Meetings and Conferences

EIGHTH ALL-UNION CONFERENCE ON LUMINESCENCE

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THE eighth All-Union Conference on Luminescence took place in Minsk on October 19-24, 1959. This conference was organized by the Scientific Council on Luminescence of the Academy of Sciences of the U. S. S. R., together with the Institute of Physics of the Academy of Sciences of the Belorussian S. S. R. and the Belorussian State University, and was devoted to molecular luminescence and luminescent analysis. More than 300 persons participated in the conference, including about 200 persons from Moscow, Leningrad, Kiev, Sverdlovsk, Erevan, Tartu, Poltava, Saratov, Chita, and many other cities of the Soviet Union. More than 100 papers were presented in seven plenary sessions and eight divided sessions (in sections on molecular spectroscopy and luminescent analysis). Most of the papers were received with lively discussion. We must note the increased number of theoretical papers and the active participation of theoreticians in the conference, which added to the fruitfulness of the discussion. Unofficial meetings were highly useful; here the participants exchanged experimental results and discussed the perspectives of further studies.

In the papers devoted to molecular luminescence and allied problems, the results of numerous experimental and theoretical studies carried out in the Soviet Union over the past year and a half were presented.

The important problem of intramolecular energy transfer was the subject of a paper by **A. N. Terenin** and **V. L. Ermolaev** (Leningrad). On the basis of measurements of the spectra and lifetimes of phosphorescence of a series of biphenylyl ketones, naphthyl ketones, and aldehydes, the possibility was established of intramolecular transfer from the triplet level of the carbonyl group to the triplet level of the biphenylyl and naphthyl groups. In the paper of **V. L. Ermolaev, I. P. Kotlyar** and **K. K. Svyatashev**, also from the laboratory of A. N. Terenin, internal conversion from the fluorescent singlet level to the phosphorescent triplet level was studied in a series of naphthalene derivatives (for a detailed presentation, see p. 137). A paper by **A. N. Terenin** and **A. V. Shabel'** was devoted to the detection of photo-induced proton transfer by means of luminescence spectra.

A paper by L. G. **Pikulik** (Minsk) presented the results of studies of the temperature-dependence of the electronic spectra of complex molecules in solution. A shift in the fluorescence and absorption band maxima toward the electronic transition frequency occurs when the temperature of the medium is lowered, and is associated with changes in the probabilities of electronic-vibrational transitions. **L. G. Pikulik** and **A. N. Sevchenko** studied the temperature-dependence of the quantum yield of fluorescence of phthalimides in solvents of high boiling point. An increase in the yield and lifetime of luminescence on heating the solution, associated with the temperature shift in the spectra, was predicted and found.

The essence of the fundamental processes of deactivation of the excited state and the influence of structure on the luminescent characteristics of complex organic molecules were discussed in three papers by **V. V. Zelinskiĭ, V. A. Borgman, I. A. Zhmyreva, V. P. Kolobkov,** and **I. I. Reznikova** (Leningrad). Many experimental data were used to demonstrate the existence of a connection between the value of the fluorescence yield and the spectral location of the fluorescence spectrum. The varying character of the effect of various substituents in the molecule on the probability of radiationless transitions was demonstrated.

The influence of the solvent on the spectra of complex organic molecules was the subject of a paper by **V. V. Zelinskiĭ, I. A. Zhmyreva, V. P. Kolobkov, A. S. Kotemirovskiĭ,** and **I. I. Reznikova**. According to these authors, the description of the influence of the solvent on the spectrum in terms of its macroscopic characteristics (dielectric constant and refractive index) is not fruitful, since it neglects the microinteractions, which in most cases are greater than the dipole-dipole interaction. The opposite viewpoint was expressed in a paper by **N. G. Bakhshiev** (Leningrad), who posed the question of discerning a universal influence of the solvent on the spectrum, and compared the influence of different solvents in a number of cases with the macroscopic characteristics of these solvents.

A paper by **E. I. Bozhevol'nov** (Moscow) was devoted to the results of studies of the fluorescent properties of solutions of a series of organic molecules; it was shown that there is no fluorescence when several conformational isomers exist.

