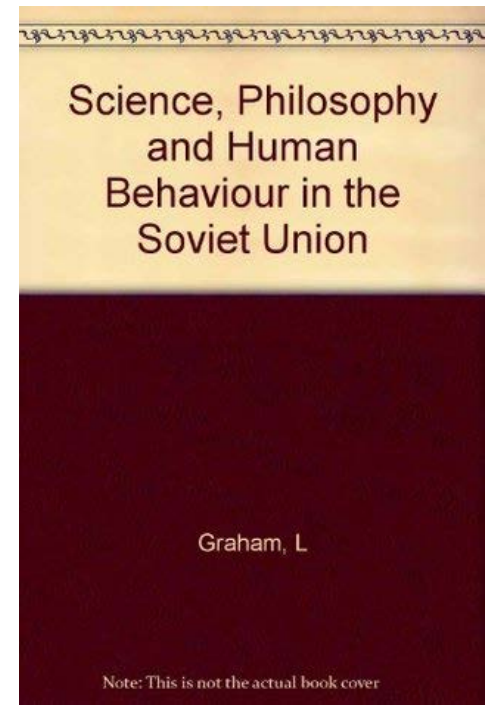
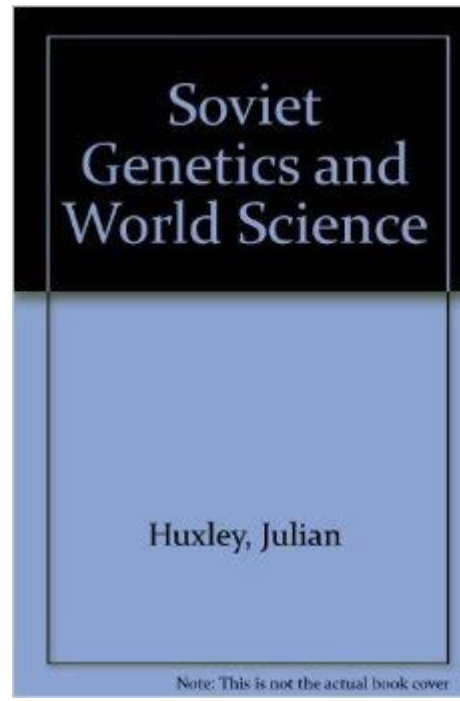
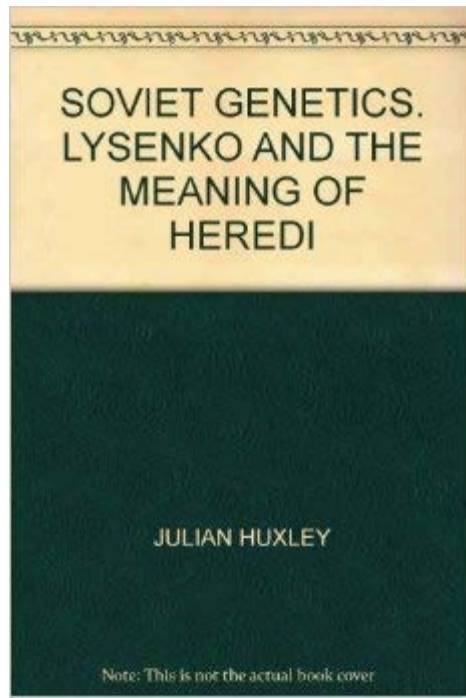




Soviet genetics

Totalitarianism and freedom



Biology in Soviet Union: 1920s

- Modernist project
- Development on the basis of XIX century science
- Many young people from lower social classes became able to get education
- 1924-1929 – New economic policy (NEP)
- History as a progress: ideological basis

Famous geneticists

- Nikolai Vavilov
- Nikolai Koltsov
- Sergei Chetverikov
- Alexander Serebrovsky
- Iosif Rapoport
- Georgii Karpechenko
- ...many others

