

**THE 2<sup>ND</sup> INTERNATIONAL  
N.W. TIMOFEEFF-RESSOVSKY CONFERENCE  
ON «MODERN PROBLEMS OF GENETICS, RADIOBIOLOGY,  
RADIOECOLOGY AND EVOLUTION»  
(Yerevan, 8–11 September 2005)**

This N.W. Timofeeff-Ressovsky conference (directly following the 105<sup>th</sup> anniversary of his birth) was dedicated to the famous paper, «On the Nature of Gene Mutations and Gene Structure» (the «Green Pamphlet») by N.W. Timofeeff-Ressovsky, K.G. Zimmer, and M. Delbrück that was published seventy years ago (<http://www.jinr.ru/~drrr/Timofeeff>). The conference was planned to examine the origins of Timofeeff-Ressovsky's classical ideas and to demonstrate their impact on modern research on mutagenesis, DNA structure, and evolution. The organizers of the conference were numerous academies, scientific societies, organizations, and institutions, including the Department of Biological Sciences of the Russian Academy of Sciences (RAS); the Genetics Society of America; the International Union of Radioecology; the Joint Institute for Nuclear Research; the Medical Radiological Scientific Centre, Russian Academy of Medical Sciences (RAMS); the National Academy of Sciences (NAS) of Armenia; the NAS of Belarus; the NAS of Ukraine; the N.I. Vavilov Society of Geneticists and Selectionists; the N.W. Timofeeff-Ressovsky Scientific Society «Biosphere and Mankind»; and the Max-Delbrück Molecular Medicine Centre. A parallel NATO Advance Research Workshop on the «Impact of radiation risk estimates in normal and emergency situations» connected fundamental problems of DNA variability with biospherology and radioecology.

The programme of the conference consisted of plenary morning sessions (Genetics, Radiobiology, Evolution, and Radioecology and Biospherology), and after-dinner sections with oral and poster presentations. All sections were headed by leading scientists: R.M. Aroutonian,

M. Cox, J.W. Drake, S.G. Inge-Vechtomov, S. Rosenberg (Genetics); M. Durante, Ju. Kiefer, D. Lloyd, C. Mothersill, C. Seymour (Radiobiology); R.M. Alexakhin, A.A. Cigna, I.N. Gudkov, G. Guegamian, Yu.A. Kutlakhmedov (Biospherology & Radioecology); A. Leitch, I. Matic, S. Rutherford (Evolution).

The Genetics section was opened by S.G. Inge-Vechtomov who presented a detailed history of the mutation theory from G. de Vries to Timofeeff-Ressovsky (convariant reduplication principle) to the theory of mutational processes today, including wider problems encountered by the general theory of variability destined to embrace inherent and non-inherent variations such as modifications, ontogenetic variability, and epigenetic variations (and inheritance). In his lecture, J.W. Drake described some quite unanticipated complications of DNA repair, especially, damage circumvention. He also characterized an aspect of the non-randomness of mutation: the strikingly non-random distribution of point mutations within collections of mutants, in particular, a minority of mutants which contain two or more mutations that appear to have arisen in bursts as a result of transient hypermutability. The lecture by S. Rosenberg was devoted to mutation as a stress response in the bacterium *Escherichia coli*. She suggested multilayered controls that severely limit the dangerous process of global mutagenesis to times of stress and showed that stress-induced point mutagenesis is caused by a switch from high-fidelity to error-prone double-strand break (DSB) repair, the latter due to a special error-prone DNA polymerase: DNA near a DSB is mutated but distant DNA is not. She suggested that coupling stress-induced mutagenesis to DSB repair could be a regula-

tory strategy that both reduces deleterious mutations in cells during normal time, and facilitates concerted evolution of genes and gene clusters. M. Cox presented a talk on genome reconstitution and its mechanisms: genome organization and three types of DNA repair able to protect against massive amount of DNA damage. R.M. Aroutionian spoke about the principles and results of genetic monitoring of chemical mutagens and radiation in Armenia. Shorter oral presentations were by V.G. Korolev (section: mutation processes in gene and genome), I.A. Martirosyan (section: mutations in natural populations), H. Mkrtchyan and M. Manvelyan (section: problems of medical genetics).

