary Session Chair: Alex Gerasimov.

Nano – 2018 International Scientific Committee Vice-Chairmen: Zurab Gasitashvili and Alex Gerasimov.

NANO 2018
Georgian Technical University

5th International Conference "Nanotechnologies "
Organized by the Georgian Technical University

Awards this

Certificate of Participation

To

Dr. Sergey Kolotilov

For The presentation " Coordination polymers with Co_2Ln cores as a bases for magnetic luminescent nanomaterials".

Thank you for your active and valued contributions to advance scientific excellence in nanotechnology .

Prof. Alex Gerasimov
Vice-Chairman of the International Scientific Committee
Chairman of the National Organizing Committee

Prof. Levan Chkhartishvili
Member of the International Scientific Committee
Secretary of the National Organizing Committee

NANO – 2018 , November 19-22, 2018 , Georgian Technical University, www.gtu.ge

Nano – 2018 Certificate of Participation signed by National Organizing Committee Chairman Alex Gerasimov.

At Nano – 2014, 2016 and 2018, Alex Gerasimov was a Vice-Chairman of the International Scientific Committee and Chairman of the National Organizing Committee. GTU's series of Georgian Nano Techs initiated and organized by Prof. Gerasimov attracted researchers from many leading scientific centers of the world and Georgia and played a significant role in the development of nanoscience and nanotechnology.

Social activities

Alex Gerasimov was distinguished by his active public position. In 1997 – 2003, Alex Gerasimov was the Advisor of President of Georgia on National Minority Issues and Ethnic Relations. From 1993 he was Vice-President of the International Committee of Public Diplomacy, as well as a Member of the 1995 Georgia Constitutional Commission.

At meeting of President of Georgia Eduard Shevardnadze with President of Ukraine Leonid Kuchma.

Alex Gerasimov's activities in academia, industry and public relations were recognized be state awards: Order of Badge of Honor, Conscientious and Valorous Labor Medals.

In the last years of his life, after a great personal tragedy – the death of his daughter – Alex Gerasimov became a deeply religious Christian. Over the years, he was a member of the board of the International Center for Christian Research under the Georgian Orthodox Church. In 2012, with his excellent lecture "Orthodox Teaching and Science", the Center's regular scientific seminar "National Identity in the Context of Human Values" was launched. He led the theme "Faith and Science" until the end of his life. Alex's active participation in international seminars and symposia organized by the Center and his unique personal charm significantly contributed to the success of the overall work.

Outside of work

According to his CV, Alex Gerasimov's hobbies were basketball, tennis, painting and philosophy.

Colleagues of Gerasimov's Department at "Mion" on excursion to Nikortsminda.

Colleagues of "Mion" on excursion to Samshvilde.

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Chargali: Nana Alania, Galina Offengaim, Nugzar Dolidze, Nana Gerasimova and Alex Gerasimov. To play football at Aragvi riverside.

Zurab Gogua, Zurab Jibuti and Alex Gerasimov. When already working separately and had not seen each other for long time.

Alex Gerasimov and Sergej Maksimenko at Nano – 2016 banquet.

GTU nano 2021

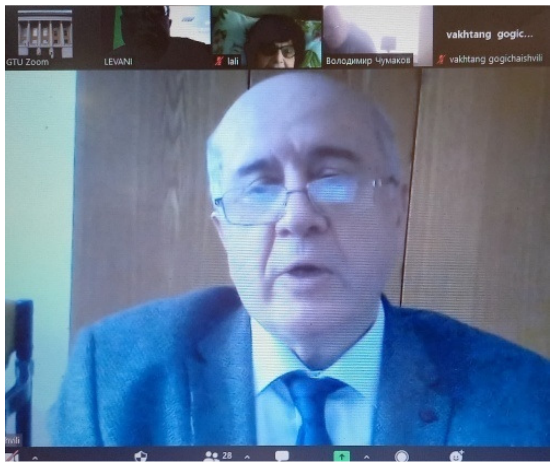
Alex B. Gerasimov passed away on May 3, 2019. With his death, Georgian science suffered a heavy loss.

Georgian Technical University held 6th International Conference "Nanotechnology" (GTU nano 2021) in memory of Professor Alex Gerasimov, initiator of GTU's nanoconferences.