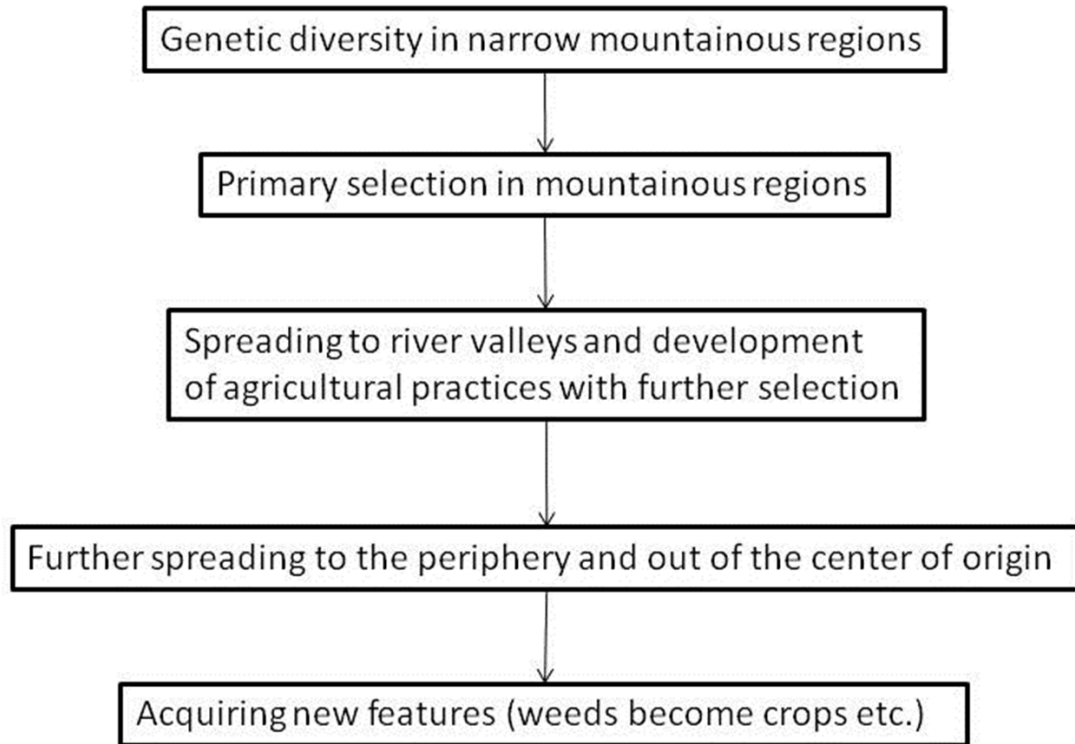
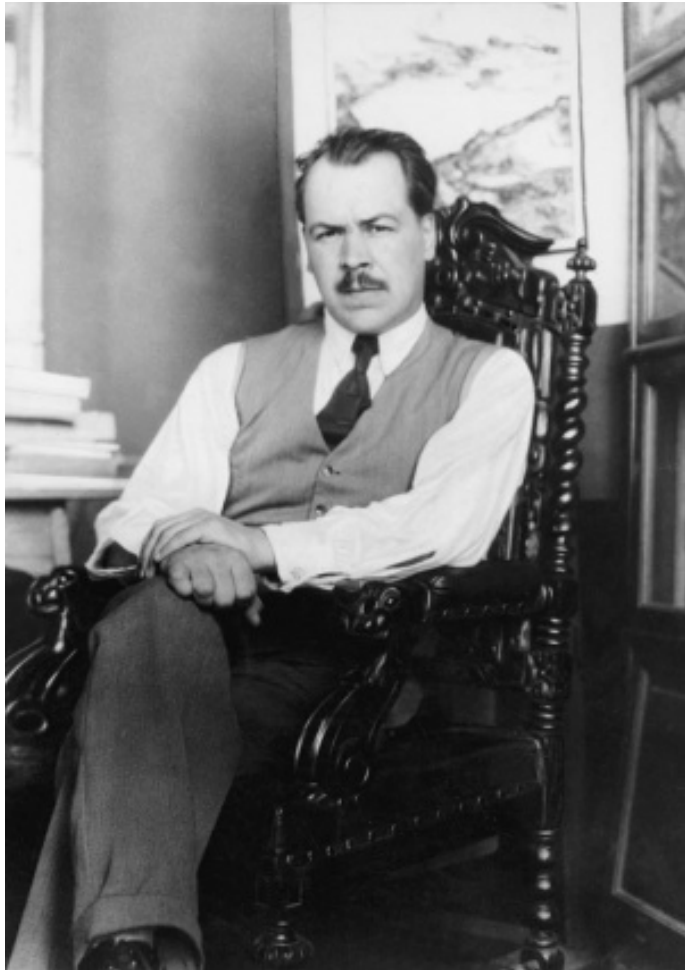
Nikolai I. Vavilov

