
Trofim Lysenko and genetics in Soviet Russia (1927-1962)

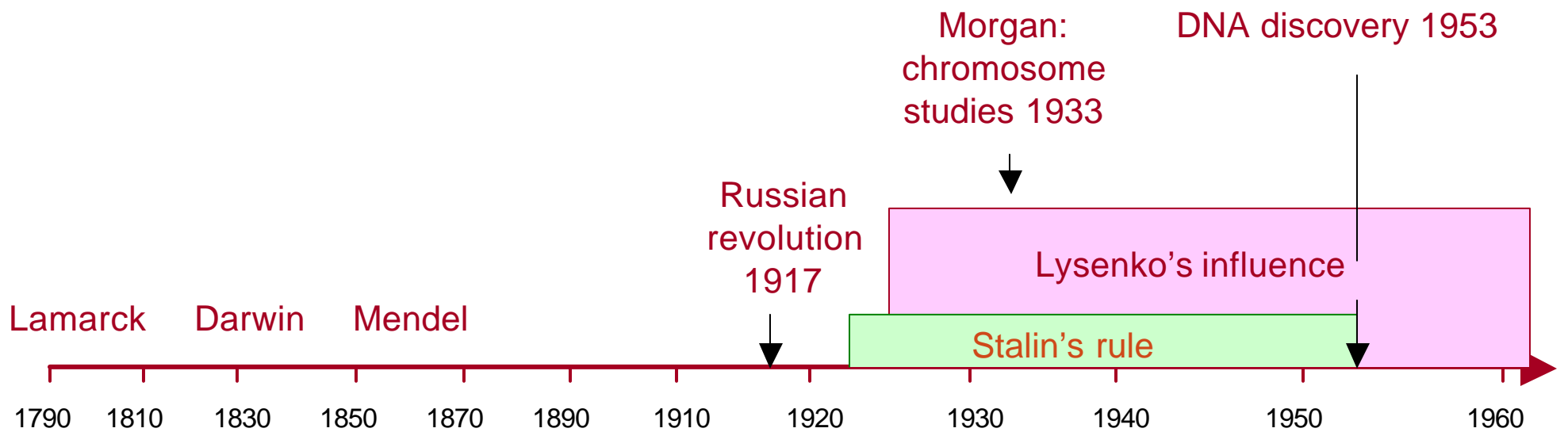
Bibliography

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2. D. Joravsky, The Lysenko affair, Cambridge University Press, 1970
3. W. Gratzer, The undegrowth of science, Oxford University Press, 2000

Genetics

- the branch of biology that studies heredity and variations in living organisms
 - I will discuss how genetics was declared a pseudo-science in a large country for more than thirty years
 - We will also try to understand the reasons behind this unfortunate story
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Timeline

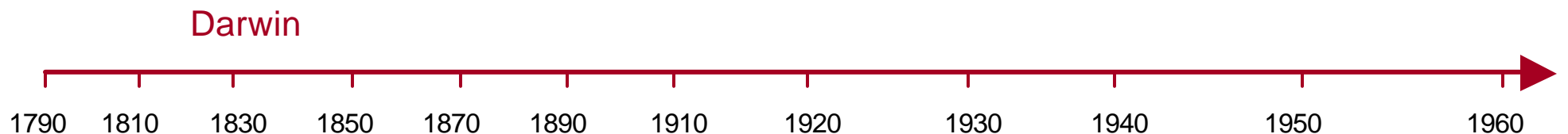


Charles Robert Darwin

(1809-1882)

- Formulated the evolution theory in his book “The Origin of Species”
- “... in the struggle for existence, ..., favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The results of this would be the formation of a new species.”

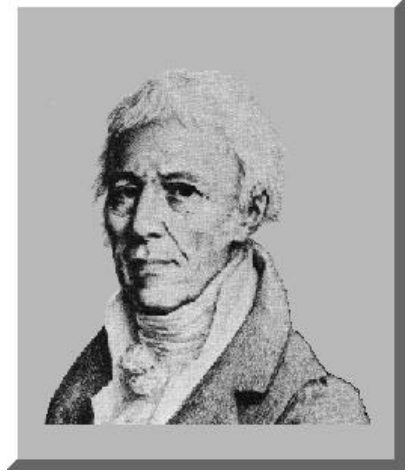
How are structural changes passed from one generation to another?