The virtual meeting was opened by Prof. Zurab Gasitashvili, Vice-Rector for Science of the Georgian Technical University and Vice-Chairman of the International Scientific Committee of the GTU nano 2021. In his speech he emphasized:

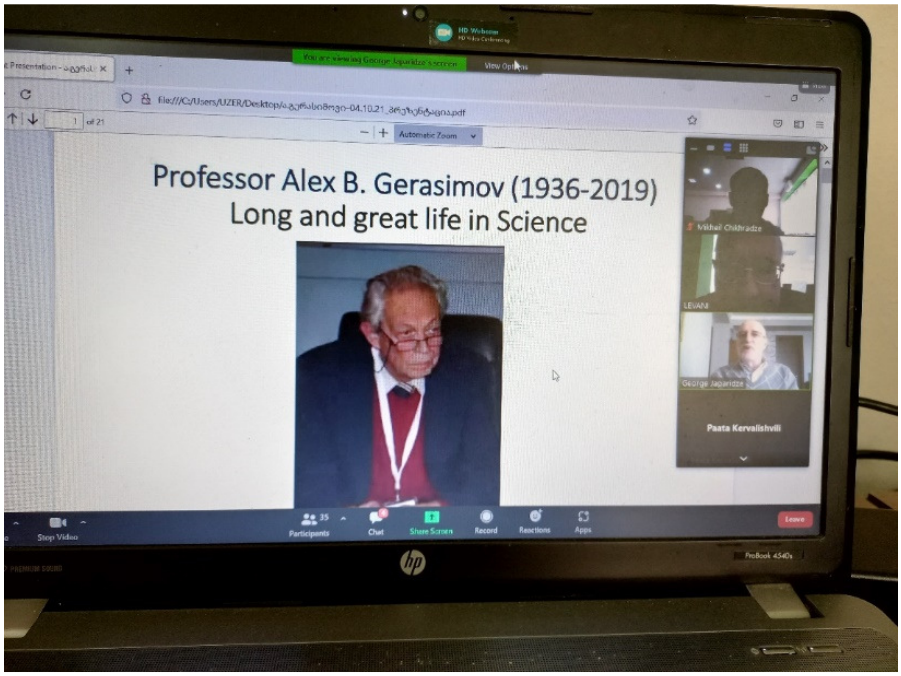
"We hope that at this GTU's conference the main directions of future nano-research will be determined and the discussion held here will give a significant impact to mutually beneficial cooperation between universities and research centers of different countries in the development of new nanotechnologies. Professors and researchers in the field of nanotechnology of the GTU are ready to actively participate in the fruitful work of the conference. The 6th International

Conference is dedicated to the blessed memory of the Professor of our university – Alex Gerasimov. Professor Gerasimov as scientist, teacher, and organizer of production significantly contributed in development of nanotechnology and nanophysics, training of young personnel, and construction of the electronic industry in Georgia. He initiated the transfer of nanoconferences to GTU and afterwards made a lot of efforts for their successful implementation."



Prof. Zurab Gasitashvili's Opening Speech.

Regarding other important points of the Conference, as Prof. Zurab Gasitashvili noted, the sessions' program included 65 invited, oral and poster presentations. Organizers of this meeting were honored that 40 leading scientists from 21 countries have agreed to join the conference International Scientific Committee – many thanks to all of them for their assistance and contribution.



Invited Lecture by Prof. George I. Japaridze devoted to Prof. Alex Gerasimov's life in science.