1887-1943



- Identified the centres of origin of cultivated plants
- Law of homologous series in variation (in evolution)
- One of fathers of “Green Revolution”
- He devoted his life to the study and improvement of wheat, corn, and other cereal crops that sustain the global population
- President of Soviet Agricultural Academy (VASKhNIL) in 1929-1935

N.I. Vavilov and the concept of Neolithic revolution



Centers of origin of various crop plants (after Vavilov)

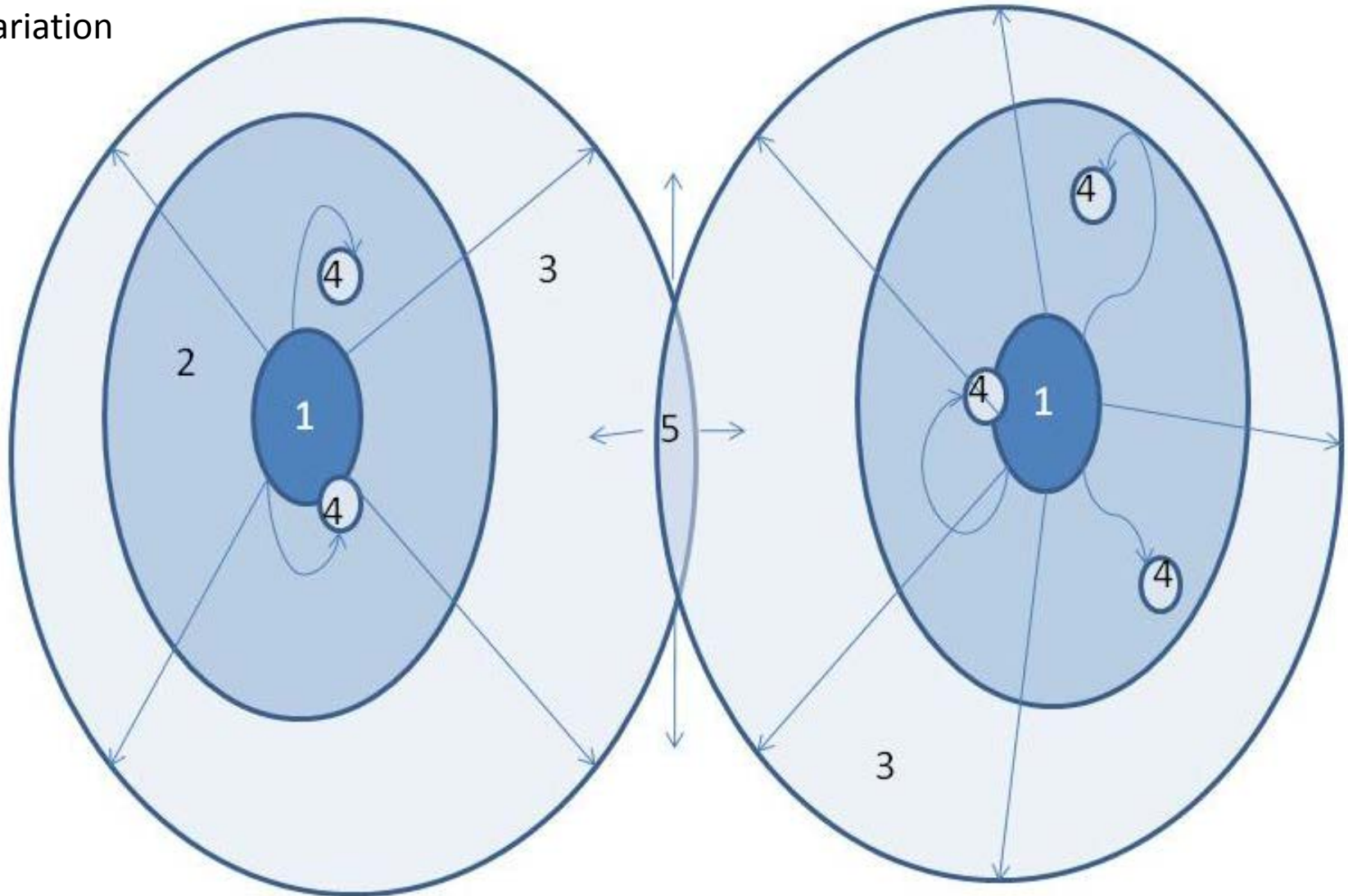


Nikolai Vavilov (1887-1943)