Problems of concentration depolarization of the fluorescence of solutions were the topics of the interesting papers of **B. Ya. Sveshnikov** and **P. I. Kudryashov** (Leningrad). A paper by **G. P. Gurinovich, A. M. Sarzhevskiĭ,** and **A. N. Sevchenko** (Minsk) elicited a lively discussion; this paper reported on a study of the limiting degree of polarization of the luminescence of complex molecules in methylmethacrylate as related to the absorption and emission spectra. When $\nu_{excit} = \nu_{emis} = \nu_{elec}$, the degree of polarization is nearly 50%. Molecules of the first type exhibit mirror symmetry in their polarization spectra, while for molecules of the second type, the degree of polarization

does not depend on ν_{emis}. In addition, the frequency ν_{elec} in all cases lies near the point of intersection of the spectra.

A paper by **B. A. Zadorozhnyĭ** and **Yu. V. Naboĭkin** (Moscow) dealt with the luminescence of more than twenty systems having intramolecular hydrogen bonds. These studies have confirmed the assumption of the existence of two fluorescent excited levels. In another paper by these authors, together with **B. G. Distanov, L. A. Ogurtsova, L. M. Podgornaya,** and **V. I. Tishchenko,** a detailed study was made of the luminescence of a large number of pyrazoline derivatives.

A paper by **L. D. Derkacheva** (Moscow) studied the change in the fluorescence of naphthalene as a function of the hydrogen-ion concentration. It was shown that the dissociation constant in the excited state is 10^{-3}, differing from the dissociation constant in the ground state by 5 — 7 orders of magnitude.

An interesting paper by **L. V. Levshin** and **V. A. Bocharova** (Moscow) was devoted to a detailed study of concentration effects in solutions of various organic compounds; they were able to distinguish concentration quenching due to energy migration and the inactive absorption due to association of molecules.

The phosphorescence of certain solvents (formic and acetic acids) and influence of these solvents on the absorption spectra of organophosphors were studied by **G. M. Kislyak** (Poltava).

Two papers were devoted to the luminescence of uranyl compounds. **L. V. Volod'ko, A. N. Sevchenko,** and **D. S. Umreĭko** (Minsk) determined by use of the approximate symmetry of the absorption and luminescence spectra that the fundamental absorption of uranyl compounds is associated with Σ-π transitions. The integrated absorption for quasi-symmetric Σ-Σ transition amounts to only 10% of the total absorption in the visible. A paper by **T. I. Kobyshev** studied the properties of the luminescent uranyl ion in the adsorbed state.

A considerable number of papers was devoted to the results of theoretical studies.

In recent years, wide use has been made of the probability method of calculation of the absorption and emission of light by matter. The quantum-electrodynamic basis of this method and an elucidation of the limits of its applicability were the subjects of a paper by **P. A. Apanasevich** (Minsk). A paper by **P. A. Apanasevich** and **G. S. Kruglik** (Minsk) discussed the angular dependence of the resonance radiation of vapors. They were able, by quantum-electrodynamic calculations, to explain the experimentally-observed gradual transition from diffuse resonance emission into specular reflection (upon increase of the pressure of the vapor).

It was shown in a paper by **V. P. Gribkovskiĭ** and **B. I. Stepanov** (Minsk) that a correct application of both quantum and classical methods of calculation of the optical properties (absorbing and luminescent power, decay laws, line contours, and polarization of luminescence) of a harmonic oscillator leads to completely identical results. On the other hand, particles with two energy levels show purely quantum properties, and may be represented by the model of the harmonic oscillator only when the degree of occupation of the upper level is small. In a second paper by the same authors, a detailed calculation was carried out of all possible non-linear effects for a system of particles having a metastable level.