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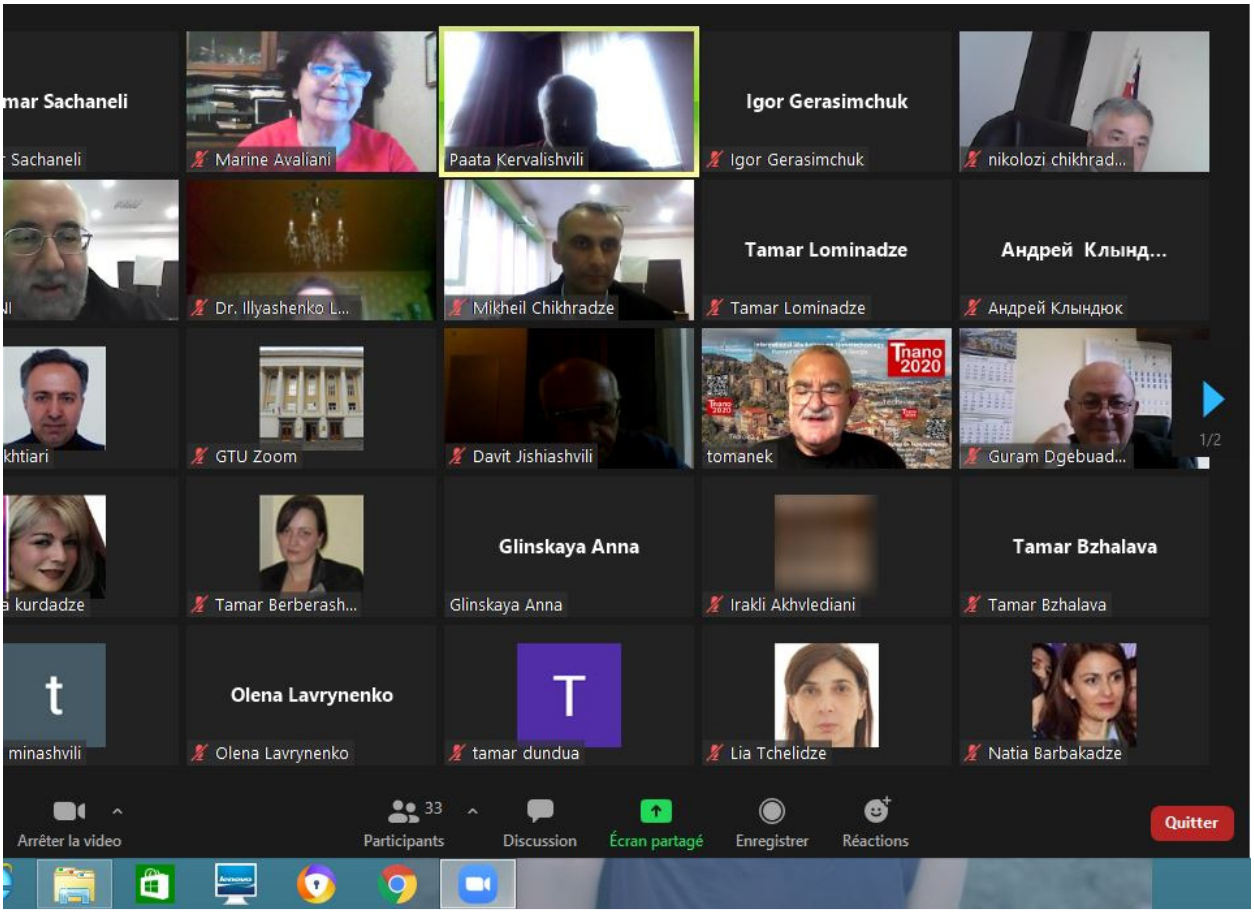
Life path and scientific works of Alex Gerasimov was presented by Professor George Japaridze (Ilia State University, Tbilisi, Georgia) in his Invited Lecture: "Professor Alex B. Gerasimov (1936 – 2019). Long and great life in science".



Screenshot of one of moments of GTU nano 2021 virtual meeting.

Prospects for Gerasimov's molecular-potential approach to nanotechnology were presented by Prof. Levan Chkhartishvili (Georgian Technical University, Tbilisi, Georgia).

In analogy with well-known "Molecular-Kinetic Theory", Alex Gerasimov called his approach to the nanotechnology as "Molecular-Potential Theory" (later called as "Electron-Potential Theory of Substance"). Actually, it is not a theory, but a powerful semiempirical method allowing a quite good general description of the complex of physical properties of substances, in particular, nanomaterials. Below, key issues of the approach are briefly formulated.

According to the Gerasimov's molecular-potential approach, all the properties of a substance, which is a bounded system of atoms, are determined by the chemical bonds between constituent atoms, i.e. are valence electrons in bonding or anti-bonding states. In the equilibrium, all the valence electrons are in bonding states. But, under various external influences part of them transits into the anti-bonding states. It changes the system properties. This statement means not only thermal (heating), but all the possible types of influence, e.g. irradiation with light of relevant wavelength.

In nanomaterials, ratio of numbers of surface and bulk atoms strongly exceeds that for macroscopic specimen of same material. Accordingly, because of breaking chemical bonds in nanomaterials are palpably weakened. This explains changes in materials' properties at increasing in their dispersity, e.g. lowering of melting point in nanomaterials.

As for the validity limits, for Gerasimov's molecular-potential approach, they should be defined in the near future.

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