Proceedings of the

XX INTERNATIONAL SCIENTIFIC CONFERENCE ELECTRONICS AND APPLIED PHYSICS

APHYS 2024

October, 22-25, 2024, Kyiv, Ukraine

Taras Shevchenko National University of Kyiv

Faculty of RadioPhysics, Electronics and Computer Systems

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General information

Date	October, 22-25, 2024
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Organization	Taras Shevchenko National University of Kyiv, Faculty of RadioPhysics, Electronics and Computer Systems

Scientific program

The Conference contributions are accepted from the following areas:
Laser Physics and Optoelectronics
Surface Physics, Nano- and Microelectronics
Physics of Semiconductors and Dielectrics, Semiconductor Devices
Physics of Magnetism
Computer Technologies
Mathematical Problems of Applied Physics
Medical Physics
Plasma Physics
Radio Engineering and Communications
Polarimetry: Theory and Applications

Conference site

All events associated with the XX INTERNATIONAL SCIENTIFIC CONFERENCE ELECTRONICS AND APPLIED PHYSICS will take place in on-line regime in 2024.

Time

Local time is one hour ahead of Middle European time – EEST (UTC+3).

Conference language

The language of the Conference Proceedings is English.

Presentation

The Conference program includes invited lectures and contributed papers. All reports will be lectured in oral presentation.
Invited talks: 40 minutes (including discussion)
Other talks: 20 minutes (including discussion)

Edited by D. Sliusarenko, O. Mokhonko.

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PREFACE

The XX INTERNATIONAL SCIENTIFIC CONFERENCE ELECTRONICS AND APPLIED PHYSICS (APHYS'2024) will be held October, 22-25, 2024, in the capital of Ukraine Kyiv. The famous scientific and cultural center of Europe welcomes over 140 delegates from different Universities and Scientific Centers of European, American and Asian countries. This conference is dedicated to the memory of professor Naum Davydovych Morgulis (1904 - 1976), founder and head of the Kyiv Scientific School of Physical Electronics.

The goal of APHYS'2024 is to create a forum for discussing recent and relevant achievements in applied physics (radiophysics and electronics), bringing together scientists from various fields of physics, fostering collaboration, and encouraging international research in applied physics. Physics, development, manufacturing, and application of new physical ideas in relevant devices are particularly important for Ukraine as a member of the European community.

The APHYS'2024 is organized by Faculty of Radiophysics, Electronics and Computer Systems of Taras Shevchenko National University of Kyiv.

The Conference technical program is divided into ten sessions; three invited lectures and more than 120 oral contributions will be presented, discussed and argued.

We believe that APHYS'2024 will provide an opportunity for researchers, postgraduates and students to discuss their problems and provide and inspire the development of future research and success.

We hope the delegates will enjoy the meeting.

The next XXI INTERNATIONAL SCIENTIFIC CONFERENCE ELECTRONICS AND APPLIED PHYSICS (APHYS'2025) will be held in Kyiv, in October, 2025.

We will be glad to see you next year.

Sincerely yours,
Chairman of organizing committee of APHYS 2024 Dr. A. Netreba

INVITED LECTURES

A FAMOUS UKRAINIAN PHYSICIST NAUM DAVYDOVYCH MORGULIS

I.O. Anisimov

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The report is devoted to the 120th anniversary of the birth of N. D. Morgulis - an outstanding Ukrainian physicist, corresponding member of the Academy of Sciences of Ukraine, professor, founder of the scientific school of physical electronics. The scientist's life path, his professional achievements and commemoration of his memory are highlighted. A list of the main publications of N.D. Morgulis is given.

N.D.Morgulis (1904-1976)

1. Biography

The prominent Ukrainian physicist Naum Davydovych Morgulis was born on May 14, 1904, in Letychiv, Podillia Gubernia (now Khmelnytsky Oblast), to a pharmacist. Soon they moved to Kyiv.