A paper by **B. I. Stepanov** and **A. M. Samson** (Minsk) was devoted to the elucidation of the influence of secondary light-absorption and emission processes in volumes of finite dimensions on the observed characteristics of resonance emission. By applying new (exact and approximate) solutions of the transfer equation, they were able to show that the role of secondary processes is highly significant in thick layers. These solutions lead, in particular, to a significant increase in the lifetime of delayed emission. **A. M. Samson** (Minsk) has developed methods of calculation of secondary processes in the emission by materials with arbitrary absorption and emission bands. The problem of re-absorption of light in crystals of finite thickness was discussed in a paper by **V. M. Agranovich** and **Yu. V. Konobeev** (Moscow).

A paper by **S. I. Kubarev** (Moscow) discussed a special mathematical apparatus suitable for solving various spectroscopic problems, together with the first positive results from its application to the characteristics of the luminescence of complex molecules.

K. K. Rebane and **O. I. Sild** (Tartu) reported the results of calculations of the probabilities of electronic-vibrational transitions of an oscillator in various approximations of the Franck-Condon principle (the quantum-mechanical approximation and three variants of the semi-classical approximation). Along with the harmonic oscillator, an anharmonic oscillator having a potential given by the Morse function was discussed.

In a paper by **Yu. A. Kurskiĭ** and **A. S. Selivanenko** (Moscow), a general phenomenological theory of quenching of the second type was formulated. A paper by **V. M. Agranovich** (see p. 427) was devoted to the theory of luminescence of crystals.

M. A. El'yashevich (Minsk) discussed some problems of the interaction of electronic motion with vibrational motion in complex molecules, and expressed the viewpoint that the adiabatic approximation is applicable both in the case of molecules showing mirror symmetry of the absorption and emission spectra and for molecules in which the mirror symmetry is violated (for further details, see p.440).

A paper by **L. P. Kazachenko** (Minsk) presented results of a calculation of the contours of absorption and luminescence bands of complex molecules in the case in which mirror symmetry is absent. In order to describe the vibration process, this author used the one-dimensional classical model. From the calcula-

tions it was found that violation of mirror symmetry appears even when the difference between the potential curves of the upper and lower electronic states is small. The author considers that the division of the spectra of complex molecules into two groups (modulation spectra and decay spectra) is not required by necessity.

A paper by **M. N. Alentsev** and **L. A. Pakhomycheva** (Moscow) covered the results of an experimental test of the universal relation between luminescence and absorption spectra of complex molecules; this relation had been derived theoretically by B. I. Stepanov in 1957. The authors determined that the relation is obeyed well by solutions of individual substances, and that the temperature determined by means of this relation is equal to the temperature of the medium. The violation of this relation is evidence of the presence in the solution of other absorbing or emitting molecules.

A number of papers were devoted to the study of the luminescence of vapors of complex molecules. A paper by **B. S. Neporent** and **S. O. Mirumyanets** (Leningrad) presented results of a study of the transfer of vibrational energy for the molecule 3-dimethylamino-6 aminophthalimide, based on a study of the effect of various added gases on the fluorescence yield of its vapor. It was shown that the effectiveness of collisions in bringing about energy transfer shows a monotonic dependence on the value of the van der Waals constant for the interaction of the molecules of the added gas. A paper by **N. A. Borisevich** and **V. A. Tolkachev** (Minsk) presented data obtained in a study of the temperature-dependence of the fluorescence yield of the vapors of complex molecules. In contradiction to the opinion expressed in the literature, it was shown that a monotonic increase in the luminescence yield occurs as the temperature is lowered. The study of the anti-Stokes fluorescence was of especial interest, as the yield of anti-Stokes fluorescence decreases as the temperature increases. A paper by **V. P. Klochkov** (Leningrad) presented results of interesting studies of the interaction between aromatic molecules in vapors, while a paper by **N. A. Borisevich** and **V. V. Gruzinskiĭ** (Minsk) gave the first results of systematic studies of the electronic fluorescence spectra of vapors and solutions of anthraquinones. The participants in the conference noted the great significance of the study of the luminescence of vapors of complex molecules, permitting the elucidation of the role of vibrational energy and the essence of the various processes of transformation of energy in excited molecules.