The Radiobiology session began with minute for memory to Prof. Vladimir Andreevich Shevchenko, who should have been Chairman and first lecturer on that day but died on 29 July. In this section, some aspects of the problems of low radiation effects were presented: targeted and non-targeted mechanisms, reviews of epidemiological data, and new methods of investigations. Ju. Kiefer reviewed the problems of quantitative description of biological radiation action. C. Mothersill and C. Seymour presented a review on adaptive response and radiation-induced bystander effects in human and non-human biota and revealed that bystander effects vary between species and between organs within individuals. The ultimate outcome after low dose irradiation exposure appears to be determined mainly by the genetic makeup of the exposed individual and by environmental factors such as other stressors. Very little change in response can be detected with increasing dose in the low dose range. A.S. Saenko presented a report by V. Ivanov and A.F. Tsyb on the radiation epidemiological investigations and the problems of potential risk groups, which were realized in the Medical Radiological Research Centre. The new methods of investigations were reported by D. Lloyd («Radiation cytogenetics and biological dosimetry: the past, the present and the future») and M. Durante («Radiation cytogenetics: the colour revolution»), who showed us the power of FISH and multiFISH techniques in visualising damage to chromosomes. In oral sections, features and mechanisms of bystander effects (I.B. Mosse), their contribution to variability and viability in nature (V.L. Korogodina *et al.*),

and radiation biology of polluted areas (M. Ton-del, L.S. Mkrtchyan) were discussed. Additionally, section of Radiation Biophysics was organized that was headed by Ts.M. Avakian.

In the Radioecological plenary session, vice-president of the International Union of Radioecology R.M. Alexakhin spoke on current issues of radioecology. A.A. Cigna talked on the radioecological assessment of the Chernobyl Nuclear Power Plant accident in Western Europe and adjacent areas, with special reference to modern problems of radioecology in the Mediterranean. Yu.A. Kutlakhmedov described modern approaches to the evaluation of ecosystems radiocapacity. Radiation protection of the environment was discussed in the reports of S.A. Geraskin *et al.* and I.N. Gudkov *et al.* T. Imanaka delivered a paper with up-to-date results on the casualties and radiation dosimetry of the atomic bombings of Hiroshima and Nagasaki. Another paper on the distribution of tritium in water systems of the Ural Region was reported by M.Ja. Chebotina and G.A. Nicolin.

The session on Adaptive Evolution was devoted to mechanisms of evolution and analyses of adaptive processes in populations under low-dose radiation. S. Rutherford talked about the mapping between genotype and phenotype, which is modified by developmental and physiological processes including genetic buffering by the Hsp90 protein chaperone. She reported that Hsp90 controls canalization, modularity and evolvability by tempering the effects of mutation in a changing environment. I. Matic spoke about a role for bacterial mutator alleles: there must be positive selection for higher mutation rates under some circumstances in spite of the fact that most newly generated mutations are deleterious. Mutator alleles sometimes rise to high frequencies through their association with the favorable mutations they generate that counterbalance the load of deleterious mutations. Leitch *et al.* presented studies on plant chromosome evolution and speciation. Several authors showed relationships between rates of speciation and karyotype divergence. E.A. Salina continued and detailed this theme by describing the dynamics of subtelomeric repetitive DNA changes during evolution and the formation of amphiploids. Y.B. Lebedev spoke about the impact of retroposons on primate genome evolution. B.F. Chadov reported that a

new class of mutations, which cause severe developmental abnormalities in offspring and give rise to genomic instability, were identified in *Drosophila*. V.I. Glazko presented studies of the population-genetic consequences of the Chernobyl catastrophe, which resulted in the occurrence of new mutant organisms, which are the less specialized (marginal) representatives of each species in species communities.

The International Committee announced a young scientists' competition (<http://www.jinr.ru/drrr/Timofeeff/2005/Awards/Untitled.htm>) on genetics, radiobiology, and radioecology. Prizes were distributed among young scientists (not older than 35 years) in order of the quality ranking of their submitted papers, which were reviewed and evaluated by the international expert commission. The submitted papers of young scientists are available on the N.W. Timofeeff-Ressovsky web-site and are published

in the «Abstracts. Short papers by young scientists», Dubna, 2005. INTAS, the Genetics Society of America, and the N.W. Timofeeff-Ressovsky fund from private donations (<http://www.jinr.ru/drrr/Timofeeff/2005/fund/Untitled.htm>) supported the young scientists' awards (cash awards, travel awards, one-year subscriptions to journals).