In 1926 N.D. Morgulis graduated from the physics department of the Kyiv Institute of Public Education (KIPE, the name of Kyiv University in that time) and worked for a year as a teacher at vocational schools. In 1927, he entered the postgraduate program at the Research Department of Physics of the All-Ukrainian Academy of Sciences (VUAN), which was later transformed into the Institute of Physics of the Ukrainian RSR. He worked at this institute until 1961 as a graduate student, researcher, group leader, head of the department (1936-1961), and vice-director (1937-1941).

At the same time, in 1927-1932, N.D. Morgulis was first a lecturer and then an associate professor at the Kyiv Polytechnic Institute. In 1932, he organized the specialization in electrophysics at KIPI. In 1934, after the reorganization of KINO into Kyiv State University (KSU), he became its professor. In 1937, on the basis of the specialization in electrophysics, he organized the department of the same name at the Faculty of Physics and Mathematics (since 1940 – at the Faculty of Physics) of KSU.

In 1937 he defended his doctoral dissertation, and in 1939 he was elected a corresponding member of the UkrRSR Academy of Sciences.

During the Second World War, while evacuated to Ufa, in 1941-43 he headed the department of the Ufa Medical Institute, and in 1943-1944 – the department of the Moscow Electrotechnical Institute of Transport

Engineers. At the same time, he worked in the defense industry – in the research and development department of one of the factories of the People's Commissariat of the Aviation Industry. After the end of World War II, he was a participant in the Soviet nuclear project.

In 1944, he returned to Kyiv, once again heading the Department of Electrophysics at the T.G.Shevchenko State University of Kyiv and a department at the Institute of Physics.

In 1952, the Faculty of Radiophysics was organized on the basis of the Department of Electrophysics of the KSU Faculty of Physics, and the department itself was renamed the Department of Electronics (later - Physical Electronics). N.D. Morgulis was its head almost until his death. He was the first professor at the Faculty of Radiophysics, developed its first curriculum, and his co-workers formed the backbone of the faculty. In the 1950s, he was the head of the closed research work "Cathode" – the first research work performed at the Faculty of Radiophysics. Its results were implemented at all enterprises in the then USSR that manufactured electronic tubes.

In 1961, N.D. Morgulis fully concentrated on his work at the T.G.Shevchenko Kyiv State University. In 1964, he organized a problematic laboratory of physical electronics on the basis of his department, which in its heyday included more than 100 employees.

N.D. Morgulis died on September 1, 1976 in Kyiv. He was buried at the Baikove cemetery.

2. Professional activity

N.D. Morgulis considered himself a successor of the Leningrad school of physical electronics of academician A.F. Ioffe (Leningrad was then a name of St. Petersburg). Throughout his life, he traveled to this city on business trips (usually on his birthday) and maintained scientific contacts with the Leningrad Institute of Physics and Technology.

N.D. Morgulis's scientific interests were concentrated in the field of physical electronics, to which plasma physics was later added. He was the author of both theoretical and experimental works, and published more than 200 scientific papers in total. His main scientific achievements include, in particular,

- creation of the ionization manometer theory (1930);
- substantiation of semiconductor properties of oxide cathodes (1946-1947);
- study of electronic and adsorption properties of metal film emitters;
- development of a plasma thermal emission converter of thermal energy into electrical energy (1941, 1949; in co-authorship);
- discovery of photoresonant plasma (1960-1971; co-authored).

He was one of the first in the former USSR to study the surface of solids in high vacuum.

A scientific school, the Kyiv School of Physical Electronics, was formed around N.D. Morgulis, whose staff worked at the Institute of Physics of the Ukrainian Academy of Sciences and at Taras Shevchenko National University of Kyiv. Kyiv became a significant scientific center in the field of physical electronics, which maintained scientific contacts with other similar centers.

For many years, N.D. Morgulis taught a course in physical electronics to students of his department. He was an excellent teacher, requiring students to work independently with scientific literature. Laboratory workshops at the department headed by him were created on the basis of real scientific installations.