Great interest was shown in the paper by **É. V. Shpol'skiĭ** (Moscow) on work which he had carried out, together with L. A. Klimova, on the spectroscopic study of a series of aromatic hydrocarbons in frozen solutions in normal paraffins at the temperature of liquid hydrogen. Upon continuing the study of the discrete spectra of frozen solutions which he had discovered, É. V. Shpol'skiĭ made a comparison of luminescence and absorption spectra. He was thus able to show convincingly that the presence of two or more vibrational series, shifted with respect to one another, is assocciated with a difference in the interactions of the molecule with the crystal field of the solvent. The suggestion was introduced in the discussion, and unanimously supported by the participants, that the appearance of discrete spectra of molecules in frozen solutions should be called the "Shpol'skiĭ spectral effect."

The Shpol'skiĭ effect was also the subject of a series of other papers. In the laboratory of É. V. Shpol'skiĭ, **R. I. Personov** has studied absorption and fluorescence spectra of perylene, and **A. Ya. Khesina** has studied the spectra of some perylene derivatives and **D. N. Shigorin, R. N. Nurmukhametov, N. S. Dokunikhin,** and **N. A. Shcheglova** (Moscow) studied the luminescence spectra in frozen solutions of haloanthraquinones as related to the structures of the molecules, and found a sharp difference between the way in which the mutual influences of groups are manifest in the excited and ground states of the molecule. The luminescence spectra of thioindigo were also studied. **S. G. Bogomolov, R. F. Pemova,** and **L. P. Kolosova** (Sverdlovsk) applied the Shpol'skiĭ effect in the semiquantitative determination of the highly carcinogenic compound, 3, 4-benzpyrene.

Interesting studies of the luminescence of molecular crystals and solid solutions at low temperatures were reported by the Kiev physicists. **M. T. Shpak** and **E. F. Sheka** studied the luminescence of crystalline naphthalene containing small amounts of impurities. It was shown that the known luminescence spectrum of crystalline naphthalene is due to impurities, and is characteristic of β-methylnaphthalene. With crystalline naphthalene having a low impurity content, it was possible to observe a luminescence which might be considered from its characteristics to be an exciton luminescence. **A. V. Solov'ev** studied the influence of additional impurities on the absorption and luminescence spectra of impurities in molecular crystals. **V. L. Broude** and **V. S. Medvedev** studied the luminescence of anthracene in various solvents under conditions excluding the exciton mechanism of energy transfer. **A. N. Faĭdysh** studied the luminescence and photoconductivity of anthracene crystals in connection with the conditions of excitation and the methods of preparing the doped crystals.

The peculiarities of the polarization of the luminescence of molecular crystals in various regions of the spectrum were the subject of a paper by **V. I. Gribkov** and **D. N. Zhevandrov** (Moscow), who made a careful study of the sharp change in polarization at the short-wavelength limit of the luminescence spectrum, which is associated with the radiation from free excitons.

A paper by **V. M. Agranovich** (Moscow) was devoted to the theory of exciton luminescence. This paper indicated the possibility of two types of processes influencing exciton luminescence in the presence of impurities and defects: first, excitons may be captured

by a local defect level and subsequently radiate; second, the transformation of an exciton into light, or the reverse, might take place due to the presence of a defect, but without the localization of the energy at the defect.

An interesting paper by **Ch. B. Lushik, N. E. Lushik,** and **K. K. Schwartz** (Tartu) reported some studies on electronic-vibrational processes in solid solutions (in NaCl, KCl, KBr, and KI) of mercury-like ions. The absorption and luminescence spectra, the thermal quenching, and the relation of the luminescence yield and spectrum to the frequency of the exciting light were studied. It was shown that in these crystals an equilibrium distribution of the luminescence centers over the vibrational levels is established. **J. J. Kirs** and **A. I. Laisaar** (Tartu) gave a paper on the effect of high pressure on the spectral characteristics of the luminescence centers of certain solid solutions.

Results of studies of the luminescence and absorption of frozen solutions of tin, lead, and thallium in certain inorganic acids, as well as of saturated aqueous solutions of the lithium halides, were presented in a paper by **M. U. Belyĭ** and **B. F. Rud'ko** (Kiev), who made a detailed study of the temperature-dependence of the spectra.

