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Division of Biology and Medicine

CONFERENCE ON GENETICS

Argonne National Laboratory

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SUMMARY OF AEC GENETICS RESEARCH PROGRAM

1. The AEC research program in genetics covers many of the subfields of genetics, but with varying emphasis. For the purpose of representing the research program, it is convenient to distinguish four major areas of research activity. These are: mutation studies, studies in cytogenetics, studies in biochemical, physiological, and developmental genetics, and finally studies in population genetics.

These areas correspond to studies of the effects of radiation at the gene level, the chromosome level, the cell, tissue, and organism level, and the population level.

2. Mutation studies. Estimation of mutation rates. Comparison of induced and spontaneous mutation rates. Relationship of mutation rate to radiation dose. Comparative mutagenicity of physical and chemical mutagens. Mechanics of the mutational event. Enhancers and inhibitors of mutations. Somatic mutations.

Conger and Kimball	ORNL	Mechanism of mutation
Russell	ORNL	Radiation-induced mutation rates in mice
Stern	UCRL	Comparative mutagenicity of deuterons and x-rays in Drosophila; spontaneous mutation rates
Singleton	BNL	Use of radiation to determine mutation mechanism; radiation dose-mutation rate

[illegible]	BNL	Comparative mutagenesis of different irradiations in Drosophila
Shapiro	BNL	Useful somatic mutations in plants
Whittinghill	North Carolina	Study of genetic recombination as influenced by mutagenic and nonmutagenic environmental agents
Einset	N. Y. State Agricultural	Induction and testing of somatic mutations in apples, grapes and other economic plants
Whiting	Pennsylvania	Mutation rates in Mormoniella
Muller	Indiana	Influence of radiation in altering the incidence of mutations in Drosophila
Plough	Amherst	Genetic effects of acute and chronic low level irradiation with Cobalt-60
Laughnan	Missouri	Genetic nature of induced mutations
Neel	Michigan	1. Estimation of the rate of mutation of certain human genes. 2. Estimation of the genetic effects of radiation on man

3. Cytogenetics. Effects of radiation on chromosomes. Phenomena of chromosome breakage and restitution. Relationship of frequencies of various kinds of chromosomal aberrations to radiation dose. Timing period of greatest and least susceptibility to radiation damage. Environmental conditions which enhance or inhibit chromosome breakage. Use of chromosomes as indicators of radiation damage.

Powers	ANL	Genetic studies on [illegible] and Paramecia
Conger and Kimball	ORNL	Cytogenetic effects of [illegible] in [illegible]. [illegible], [illegible], and Tradescantia, [illegible] influence on restitution of broken chromosomes
Gaulden	ORNL	Effect of radiation on mitosis

Clark and Heidenthal	BNL	Relationship of chromosome complement to radiation sensitivity in Habrobracon
Baker	ORNL	Cytogenetic effects of radiation in Drosophila
Caldecott	BNL	Relationship of cytoplasmic and chromosome damage to radiation sensitivity in seeds of barley
Schwartz	ORNL	Chromosome breakage in Drosophila
Sax	Harvard	The biological effect of radiation
Blakeslee	Smith	Studies to determine the effects of different types of radiations on plants
Zelle	Cornell	Cytological and genetic studies of bacteria as related to effects of radiation
Giles	Yale	Investigations on the cytogenetic effects of radiations
Stone	Texas	Research on direct and indirect effects of radiations on the genetic systems of organisms
Lindegren	So. Illinois	The effect of X-irradiation on a Polyploid series of yeast cultures containing determined amounts of DNA
Swanson	Johns Hopkins	Modification of the rates of induced chromosome and gene changes by supplementary agents

4. Biochemical, physiological, and developmental genetics. The effects of radiation-induced and spontaneous mutations on the biochemistry, physiology, and development of cells, tissues, and organisms. Analysis of pathways of biosynthesis of various cellular constituents to reflect gene-controlled enzyme activity. Analysis of physiological differences between normal and mutant phenotypes. Description and analysis of developmental differences and interactions of genes during development.

Powers	ANL	Genetic studies on bacteria and Paramecia

Conger and Kimball	ORNL	Elucidation of genetic action in biological systems
Kimball	ORNL	Oxygen and hydrogen paroxide influence on genetic and non-genetic damage to Paramecium
Russell	ORNL	Effect of radiation on developmental processes
King	BNL	Incorporation of radioisotopes in Drosophila
Woodward	BNL	Biochemical genetics of Neurospora, especially glucose metabolism
Conzak and Singleton	BNL	Disease resistance in plants by radiation induced mutations
Giles	Yale	Investigations on the cytogenetic effects of radiations
Stone	Texas	Research on direct and indirect effects of radiations on the genetic systems of organisms
Glass	Johns Hopkins	The action of radiation and other mutagenic agents (1) in inducing mutation in Drosophila females, and (2) in controlling the action of a specific gene responsible for suppressing uncontrolled growth
Ryan	Columbia	Radiation induced genetic instability
Beadle	Cal. Tech..	The genetic and cytological effects of high energy radiation
Wyss	Texas	The genetic and biochemical effects of radiation on bacteria
Bunting	Yale	The genetics of Serratia as revealed by radiation
Gowen	Iowa	Quantitative study of lifetime sickness and mortality and progeny effects resulting from exposure of animals to penetrating irradiation
Nilan	Wash. State	Study of factors influencing the biological effects of X-rays

Crosch	N. C. State	The genetic developmental effects of ingested radioactives in Habrobracon
Frolik	Nebraska	Genetic effects of thermal neutron irradiation of crop seeds
Bonner	Yale	Relationship of genes to biochemical reactions in Neurospora
McElroy	Johns Hopkins	Modification through the use of supplemental environmental factors of the frequency of gene and chromosome changes induced by X-rays, Ultraviolet light and nitrogen mustard
Sonneborn	Indiana	Specific immobilization substances (Antigens) of Paramecium aurelia
Christensen	Minnesota	Effects of Radioactive substances on plant pathogens and other microorganisms
Mickey	Northwestern	Comparison of the delayed effects produced by chemical mutagens and by X-rays
Adelberg	California	Enzymatic changes associated with radiation induced mutations

5. Population genetics. Estimation of parameters needed to describe the genetic structure of populations, including gene frequency, genotype frequency, mating type frequency, mutation pressure, selection pressure, adaptive values, consanguinity rates, phenotypic variance, total genetic variance, additive genetic variance, allelic and nonallelic interactions.

Sacher and Grahn	ANL	Genetics of differences in radiation resistance in mice
Neel	Michigan	1. Estimation of the rate of mutation of certain human genes. 2. Estimation of the genetic effects of radiation on man
Stephens	Utah	Study of the frequency of human consanguineous marriages and its relation to the appearance of recessive gene mutations

Gregory	North Carolina	Effects of nuclear reactor radiation upon genetic and physiological characteristics of peanuts
Blair	Texas	Direct and indirect effects of radiation on genetic and developmental systems of vertebrates
Dobzhansky	Columbia	The population genetics of species of Drosophila
Wallace	Long Island Biological	Adaptive value of experimental populations exposed to radiations