Spreading from the centres of origin

1 – dominant genes, 2 – heterozygous, 3 – recessive, 4 - isolates

Vavilov's concept of species: Complex dynamic morpho-physiological system bound in its origin to a certain environment and area and following the law of homologous series in variation



Rise of civilization

Initial agricultural practices in narrow mountainous regions

Formation of the core of agricultural civilization

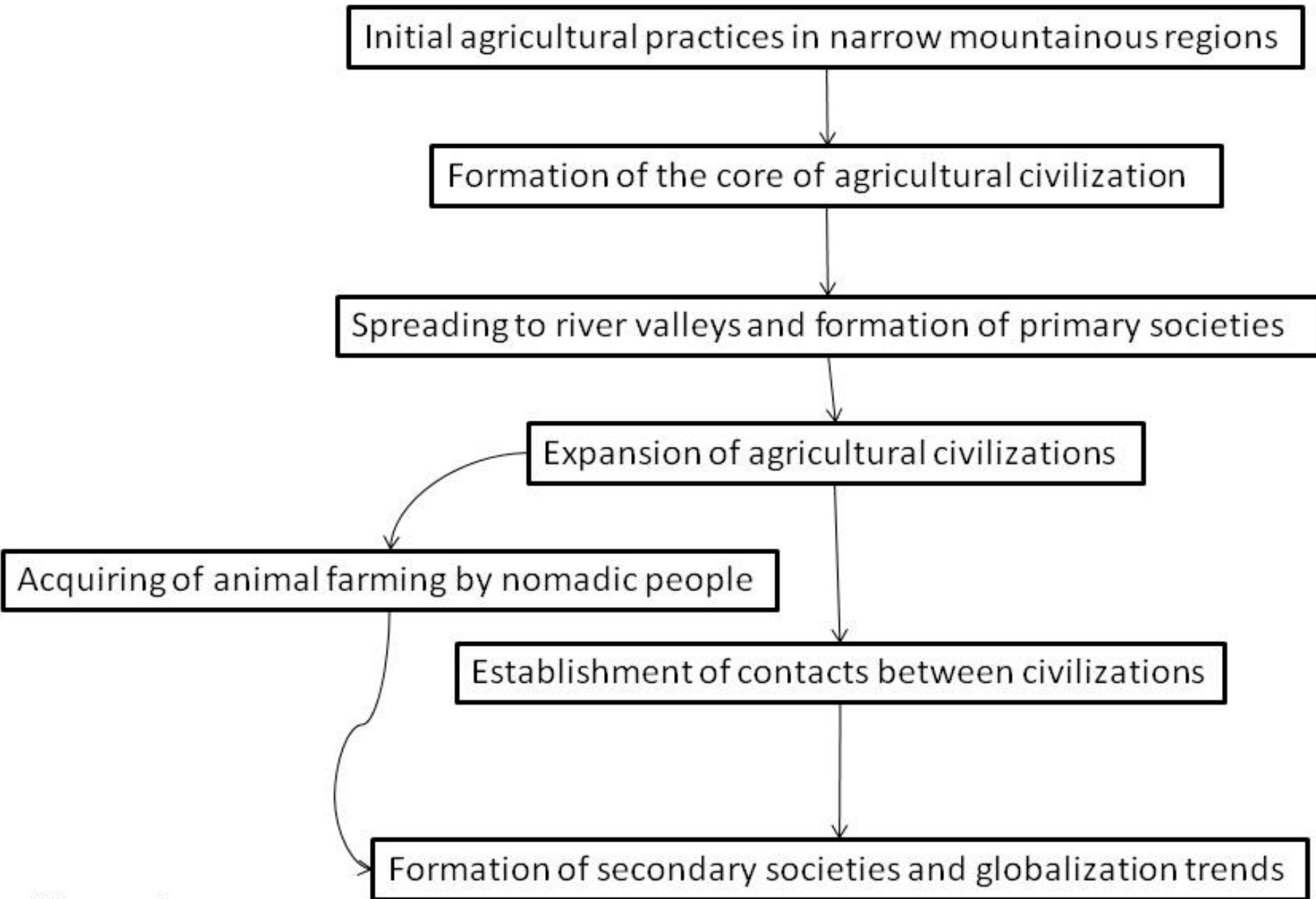
Spreading to river valleys and formation of primary societies

Expansion of agricultural civilizations

Acquiring of animal farming by nomadic people

Establishment of contacts between civilizations

Formation of secondary societies and globalization trends



N.I. Vavilov and Margaret Newton



- Impressed with the work of Canadian phytopathologist Margaret Newton on wheat stem rust, in 1930 N.I. Vavilov attempted to hire her to work at the institute.
- She declined, but visited the institute in 1933 for three months to train 50 students in her research.