The relation between the glass-transition of polymers and their phosphorescent properties was the subject of a paper by **E. V. Anufrieva** and **A. D. Zaĭtseva** (Leningrad). They showed that a study of the temperature-dependence and polarization of the phosphorescence permits us to determine many characteristics of the glass-transition process, and in particular, the relaxation time of the macromolecules in the bulk polymer.

A paper by **L. T. Kantardzhyan, É. V. Grigoryan,** and **S. S. Chikinyan** (Erevan) was devoted to the study of the various ionic forms of uranine and fluorescein which occur at different pH values of the solution. A paper by **L. T. Kantardzhyan** and **V. S. Adamov** reported an attempt to explain the non-exponential law of decay of phosphorescence by the presence of secondary effects.

Several papers were devoted to luminescence under the action of penetrating radiations. On studying the effect of β-irradiation on the photo-luminescence of molecular crystals, **Sh. D. Khan-Magometova, N. D. Zhevandrov,** and **V. I. Gribkov** (Moscow) found a decrease in the intensity of photo-luminescence of mixed crystals of anthracene and naphthalene after β-irradiation. A paper by **Z. A. Chizhikova** (Moscow) reported an experimental determination of the energy yield of the radioluminescence of organic substances under the action of γ rays. The radioluminescence yields of organic crystals and solutions in which energy transfer does not occur are approximately the same. The Vavilov-Cerenkov radiation was used as an internal standard. The assumption of bimolecular quenching as the reason for the low radioluminescence yield is not very plausible. In his paper **I. M. Rozman** (Moscow) drew the conclusion that thermal quenching cannot be the only reason for the decrease in the radioluminescence yield from organic substances as the specific energy loss of the particles increases. In order to explain the experimental facts, the author suggested that the transformation of the excitation energy of the upper electronic levels into thermal energy does not take place instantaneously, but over an interval of about 10 or 11 seconds. A paper by **Yu. V. Naboĭkin, V. K. Dobrokhotova,** and **V. V. Uglanova** (Moscow) was devoted to a study of the scintillation properties and fluorescence spectra of single crystals of naphthalene, stilbene, biphenyl, and other substances with the addition of impurities.

A separate plenary session was devoted to spectral-luminescence studies of chlorophyll and its analogs. In four papers, **T. N. Godnev, R. V. Efremova, N. P. Ivanov,** and **L. A. Kravtsov** (Minsk) gave results of a study of the formation of chlorophyll in leaves. On the basis of these studies, the authors consider the probable precursor of chlorophyll to be protochlorophyll. Interesting results were given from the study of the effect of the solvent and the temperature on the luminescence yield and the spectrum of chlorophyll, as well as on the formation of dimers of chlorophyll and chlorophyllide.

Two meaty papers by **A. A. Krasnovskiĭ** and **F. F. Litvin** (Moscow) were devoted to the chemiluminescence spectra of chlorophyll and the fluorescence and phosphorescence spectra of leaves. For a detailed text of these papers, see p. 000.

A paper by **G. P. Gurinovich, A. N. Sevchenko,** and **K. N. Solov'ev** (Minsk) attracted much attention from the participants in the conference. This paper was based on a study of the limiting polarization of the fluorescence of porphyrins and phthalocyanines. It showed that, when there is a metal atom or two excess protons at the center of the molecule, these molecules possess D_{4h} symmetry (exact or approximate). However, in the case of chlorins, metallochlorins, and porphyrins in a neutral medium, the molecular symmetry is distinctly lower (two-fold). The conference demonstrated the fruitfulness of the application of luminescent methods to problems associated with photosynthesis.

A considerable number of papers was devoted to luminescent analysis.

A paper by **V. A. Fedorov** and **S. I. Freĭvert** (Leningrad), "A double-beam photoelectric fluorimeter for quantitative determination of uranium", described the construction of an apparatus and a luminescence method for determination of small quantities of uranium in pearls. The measurements were carried out by a null-point method by comparison of the fluorescence intensities of the sample being studied with a glass standard. The fluorimeter is to be marketed under the code symbol LYuF-57.

