

EVROPSKÁ UNIE Evropské strukturální a investiční fondy Operační program Výzkum, vývoj a vzdělávání



Sources

Nobel prizes in chemistry

Nobel prizes in physiology

Human Genome Project, Celera Genomics

others

(indicated decades and periods are approximate)

18 century discovery of starch digestion by saliva or meat digestion by stomach acid

19 century

Louis Pasteur – fermentation is accelerated by ferments (enzymes)



Anselme Payen – discovery of diastase (amylase)

Wilhelm Kühne – word "enzyme"

Eduard Buchner – fermentation takes place in a cell-free extract

Hans Karl August Simon von Euler-Chelpin – glycolysis is the action of enzymes

19 century Friedrich Miescher – existence of DNA



Albrecht Kossel – isolation of DNA, identification of some components



1st half of 20 century Gustav Embden, Otto Meyerhof and Jakub Karol Parnas – discovery of glycolysis, isolation of glycolytic enzymes, identification of individual steps

Hans Adolf Krebs – Krebs cycle, urea cycle, glyoxylate cycle



1st half of 20 century James B. Sumner – urease and catalase are proteins, they can be crystallized

John Cowdery Kendrew and Max Perutz – X-ray structure of myoglobin





Phoebus Levene – identification of DNA building blocks

Jean Brachet – RNA discovery

1st half of 20 century Melvin Calvin - photosynthesis



Luis F. Leloir – sugar metabolism



1st half of 20 century John Howard Northrop and Wendell Meredith Stanley – crystalization of proteins, enzymes and viruses

Alexander R. Todd – structure and synthesis of nucleosides, nucleotides and coenzymes

Dorothy Crowfoot Hodgkin – 3D structure of B₁₂, penicilin, insulin, proteins



1950s Robert Brainard Corey, Linus Carl Pauling – secondary structure of proteins

Max Perutz – structure and function of hemoglobin

Rosalind Franklin and Raymond Gosling – X-ray diffraction of DNA

Francis Crick, James Watson, Maurice Wilkins – DNA structure



Francis Crick – central dogma of molecular biology

Frederick Sanger – sequencing of insulin

1960s Christian B. Anfinsen – protein folding

Frederick Sanger – sequencing of RNA

Peter D. Mitchell – chemiosmotic mechanism of ATP synthesis

Paul Berg – recombinant DNA

Robert Bruce Merrifield – solid-phase synthesis of peptides/protein

Johann Deisenhofer, Robert Huber and Hartmut Michel – 3D structure of membrane proteins

Sidney Altman and Thomas R. Cech – catalytic RNA

1970s

Kary B. Mullis and Michael Smith – PCR, side-directed mutagenesis

Jens C. Skou, Paul D. Boyer and John E. Walker – Na⁺/K⁺-ATPase

John B. Fenn – electrospray MS

Koichi Tanaka – MALDI MS

Kurt Wüthrich – NMR in structural biology

1970s Frederick Sanger – sequencing of DNA



J. Andrew McCammon and Martin Karplus – first simulation of protein dynamics

Roger D. Kornberg – RNA polymerase structure and function

Bruce A. Beutler and Jules A. Hoffmann – innate immunity

Ralph M. Steinman – dendritic cells

Sydney Brenner, H. Robert Horvitz and John E. Sulston – apoptosis

1980s Peter Agre – aquaporins

Roderick MacKinnon – structure of ion channels

Aaron Ciechanover, Avram Hershko and Irwin Rose – ubiquitin, proteasome

Robert Lefkowitz – function of G protein-coupled receptors

Yoshinori Ohsumi – role of cell autophagy in diseases

Françoise Barré-Sinoussi ans Luc Montagnier - HIV discovery

Barry J. Marshall and J. Robin Warren – role of *Helicobacter pylori* in stomach ulcers

Leland H. Hartwell, Tim Hunt and Paul M. Nurse – cell cycle

Stanley B. Prusiner – prions as proteinaceous infectious particle

1990s Osamu Shimomura, Martin Lee Chalfie and Roger Y. Tsien – Green Fluorescent Protein

Eric Betzig, Stefan Hell and William E. Moerner – ultra-high resolution microscopy

Tomas Lindahl, Paul L. Modrich and Aziz Sancar – DNA repair

James E. Rothman, Randy W. Schekman and Thomas C. Südhof – vesicle traffic

John B. Gurdon and Shinya Yamanaka – pluripotency

Andrew Z. Fire and Craig C. Mello – RNA interference

Human Genome Project

Launched in 1990

Human Genome Project funded by National Institute of Health (USA) and Welcome Trust (UK)

Celera Genomics started a concurrent project with a lower budget, but they used public data from HGP

Published: *Nature* 2001, **409**(6822): 860–921 (HGP). *Science* 2001, **291**(5507): 1304–1351 (Celera).

Human Genome Project

www.ensembl.org

Version GRCh38.p12 (2013)

3,609,003,417 base pairs

20,376 coding and 22,305 non-coding genes

203,903 gene transcripts (e.g. splicing variants)

Human Genome Project

www.ensembl.org



2000s Venkatraman Ramakrishnan, Thomas A. Steitz and Ada Yonath – 3D structure and function of ribosome

Brian Kobilka – structure of G protein-coupled receptors

Jacques Dubochet, Joachim Frank and Richard Henderson – high-resolution cryoEM

Elizabeth H. Blackburn, Carol W. Greider and Jack W. Szostak – telomere and telomerase

2010s CRISPR/Cas9

Next generation sequencing of DNA

Cell reprogramming - induced pluripotent cells

Synthetic biology

CryoEM as emerging structural biology tool

Integrative omics, ENCODE

Single cell omics

Single molecule studies