N.I. Vavilov and Hermann Muller



- Discoverer of radiation mutagenesis
- He had radical political views
- Invited by N.I. Vavilov
- Lived in Soviet Union from 1933 to 1938
- Escaped from Soviet Union with the help of N.I. Vavilov

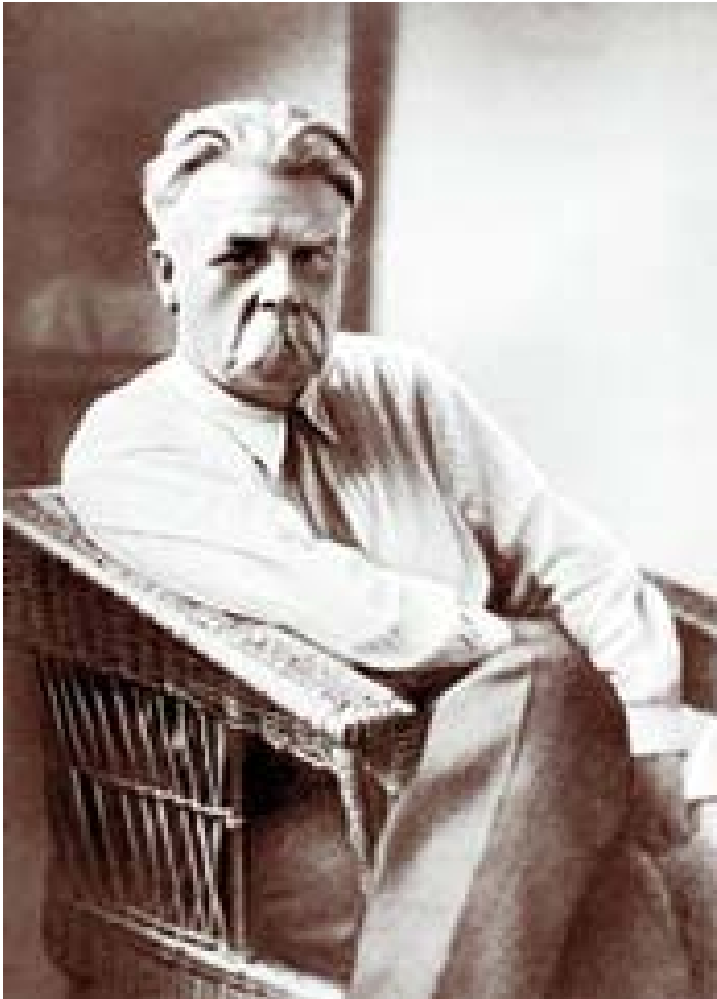
Prison and death



- Vavilov was arrested on August 6, 1940, while on an expedition to Ukraine. He was sentenced to death in July 1941.
- In 1942 his sentence was commuted to twenty years' imprisonment; he died in prison in 1943 of starvation
- In prison he wrote the book “The History of Development of World Agriculture” – it was destroyed

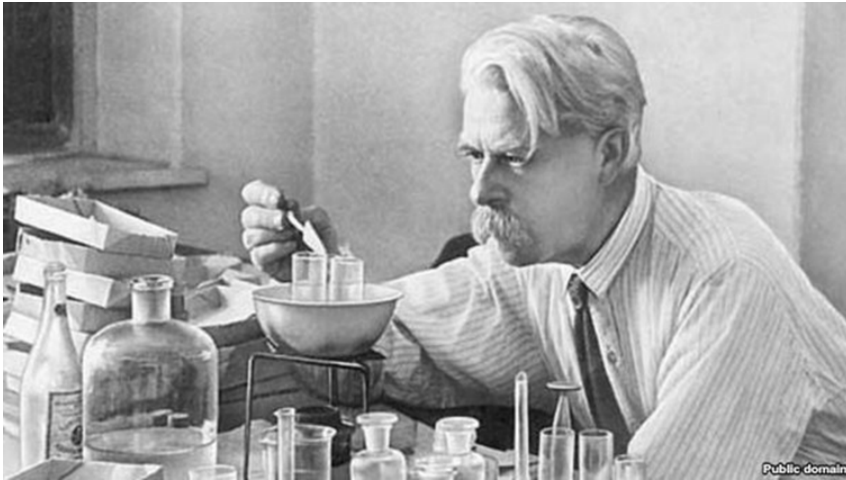
Nikolai K. Koltsov

1872-1940



- In 1903 Koltsov proposed that the shape of cells was determined by a network of tubules which he termed the cytoskeleton (based on experiments with crustacean cells)
- In 1927 Koltsov proposed that inherited traits would be inherited via a "giant hereditary molecule" which would be made up of "two mirror strands that would replicate in a semi-conservative fashion using each strand as a template"
- Founder of the Institute of Experimental Biology and several genetics departments