K. P. Stolyarov and **N. N. Grigor'ev** (Leningrad)

developed a method for qualitative microchemical analysis with the identification of ions by the formation of chemical compounds. In some cases, crystalline phosphors are formed, and in other cases, chemical compounds which luminesce. This method of analysis permits the detection of ions of mercury, antimony, lead, tin, and gallium. The sensitivity of the reactions varies from 0.01 to 0.0005 microgram in a volume of 0.001-0.003 ml. An original microtitrometer was built for the quantitative determination of the content of ions in solutions by the method of luminescent titration.

D. P. Shcherbov, R. N. Korzheva, and **A. I. Ponomarenko** (Alma-Ata) proposed a method for determining boron in fluorine-containing mineral raw materials. This method was based on a study of the fluorescent reaction of boron with benzoin, with the aid of an objective fluorimeter with an incandescent lamp. This method for determination of boron has an advantage over most colorimetric methods in the simplicity of sample preparation and of carrying out the reactions. In another paper, **D. P. Shcherbov** and **R. N. Korzheva** (Alma-Ata) showed that the sensitivity of the analysis may be increased significantly by using an incandescent lamp to excite the fluorescence of certain substances, rather than a mercury-quartz lamp. In their opinion, the replacement in the objective fluorimeter of the mercury-quartz illuminators by incandescent lamps with crossed light filters increases the sensitivity and reproducibility of the determination of many substances, as well as simplifying the apparatus and making it cheaper.

T. V. Gurkina and **A. V. Drobachenko** (Alma-Ata) applied a sensitive fluorimeter which they had developed to the determination of boron in solutions with the use of morin. The reaction has a lower limit of sensitivity of 0.06μg/ml.

E.A. Bozhevol'nov and **G.V. Serebryakova** (Moscow), as the result of the examination of a large group of substances, found a compound which they designate as "Lyumomagnezon IREA". This compound gives a pink fluorescence in aqueous solution in the presence of magnesium. With the use of "lyumomagnezon IREA", it is possible to determine magnesium in acids at a concentration of 10^{-6}% with a sample of 10 grams. **E. A. Bozhevol'nov** and **V. M. Yanishevskaya** reported on a luminescence method for determining aluminum in sodium acetate, nitric, hydrochloric, sulfuric, or hydrochloric acids, and in hydrogen peroxide at concentrations of 10^{-6} to 10^{-7}%.

V. K. Matveev (Moscow) reported on a commercial method of synthesis of a material giving a red luminescence, designated as "lyumogen oranzhevo-krasnyi II" (lumogen orange-red II). This luminescent material has been applied in the luminescent detection of defects in electro-vacuum apparatus, in preparing "luminescence-labeled sands," etc.

N. S. Borodin, E. A. Galashin, N. Ya. Semyakina, and **V. N. Silaeva** (Moscow) proposed a simple procedure for revealing the distribution of colorless substances on chromatographic paper by means of phosphorescence at low temperatures.

I. N. Ermolenko, M. Z. Gavrilov, and **L. F. Gladchenko** (Minsk) applied a relation which they had found between the luminescence intensity of cellulose and the amount of absorbed water to the control of sorption of water by cellulosic materials. **V. N. Alekseev** presented a method, together with results, for luminescent-bituminological studies of deep drillings from the Pripyat depression. Serious critical remarks were made concerning this paper. **M. M. Yudilevich** (Rostov-Don) told of a semi-automatic apparatus designed for selection of samples in a luminescence method for determining the content of oils in water.

Three papers were devoted to luminescence methods for the quality control of rubber. **A. N. Faidysh, L. E. Chechik, A. D. Chugaĭ,** and **M. I. Przhebyl'skiĭ** (Kiev) developed a method of control for the degree of vulcanization, plasticization, aging, and composition of rubbers, using a simple photoelectric apparatus for recording of luminescence. **M. L. Berman** (Tashkent) applied a luminescence method to the study of diffusion of liquids into rubbers. **V. N. Provorov** and **V. D. Zaĭtseva** (Moscow) studied the luminescent properties of ingredients and of rubbers based on natural rubber. They found that the intensity and color of the luminescence depend on the vulcanization time of the rubbers. The luminescence intensity was measured by the specially-designed photoelectric apparatus KFA-2.

