DNAinteractive

DNAi Site Guide

Timeline

Pre 1920's

Johann Gregor Mendel, Friedrich Miescher, Carl Erich Correns, Hugo De Vries, Erich Von Tschermak-Seysenegg, Thomas Hunt Morgan

1920-49

Hermann Muller, Barbara McClintock, George Wells Beadle, Edward Lawrie Tatum, Joshua Lederberg, Oswald Theodore Avery

1950-54

Erwin Chargaff, Rosalind Elsie Franklin, Martha Chase, Alfred Day Hershey, Linus Pauling, James Dewey Watson, Francis Harry Compton Crick, Seymour Benzer

1955-59

Francis Harry Compton Crick, Paul Charles Zamecnik, Mahlon Hoagland, Matthew Stanley Meselson, Franklin William Stahl, Arthur Kornberg

1960's

Sydney Brenner, Marshall Warren Nirenberg, François Jacob, Jacques Lucien Monod, Roy John Britten

1970's

David Baltimore, Howard Martin Temin, Stanley Norman Cohen, Herbert W. Boyer, Richard John Roberts, Phillip Allen Sharp, Roger Kornberg, Frederick Sanger

1980's

Christiane Nüsslein-Volhard, Eric Francis Wieschaus, Kary Mullis, Thomas Robert Cech, Sidney Altman, Mario Renato Capecchi

1990-2000

Mary-Claire King, Stephen P.A. Fodor, Patrick Henry Brown, John Craig Venter Francis Collins, John Sulston

Code

Finding the structure

Problem

What is the structure of DNA?

Players

Erwin Chargaff, Rosalind Franklin, Linus Pauling,
James Watson and Francis Crick, Maurice Wilkins

Pieces of the puzzle

Wilkins' X-ray, Pauling's triple helix, Franklin's X-ray,
Watson's base pairing, Chargaff's ratios

Putting it together

DNA is a double-stranded helix.

Copying the code

Problem

How is DNA copied?

Players

James Watson and Francis Crick, Sydney Brenner,
François Jacob, Matthew Meselson, Arthur Kornberg

Pieces of the puzzle

The Central Dogma, Semi-conservative replication
Models of DNA replication, The RNA experiment, DNA synthesis

Putting it together

DNA is used as a template for copying information.

Reading the code

Problem

How is the DNA code read?

Players

Paul Zamecnik and Mahlon Hoagland, Sydney Brenner, Marshall Nirenberg, Marshall
Nirenberg and collaborators, Har Gobind Khorana

Pieces of the puzzle

Breaking the code, Cell-free extracts, The genetic code, The other codons, Defining the gene

Putting it together

The DNA code is read in triplets.

Controlling the code

Problem
How is the DNA code controlled?

Players
François Jacob and Jacques Monod, Walter Gilbert

Pieces of the puzzle
DNA packaging, The lac operon

Putting it together
The DNA code is regulated by proteins

Manipulation

Revolution

Problem
How do you study a gene?

Players
James Watson, Paul Berg, Herbert Boyer and Stanley Cohen, The controversy

Pieces of the puzzle
Restriction enzymes, DNA ligation, The first recombinant DNA, DNA transformation

Putting it together
rDNA: more risk than reward?

Techniques

Cutting & pasting
Using enzymes to manipulate DNA

Sorting & sequencing
Delivering foreign DNA into a cell

Transferring & storing
Analyzing the activity of thousands of genes

Amplifying
Determining the size and sequence of DNA fragments

Large-scale analysis
Making many copies of DNA

Model organisms
Using model organisms in research

Production

Problem
Making insulin with recombinant DNA technology

Players
Herbert Boyer, David Goeddel, Walter Gilbert

Pieces of the puzzle
Synthetic insulin, Synthesizing the DNA, Isolating the DNA, The P4 facility

Putting it together
Synthetic insulin was made using recombinant DNA.

Genome

Tour

Flyover
The landscape of a chromosome

Chromosome close-up
Chromosome coiling and contents

Genome FISHing
FISH for information about your chromosomes: Centromeres, Telomeres, Variation

Genome spots
Click on a "spot" to find out about the gene or genes at that location

The Project

Problem
How do you map, sequence, and find all the genes in the human genome?

Players
Pros & cons, Public consortium, Private project, Money, Technology, Competition and the media

Pieces of the puzzle

Maps and markers, Storing DNA, Sequencing head to toe, Whole genome shotgun, Sequencing DNA, Dealing with the data, Finding genes

Putting it together

Viewing our code for the first time

Genome Mining

Meaning

Meaningful sequences

DNA analysis

Analyzing DNA

Gene features

What makes up a gene?

Gene finding

Finding genes in DNA

Gene Boy

A multi-function sequence analysis tool

Applications

Human identification

Fingerprint

DNA variations and fingerprints, The first DNA fingerprints, Today's DNA profile

Case study 1

Sarbah vs. Home Office, Ghana Immigration Case, 1985

Case study 2

State of Florida vs. Jones and Reesh, Murder at Rodman Dam, 1988

Case study 3

The Innocence Project

Recovering the Romanovs

The Romanov family

The history of the Romanovs, the last Imperial family of Tsarist Russia

The mystery of Anna Anderson

Anna Anderson claimed to be Anastasia, the missing Anastasia Romanov

Science solves a mystery

DNA science was used to determine whether Anna Anderson was Anastasia

Genes and medicine

Gene hunting

Mary-Claire King, Mark Skolnick, Markers, The finish line

Gene testing

Barbara Weber, Denise, Making a pedigree, Testing

Genetic profiling

Patrick (Pat) Brown, Stephen Fodor, David Botstein, Techniques

Drug design

Brian Druker, The Philadelphia chromosome, Bud's story, How Gleevec™ works

Gene targeting

Mario Capecchi, Animal models, Techniques, Possibilities

Human origins

Our family tree

Meet the extended family

Comparisons

Bones, Behavior, DNA

Gene genealogy

Mitochondrial DNA, Y Chromosome, Other genome regions,
A molecular clock?, Tracing ancestries

Migrations

Follow the paths, Hear the stories

Variation

Primate diversity, Interviews, Variation activity

Chronicle

Threat of the Unfit

Founders

Bringing the eugenics movement to prominence

The fit and unfit

Pedigrees of the fit and unfit

Threats

The eugenicists' views on the socially "unfit"

Epilogue

Eugenics as the "solution" to social problems

Trial of Carrie Buck

Prologue

Upholding the "legality" of sterilization

Players

Carrie Buck, Emma Buck, Vivian Dobbs, Albert Priddy, Aubrey Strode, Irving Whitehead, Arthur Estabrook, Harry Laughlin, Oliver Wendell Holmes

Trials

Buck *vs.* Bell: forced sterilization of the "feebleminded"

Outcome

The Supreme Court decision

Epilogue

The truth about Buck vs. Bell

In the Third Reich

Taking the torch

Nazi eugenics

The final solution

"The final solution" to mental illness

Applying the solution
The concentration camps

Epilogue
After World War II

Living with Eugenics

Living with depression
The highs and lows of manic depression

Kallikak revisited
Comparing family pedigrees

The diagnosis
Dealing with the diagnosis

Eplilogue
The "eugenic quandary," prenatal testing for manic depression