Jean-Baptiste Lamarck

(1744-1829)

- Developed a classification of animals and plants based on their structural characteristics
- Suggested that hereditary changes accumulate during the lifetime of an organism under the influence of environmental stimuli
- These accumulated changes are then passed to the next generation



Lamarck Darwin



Gregor Mendel (1822-1884)

- A monk in a small E. European town & father of genetics
- Extensively experimented with common plants (peas, etc.)
- Observed that certain traits do not blend when passed from the parent (pea flowers can be only purple or white, but not a mix)
- Some of the traits require another trait to be also present
- Introduced a notion of a “unit of heredity” (gene)

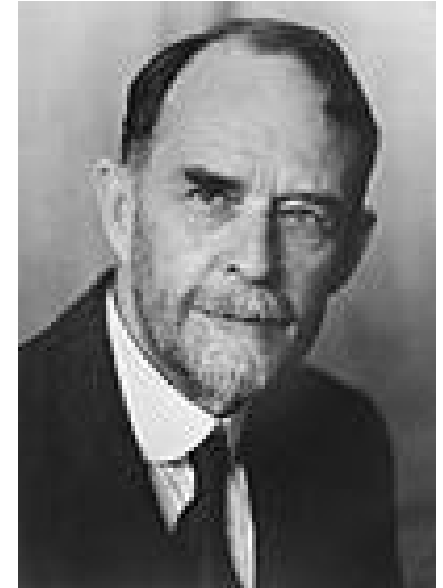


Lamarck Darwin Mendel

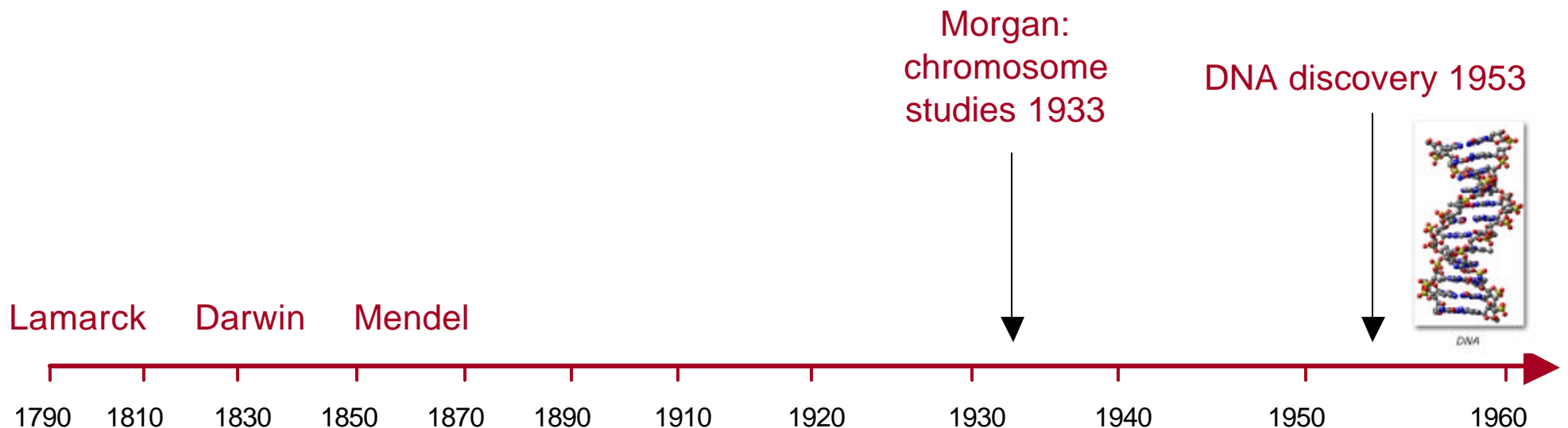


Thomas Hunt Morgan (1866-1945)

- Discovered that genes are contained in chromosomes
- Received the Nobel prize in medicine

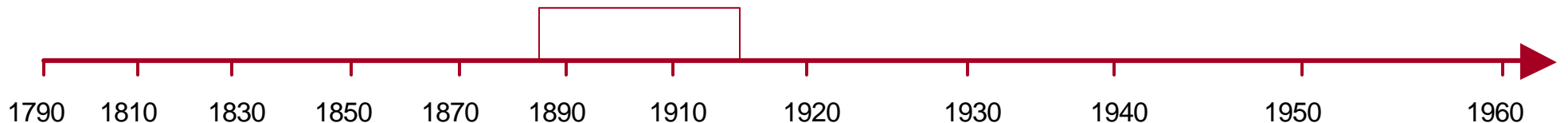


However, what the gene exactly is was unknown for another twenty years, until the discovery of the DNA molecules