A series of papers was devoted to the application of luminescence in medicine and biology.

E. M. Brumberg, M. N. Meĭsel', and **A. V. Gutkina** (Leningrad, Moscow) applied special contact objectives in a luminescence microscope for study of vital luminescence of cells of living organs. The objective was lowered into contact with the surface of the animal organ, which was continually irrigated with a physiological solution. The front lens was pressed against the surface of the organ, thus preventing its movement and eliminating any unevenness which might interfere with observation.

V. Kh. Anestiadi (Kishinev) reported on a luminescence-microscope analysis for skin cancer, permitting to a certain extent the differentiation of tumors. A paper by **M. N. Meĭsel'** and **L. V. Mirolyubova** (Leningrad) was devoted to a luminescence-microscope study of bacterial cell structure. **A. P. Kononenko** and **K. N. Ishchenko-Linnik** (Khar'kov) used a luminescence-microscopic method for study of the morphology of spore-forming and non-spore-forming bacteria. Using vital fluorochromes, they demonstrated the presence of nuclei capable of division in certain of the bacteria studied. **Yu. I. Rubinshtein** (Moscow) studied the morphology and structure of the cells of certain microscopic fungi by the luminescence-microscope method.

S. M. Klimenko and **N. B. Azadova** (Moscow) studied the distribution of grippe virus antigen in mouse

lung tissues at various stages of infection by using an indirect modification of the fluorescent-antibody method. **F. M. Kirillova** (Moscow) reported on the detection of polio virus in tissue cultures by the fluorescent-antibody method. **E. A. Kabanova** and **E. N. Levina** reported on luminescence-serological methods for detecting pathogenic micro-organisms. **T. A. Kalitina** (Moscow) reported the preparation of a fluorescent anti-botulinus serum and the identification of the microbe Cl. botulinum with its aid. **V. A. Blagoveshchenskiĭ** and **A. I. Glubokina** gave advice on the preparation of antisera labeled with fluorescent dyes. **S. N. Braĭnes, S. V. Konev,** and **G. P. Golubeva** studied the excitation spectra of ultraviolet fluorescence of human and animal blood plasma, and studied the energy migration in proteins in normal and psychopathological (schizophrenic) states. Ultraviolet-fluorescence spectra of animal tissues and the influence of x-irradiation on them were studied by **Sh. D. Khan-Magometova, A. V. Gutkina,** and **M. N. Meĭsel'** (Moscow). **S. I. Vasilov** and **V. I. Nikolaev** (Chita) suggested the application of the ability of cardiac glucosides to affect the luminescence of a standard medium in order to determine the concentrations of these substances in aqueous solutions.

A paper by **Yu. A. Vladimirov** (Moscow) reported results of a systematic study of luminescence spectra, phosphorescence spectra, and excitation spectra of phosphorescence of the aromatic amino acids (tyrosine, tryptophan, and phenylalanine) and of proteins (zein, albumin, γ-globulin, and actomyosin). **S. V. Konev** and **I. I. Kozulin** (Moscow) proposed a luminescence method for determining the amount of protein in milk, based on a comparison of the fluorescence intensity of the milk proteins with that of standards.

A paper by **V. V. Gruzinskiĭ, G. I. Margaĭlik,** and **A. V. Ermolovich** (Minsk) was devoted to the application of a luminescence method for determining the viability of seeds of species of trees (fir, pine, and cedar). The method is effective since the seeds of these tree species germinate very slowly, and the determination of their viability by the germination method is often difficult.

A resolution was passed in the final plenary session of the conference noting the advances in the development of studies on molecular luminescence and luminescent analysis. The resolution also indicated the existing gaps, and suggested a set of concrete measures for bridging them; especial attention was paid here to the production of the necessary instrumentation for studies in luminescence and luminescent analysis.

Translated by M. V. King