The cultural programme of the conference was extensive and interesting. Our Yerevan colleagues took us to several of the most important places in Armenia: Matenadaran, the Armenian Genocide museum, the Armenian brandy factory 'Ararat', Sevan, and Echmiadzin. We heard a fine concert by young Armenia music student and met with the Catholicos of All Armenians Garegin II and others.

We hope to continue the N.W. Timofeeff-Ressovsky conferences and the young scientists' competition.

**Ts.M. Avakian, A.A. Cigna, J.W. Drake, V.L. Korogodina, C. Mothersill**

#### **WINNERS OF THE YOUNG SCIENTISTS' COMPETITION** (Cash prizes and journal subscriptions)

##### **The N.W. Timofeeff-Ressovsky –Teacher Prize**

###### **Genetics:**

First prize:

Victoria Shilova (Engelhardt Institute of Molecular Biology, RAS, Moscow, Russia)

Second prize:

Ekaterina Sergeeva (Institute of Cytology and Genetics, RAS, Novosibirsk, Russia)

###### **Radiobiology:**

Second prize:

Sergey Druzhinin (Institute of Medico-biological Problems, RAS, Moscow, Russia)

Liana Mkrtychyan (Medical Radiological Research Center, RAMS, Obninsk, Russia)

Nickolay Zyuzikov (Joint Institute for Nuclear Research, Dubna, International; Gray Cancer Institute, Northwood, UK)

###### **Radioecology:**

Second prize:

Igor Popov (K. Lorenz Institute for Evolution and Cognition Research, Altenberg, Austria)

##### **The Genetics Society of America Prize:**

Dmitry Yudkin (Institute of Cytology and Genetics, RAS, Novosibirsk, Russia)

Hasmik Mkrtychyan (Yerevan State University, Yerevan, Armenia)

##### **The Scientific Council on Radiobiology Problems of RAS Prize**

Nina Fedorova (Institute of Cytology and Genetics, RAS, Novosibirsk, Russia)

Alexey Moskalev (Institute of Biology, RAS, Syktyvkar, 167982, Komi Republic, Russia)

**The Special Prize of the Expert Committee:**

Anna Nalbandyan (Center for Ecological-Noosphere Studies of the NAS of Armenia, Yerevan, Armenia)  
Andrey Myazin (N.I. Vavilov Institute of General Genetics, RAS, Moscow, Russia)

**Special Recognition Prize of the Genetics Society of America**

(one-year subscription to GENETICS)

Marine Manvelyan (Yerevan State University, Yerevan, Armenia)

Svetlana Polonetskaya (Institute of Genetics & Cytology, National Academy of Sciences of Belarus, Minsk, Belarus)

Ludmila Vdovitchenko (Institute of Agriculogy and Biotechnology, Ukrainian Academy of Agrarian Science, Kiev, Ukraine)

**Special Recognition Prize of the Scientific Council on Radiobiology Problems of RAS**

(one-year subscription to RADIATION BIOLOGY. RADIOECOLOGY)

Dmitry Kretov (Joint Institute for Nuclear Research, Dubna, International)

Nina Kuzmina (N.I. Vavilov Institute of General Genetics, RAS, Moscow, Russia)

**Special Recognition Prize of Department of Biological Sciences RAS**

(one-year subscription to RUSSIAN JOURNAL OF GENETICS)

Gulnora Makhmudova (Institute of Genetics and Experimental Biology of Plants, Tashkent, Uzbekistan)

Elena Khramtsova (The A.M. Gorky Urals State University, Ekaterinburg, Russia)

**Special Recognition Prize of the N. I. Vavilov Society of Geneticists and Selectionists**

(one-year subscription to THE HERALD OF VAVILOV SOCIETY OF GENETICISTS AND BREEDING SCIENTISTS)

Evgeniya Kemeleva (Institute of Cytology and Genetics, RAS, Novosibirsk, Russia)

Anton Korsakov (Bryansk State University, Bryansk, Russia)

Oksana Kovalova (Institute of Agriculogy and Biotechnology, Ukrainian Academy of Agrarian Science, Kiev, Ukraine)

Anna Nebish (Yerevan State University, Yerevan, Armenia)