Biology in Russia in 1900's

- World schools in medicine, physiology, zoology, genetics
- Two Nobel prizes in medicine (Pavlov, 1904; Mechnikov, 1908)
- The main agricultural producer in Europe
- Large number of centers of experimental agriculture;
- two centers of genetics studies (Moscow & St.Petersburg)



Russian revolution (November 1917)

The conservative monarchy was overthrown by a radical Bolshevik party headed by Vladimir Lenin

- The new party proclaimed the goal to create a new type of society based on the socialist ideas of Marx and Engels
- The ensuing civil war resulted in millions of deaths, famine, and destruction of the economy

After the death of Lenin, the power was transferred to Josef Stalin, an omnipotent dictator who ruled until 1953



Nature of Soviet ideology 1

- “Dialectical materialism” -- a philosophy “inspired” by the achievements of modern science
 - Constantly changing matter as a primary form of the existence

Consciousness as a particular form of matter

Rejection of religion or the ideal laws that exist independently of matter

God and “absolute” ideas do not exist

The concept of a “gene” seemingly contradicted the Marxist views

- Suggested the existence of a unit of “ideal” characteristics (similar to the soul)
 - Disagreed with the perceived infinite divisibility of objects in nature
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Nature of Soviet ideology 2

- Political economy of Karl Marx: all social life can be reduced to economical relations, i.e., material needs of the society
 - Creation of a utopian society without private property on means of production (communism)
 - Abolition of social classes; absolute equality of citizens; creation of a state “where a kitchen maid can rule the country” (V. Lenin)
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Science in the Soviet Russia

Russian government tremendously increased the funding of science...

- ...but strictly persecuted deviations from the communist ideology
 - Introduced a party control over industry and science
 - Installed party hardliners on key positions in scientific organizations
 - Was highly suspicious of highly trained scientists
 - Introduced large privileges for workers' and peasants' children on college entry exams
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Genetics in the Soviet Russia

- Due to wrong agricultural policies, underproduction was chronic during the first ten years of the new regime
- The government strongly encouraged the scientists to revive the Russian agricultural school
- Large investments, support in press, etc.

Scientists like Vavilov were realistic about what the selection can achieve in just a few years

Painstakingly long experiments with many generations of organisms needed to produce new breeds



Nikolai Vavilov,
The President of the
Russian Agricultural
Academy

- Student of W. Bateson, one of the founders of modern genetics
- Enthusiastic proponent of new agricultural methods and plant breeds

Trofim Lysenko (1898-1976)

1898 Born in a peasant family

1917-1925 Higher education in agriculture

1925-1929 Junior researcher in
experimental agriculture

1934 Associate member of Russian
Academy of Sciences

1938 President of the Agricultural
academy

1939 Full member of the Academy of
Sciences

1956 Dismissed from the position of the
president of the Agricultural academy

1961 Elected the president of the
Agricultural academy (the second time)

1964 Dismissed again after the death of
Khrushchev

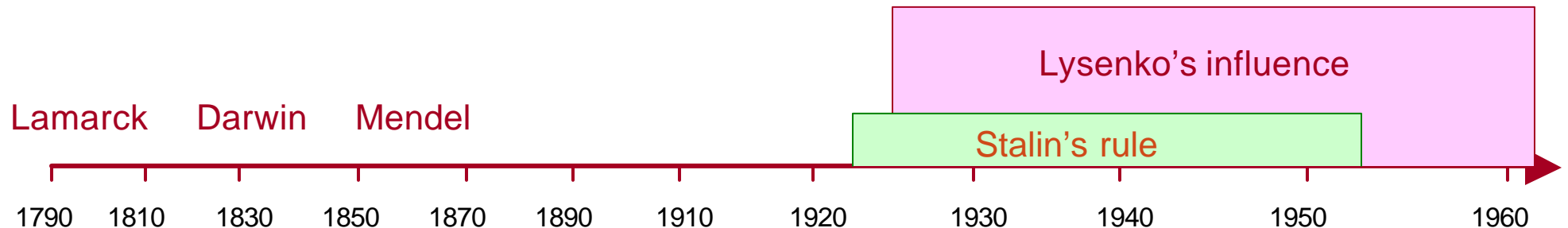


Trofim Lysenko scientific views

Claimed a method for transforming winter grains into spring grains (vernalization)

