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THE SECOND INTERNATIONAL N.W.TIMOFEEFF-RESSOVSKY CONFERENCE "MODERN PROBLEMS OF GENETICS, RADIOBIOLOGY, RADIOECOLOGY AND EVOLUTION"

(Yerevan, Armenia, 8-11 September 2005)

This N.W.Timofeeff-Ressovsky conference (confined to 105-th anniversary) was dedicated to the seventy years of the famous publication "On the Nature of Gene Mutations and Gene Structure" ("green Pamphlet") by N.W. Timofeeff-Ressovsky, K.G. Zimmer, and M. Delbrück http://www.jinr.ru/~drrr/Timofeeff. The conference should analyse not only the results of Timofeeff-Ressovsky's classical ideas but demonstrate their transferring to modern research on mutagenesis, DNA structure and evolution. The organizers of the conference were many academies, scientific societies, organizations, institutions, including the Department of Biological Sciences, 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); National Academy of Sciences (NAS) of Armenia; NAS of Belarus; NAS of Ukraine; the N. I. Vavilov Society of Geneticists and Selectionists; the N.W. Timofeeff-Ressovsky Scientific Society "Biosphere and Mankind"; the Max-Delbrück Molecular Medicine Centre. In parallel to the conference, the NATO Advance Research Workshop "Impact of radiation risk estimates in normal and emergency situations" was held, which 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 & Biospherology), and after-dinner sections with oral and poster presentations. All sections were headed by leading scientists: R.M. Aroutiounian, 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. Gueqamian, Yu.A. Kutlakhmedov (Biospherology & Radioecology); E. Afrikian, 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 up to Timofeeff-Ressovsky (convariant reduplication principle). Furthermore, he outlined the theory of mutational process today, 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* reported about the almost completely unanticipated complication of DNA repair and, especially, damage circumvention. He spoke about some kind of complexity, characterized the non-randomness of mutation: the strikingly non-random distribution of point mutations within a gene: non-randomly assorting of mutations among mutants,

in particular, a minority of mutants which contain two or more mutations that appear to have arisen in bursts as a result of some kind of transient hypermutability. The Lecture by *S.Rosenberg et al.* was devoted to mutation as a stress response in the bacterium *Escherichia coli*. The authors suggested multilayered control by stress response that severely limits the dangerous process of global mutagenesis to times of stress. They showed that stress-induced point mutagenesis is caused by a switch from high-fidelity to error-prone double-strand breaks (DSBs) repair, using the special error-prone DNA polymerase. DNA near a DSB is mutated but another molecule is not. They suggested that coupling of stress-induced mutagenesis to DSB-repair could be a regulatory strategy that both reduces deleterious mutations in cells, and potentially 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. *R.M. Aroutiounian* spoke about the principles and results of genetic monitoring of chemical mutagens and radiation in Armenia. It is necessary to mention oral presentations by *V.G. Korolev* (section: mutation processes in gene and genome), *Martirosyan I.A.* (section: mutations in natural populations); *H. Mkrtchyan, 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 & 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 & 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. Tondel, 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 the actual issues of radioecology. *A.A. Cigna* talked on radioecological assessment of the Chernobyl Nuclear Power Plant accident in Western Europe and adjacent areas, with special reference to the modern problems of radioecology in the Mediterranean. *Yu.I. Kutlakhmedov* presented the modern approaches to 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.*

The session "Adaptive Evolution" was devoted to the mechanisms of evolution and analysis of adaptive processes in populations under low 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. It was shown that Hsp90 controls over canalization, modularity and evolvability that means tempering the effects of mutation in a changing environment. *I.Matic* spoke about a role of mutator alleles. He said that there must be positive selection for higher mutation rate in spite of the fact that majority of newly generated mutations are deleterious or lethal. Mutator alleles rise to a high frequency 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. Authors showed relationships between rates of speciation and of karyotype divergence. *E.A. Salina* continued and detailed this theme by the description of the dynamics of subtelomeric repetitive DNA changes during evolution and amphiploids formation. *Yuri B. Lebedev* spoke about the retroposon impact on primate genome evolution. *B.F. Chadov* reported that a new class of mutations, which form severe developmental abnormalities in offspring and give rise to genomic instability, were identified in Drosophila. *V.I. Glazko* presented studies of population-genetic consequences of the Chernobyl catastrophe, which resulted in the occurrence of the 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 old) 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 placed on the N.W. Timofeeff-Ressovsky web-site and published in the "Abstracts. Short papers by young scientists", Dubna, 2005. INTAS, Genetics Society of America and N.W. Timofeeff-Ressovsky fund on private donations (http://www.jinr.ru/drrr/Timofeeff/2005\fund\Untitled.htm) supported the young scientists' awards (money and travel awards, journal one-year subscriptions).

The cultural programme of the conference was very extensive and interesting. The participants visited several of the most important places of Armenia. These are Matenadaran, Armenian Genocide museum, Armenian brandy factory 'Ararat', Sevan, Echmiadzin. They heard fine concert, had a meeting with Catholicos of All Armenians Garegin II.

J.W. Drake, USA; Ts.M.Avakian, Armenia; V.L. Korogodina, Russia