Nikolai K. Koltsov



- In 1920, Koltsov was arrested as a member of the non-existent "anti-Soviet Tactical Center". Saved from execution by Maxim Gorky (writer)
- His death in 1940 was claimed to have been due to a stroke. However it was later revealed that it was a result of his poisoning by the NKVD, the secret police of the Soviet Union.

Sergei S. Chetverikov

1880-1959



- the modern synthesis of evolutionary theory
- Natural selection and mutations
- “waves” of life
- Selection of silkworm

- *Arrested in 1929-1932*
- *Dismissed in 1948*

Alexander S. Serebrovsky

1892-1948



- Concept of gene divisibility (chromosomal crossover units)
- Population gene pool
- Gene geography
- Genetic method against pest insects

Iosif Rapoport



Discoverer of chemical mutagenesis – nominated to Nobel prize in 1960s
together with Charlotte Auerbach

He spoiled the triumph of Lysenko at the August 1948 Session of VASKhNIL

Georgii D. Karpechenko

1899-1941



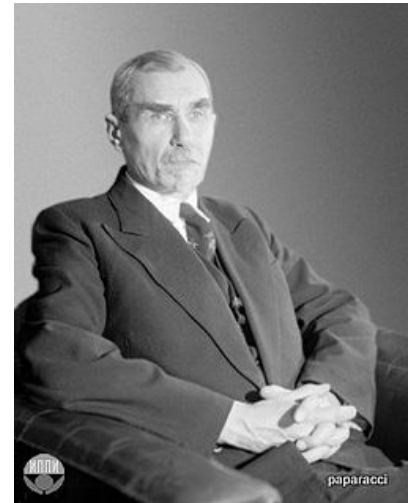
- Allopolyploidy in evolution, also of cultivated plants
- Raphanobrassica (Brassicoraphanus, radicole) – fertile offspring of radishes and cabbages, the first instance of a new species obtained through polyploid speciation during experimental crossbreeding of different genera
- *He was sentenced to death and executed on July 28, 1941.*

Geneticists – victims of terror

- From 1934 to 1940, under Lysenko's admonitions and with Stalin's approval, many geneticists were executed (including Isaak Agol, Solomon Levit, Grigorii Levitskii, Georgii Karpechenko and Georgii Nadson)