Among the direct pupils of N.D. Morgulis are 3 academicians (Y.P. Korchovyi, A.G. Naumovets, M.G. Nakhodkin) and 4 corresponding members of the Academy of Sciences of Ukraine, 4 heads of departments at the Faculty of Radiophysics of the Kyiv National University (D.O. Gorodetskyi, S.M. Levytskyi, M.G. Nakhodkin, Y.I. Chutov), 7 doctors and more than 25 candidates of sciences, professors, laureates of the State Prizes of the USSR and Ukraine. Among the graduates of the Department of Electrophysics were Academician of the UkrSSR

Academy of Sciences S.I. Pekar (1938), Academician of the Kazakh Academy of Sciences V.M. Kelman (1939), and Lenin Prize winner in Science and Technology (the highest scientific award of the former USSR) E.I. Rashba.

N.D. Morgulis conducted extensive organizational work in the field of science.

He was a member of the editorial boards of periodicals, including the Ukrainian Physical Journal, the Journal of Radiophysics, "Bulletin of KSU. Physics", the periodical of the Academy of Sciences of the UkrSSR "Plasma Physics and Problems of Controlled Fusion".

He was an active participant and organizer of many All-Union scientific conferences, in particular, the permanent head of the All-Union Scientific Conferences on Low-Temperature Plasma Physics. He organized the Kyiv City Seminar on Plasma Physics and was its leader for many years.

Thanks to his ability to quickly make quantitative estimates, he always took an active part in the discussion of reports, often pointing out their mistakes to the authors.

He was a member of several scientific councils of the USSR Academy of Sciences and the Ukrainian Academy of Sciences (on physical electronics, plasma physics, energy conversion, and high-temperature thermal physics).

3. Honoring the memory

In 2004, on the occasion of the 100th anniversary of Morgulis' birth, a solemn meeting dedicated to his memory was held at the Faculty of Radiophysics of Taras Shevchenko National University of Kyiv. A special issue of the journal "KNU Bulletin. Radiophysics and Electronics", No. 6, 2004, which included scientific articles reflecting the current research directions of the scientific school founded by N.D. Morgilis. At the same time, a list of his scientific publications was published.

In 2007, the N.D. Morgulis Prize of the Presidium of the National Academy of Sciences of Ukraine was established, awarded for outstanding scientific works in the field of surface physics, physical and nanoelectronics.

In 2014, on the 110th anniversary of his birth, a memorial plaque was installed in the lobby of the Faculty of Radiophysics, Electronics and Computer Systems of the Kyiv National University (4G Glushkov Avenue). There is also a memorial plaque with his name on the main building of the Institute of Physics of the National Academy of Sciences of Ukraine (46 Nauky Avenue).

4. Main scientific publications

[1] Morgulis N.D. Thermoelectronic (plasma) energy converter. M., 1961.

[2] Morgulis N.D. Theory of the ionization manometer. Journal of Technical Physics. 1931. Vol.1, issue 1. C.57-62.

[3] N.D.Morgulis. Secondary-electron emission of metals at their bombardment by electrons. Uspekhi physicheskikh nauk. 1936. T.16, v.6. C.730-751.

[4] N.D.Morgulis. To the problem of the Schottky effect for complex semiconductor cathodes. Journal of Experimental and Theoretical Physics. 1946. Vol.16, issue 11. C.959-964.

[5] N.D.Morgulis, P.G.Borziak. Optical and photoelectric properties of silver-oxygen-zezium cathodes. Reports of the USSR Academy of Sciences. Physics. 1948. T.59, №4. C.625-628.

[6] N.D.Morgulis, D.A.Gorodetsky. Reflection of slow electrons from surfaces of pure and thin film-coated tungsten. Journal of Experimental and Theoretical Physics. 1956. Vol.30, issue 4. P.667-674.

[7] N.D.Morgulis. Conversion of thermal energy into electrical energy by means of thermoelectron emission. Uspekhi physicheskikh nauk. 1960. Vol.70, issue 4. P.679-692.

[8] N.D.Morgulis, A.M.Przhonsky. Nature of Ionization in Photoresonant Cesium Plasma. Journal of Experimental and Theoretical Physics. 1970. V.58, vol.6. C.1873-1878.

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