Based on the ideas similar to the Lamarckian theory of acquired characteristics, denied the existence of genes

Promised astonishing advances in breeding, which were never realized



Trofim Lysenko: scientific views

Based on the ideas similar to the Lamarckian theory of acquired characteristics, denied the existence of genes

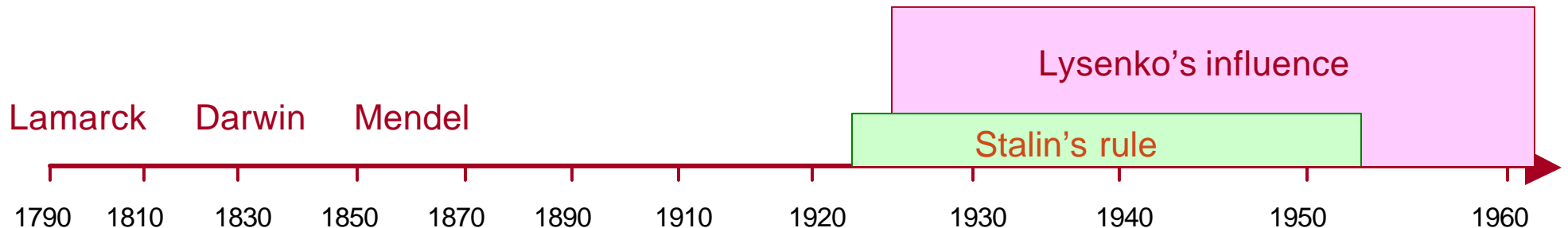
Promised astonishing advances in breeding and agriculture, which were never realized

In discussions with the opponents, routinely based his arguments on the agreement with the Marxist philosophy



Was extremely hostile to applying mathematical methods in biology

Was not shy of using statistically incomplete data or sometimes “correct” the data to match expectations



Miraculous discoveries by Lysenko and his followers

- Southern plants can be trained to grow in North
 - Could transform rye into wheat and wheat into barley
 - Natural cooperation as a co-existing opposite to natural selection
 - Claimed that song-birds gave birth to cuckoos, and that weeds are transmutations of food grains
 - Bacteria were discovered to emerge from lifeless matter
 - New hybrid chickens emerged from one egg fertilized by several cocks
 - Cows can be coached to produce fatter milk by a “chocolate diet” treatment
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Suppression of opposition to Lysenko

- Lysenko's movement had a strong support by media and Stalin himself
 - He blamed continual failures on incapability and sabotage by the others
 - He also promoted his "truly communist" science as an opposite to the incapable Western science of "Mendelists-Morganists"
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Quote

"The history of Mendel's heredity science demonstrates with a striking clarity the connection between the capitalistic science and all ideological corruption of the bourgeois society."

In "Fly lovers, human haters", a newspaper article (1949)

Suppression of Lysenko's opposition

- Through a series of intrigues and highly politicized public “discussions”, he managed to destroy practically all of his opponents
 - More than 3000 biologists were fired, arrested, or executed
 - Nikolai Vavilov was disgracefully dismissed from the presidency of the Agriculture Academy in 1938 and died in prison in 1940
 - The genetic science in Russia was effectively destroyed until the death of Stalin in 1953
 - Despite successive failures, Lysenko remained in the leadership of biology and briefly regained the position of the President of the Academy during Khrushchev
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Analysis: was Lysenko a pseudoscientist?

- Were the **ideas** and **models** of Lysenko pseudoscientific? Why?
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Analysis: was Lysenko a pseudoscientist?

- Did Lysenko's **limited education** make him a pseudoscientist? Why?
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Analysis: was Lysenko a pseudoscientist?

- Did the **agreement** of Lysenko's views on biology **with the philosophy of "dialectical materialism"** make him a pseudoscientist? Why?
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Analysis: was Lysenko a pseudoscientist?

- Were Lysenko's research **methods** pseudoscientific? Why?
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Analysis

- What was wrong with **Russia** and **Russian science** that made the rise of Lysenko possible?
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