Georgii Nadson –
one of discoverers
of radiation
mutagenesis

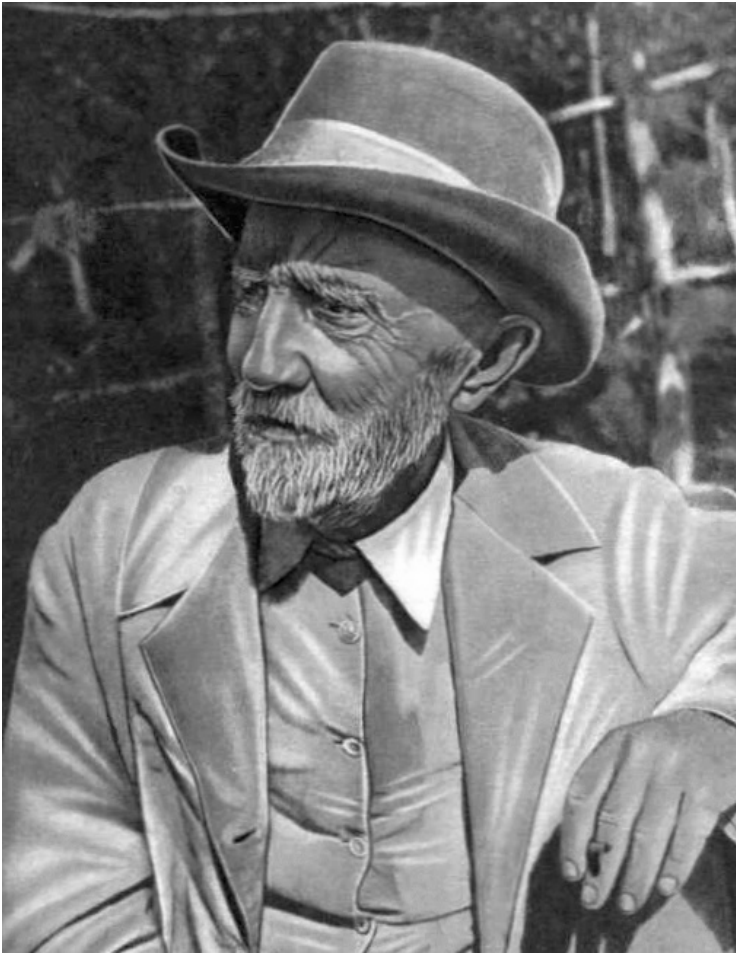


Grigory Levitsky -
author of
karyotype concept

Michurinist Biology

- Soviet propaganda contrasted the "productive" "Soviet Michurinist Biology" with the "fruitless" "capitalist" Weismanist-Morganist-Mendelist genetics
- Michurin's theory of influence of the environment on the heredity was a variant of Lamarckism. He maintained the position that the task of a selectioner is to assist and enhance the natural selection.

Ivan V. Michurin (1855-1935)



- "We cannot wait for favors from Nature. To take them from it – that is our task."
- Selection of plants – like Luther Burbank

Trofim D. Lysenko



На совещании передовиков урожайности по зерну, трактористов и машинистов молотилок с руководителями партии и правительства. Товарищи Сталин, Андреев, Микоян и Косигов слушают речь академика Т. Д. Лысенко.
Снимок сделан в Кремле 29 декабря 1935 года. Фото М. Екзельштерна и П. Кузнецова

Some aspects of Lysenko research

- Vernalization
- Stage theory
- Seeding of potatoes by tuber cuts
- “Net” seeding in agriculture
- Branched wheat
- Inheritance of acquired traits

Branched-spike spring wheat (*Triticum turgidum* L.) genotypes are periodically promoted in western Canada as having very high grain yield capacity



Triticum turgidum L. (Wheat)

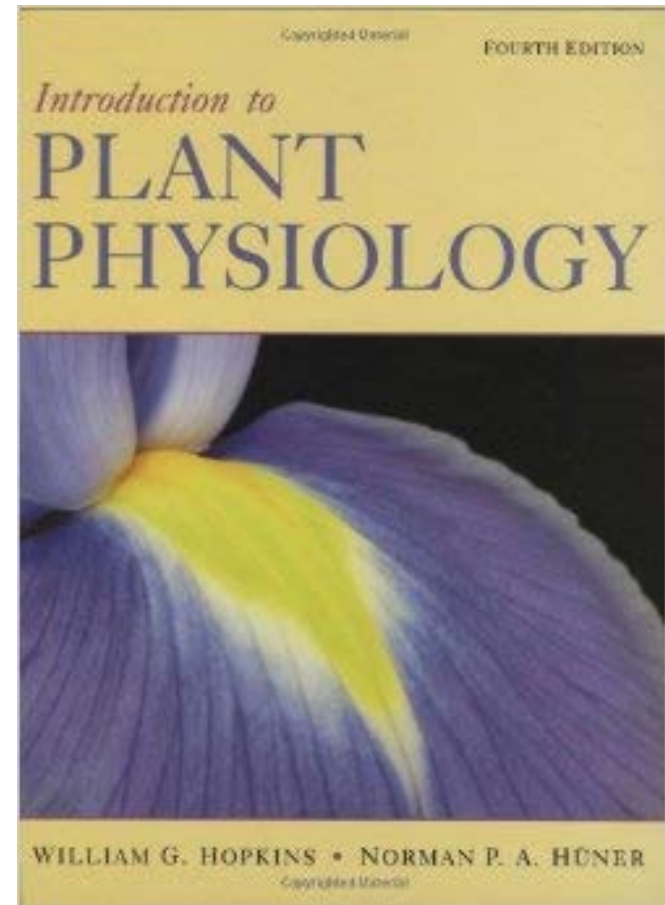
Stalin and Lysenko



And we shall defeat drought

Lysenko and vernalization

- Limited significance
- No mechanism revealed



Olga Lepeshinskaya



- was a Soviet biologist, a personal protégée of Vladimir Lenin, later Joseph Stalin, Trofim Lysenko and Alexander Oparin
- She rejected genetics and was an advocate of spontaneous generation of life from inanimate matter.

Session of VASKhNIL - 1948

- VASKhNIL (Russian: ВАСХНИЛ) was the All-Union Academy of Agricultural Sciences of the Soviet Union named after V.I. Lenin

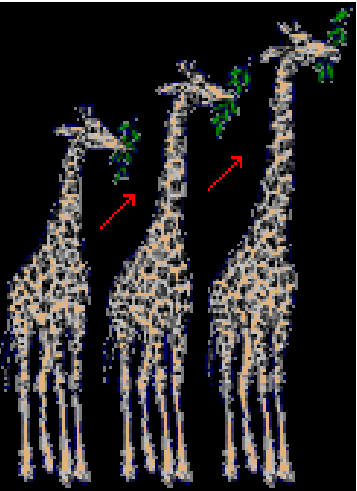


Session of VASKhNIL

- “The Central Committee has read my report and approved it.” - Long applause, all stand up
- Lysenko confirmed that Stalin had personally gone over his text.
- The Michurinist biology was portrayed as a socialist, materialist, proletarian science, a kind of “creative Darwinism” deriving from Darwin, Timiryazev, and Michurin that united theory and practice, and had mastered the control of heredity.

Results of VASKhNIL session

- Genetics was officially declared "a bourgeois pseudoscience"
- All geneticists were fired from their jobs
- Lysenkoism dominated in Soviet Union until the end of Khrushchev era (mid-1960s)
- Development of biology was significantly affected for many years



Mouse #899: Female

Mouse #900: Male

Mouse #901: Baby



“Seriously, Weismann. Enough is enough!”

Inheritance of acquired characteristics

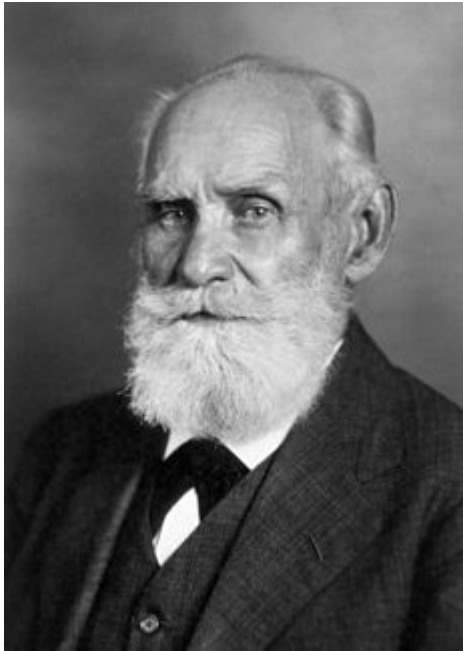
- One of the foundations of Lamarckism (but not the main)
- Lysenko called this concept “Creative Darwinism”
- Pseudo-scientific in Lysenko theories
- Has relations to current development of molecular biology (Molecular Lamarckism of Eugene Koonin, directed mutations, epigenetic inheritance, Read-Write genome of James Shapiro).

Nikolai P. Dubinin



- One of leading geneticists
- Monopolized Soviet genetics after Lysenko

Pavlovian session



Ivan P. Pavlov
1849-1936

- Joint session of the USSR Academy of Sciences and the USSR Academy of Medical Sciences held on June 28 to July 4, 1950
- During the session, a number of Ivan Pavlov's former students attacked another group of his students (L.A. Orbeli, P.K. Anokhin, A.D. Speransky, I.S. Beritashvili) whom they accused of deviating from Pavlov's teaching

Bauer: Stable non-equilibrium state



- Ervin Bauer (1890-1938)
- Biological molecules are in non-equilibrium conformations
- Author of the monograph “Theoretical Biology”
- *Moved to Soviet Union from Hungary*
- *He and his wife Stefánia Szilárd were executed in 1938*

Physics and ideology

- Atomic bomb project stopped ideologization of physics
- In 1930s several physicists were repressed: Matvei Bronstein was executed, Lev Landau was arrested.
- Physicists working on the atomic project were controlled by L. Beriya (NKVD), nobody was arrested.

Current situation in Russia



- Some papers supporting Lysenko
- Not major trend but in most conservative editions
- State support of science in most recent years was devaluated by negative political development.