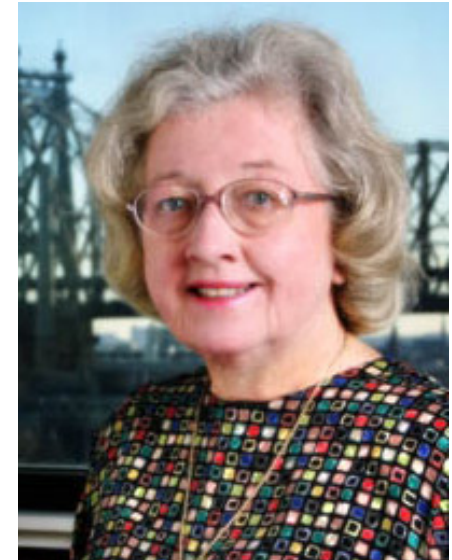


# Heroes and Heroines of Drug Discovery

Talking Science Lecture  
The Rockefeller University  
January 9, 2016

# Mary Jeanne Kreek

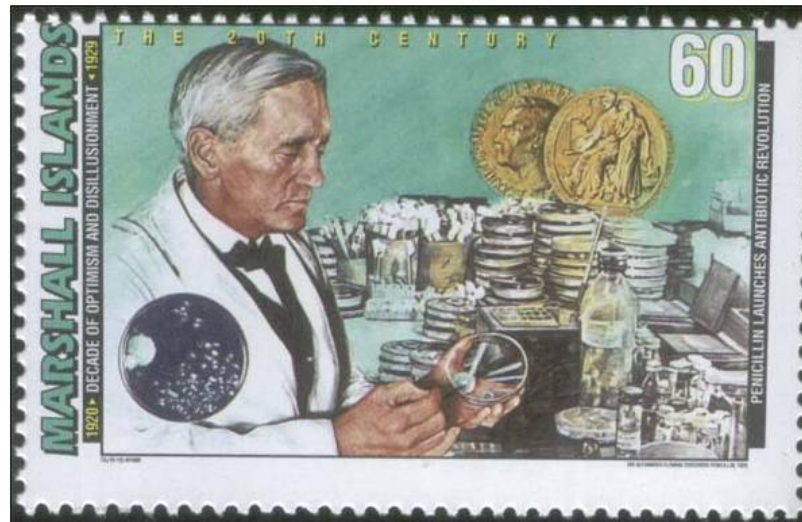
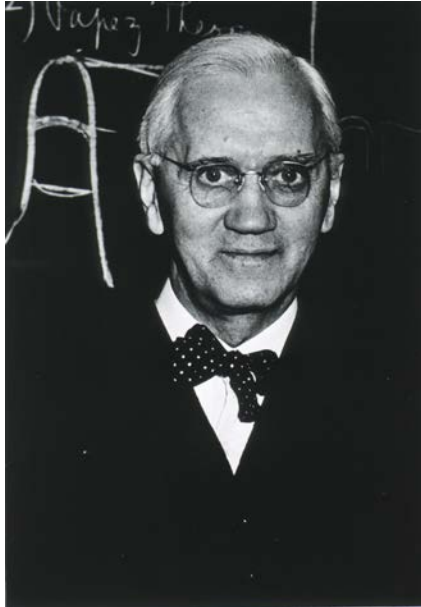
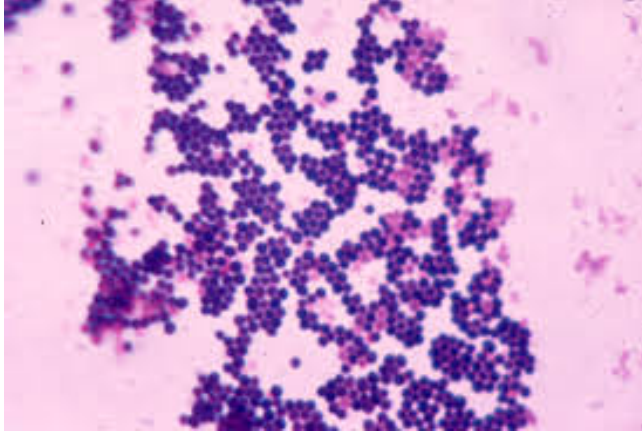


# Mary Jeanne Kreek

(b. February 9, 1937)

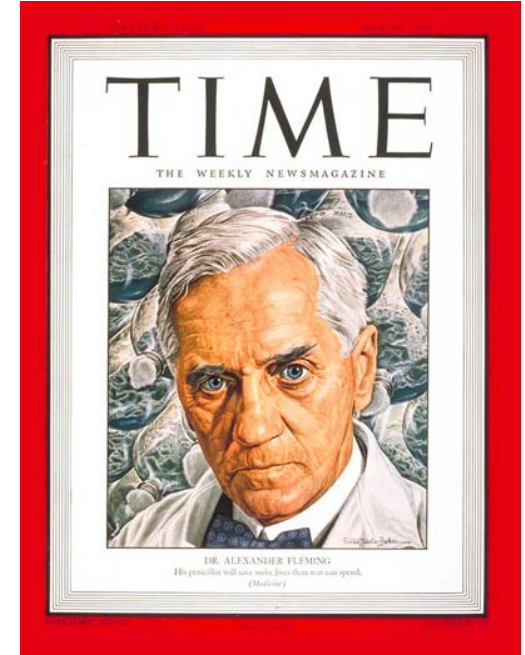
- Recruited by a Rockefeller University researcher, Vincent P. Dole, to assess addiction, with the focus of seeing addiction as an illness, not a choice
- Research focused on the synthetic drug methadone, which she found relieved heroin cravings and prevented withdrawal symptoms
- Helped get methadone approved as a long term opiate addiction therapy in 1973
- Transformed our understanding of addiction from a personal shortcoming to a medical disease

# Alexander Fleming



Rajus2001

[www.delcampe.net](http://www.delcampe.net)



# Alexander Fleming

(August 6, 1881 – March 11, 1955)

- **1928** – observed that mold accidentally developed on a staphylococcus culture plate which had created a bacteria-free circle around itself
- Further experimentation found that this mold, even when diluted 800 times, prevented the growth of staphylococci
- He would name it Penicillin
- **1945** – won the *Nobel Prize in Physiology or Medicine*



# Charles L. Sawyers



Memorial Sloan Kettering  
Cancer Center™

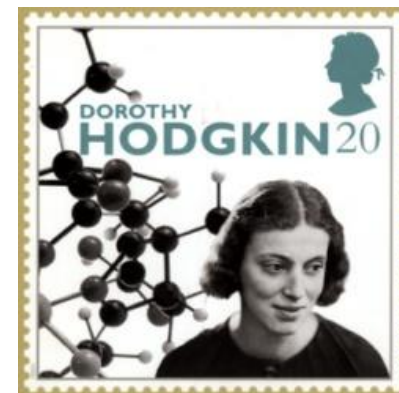
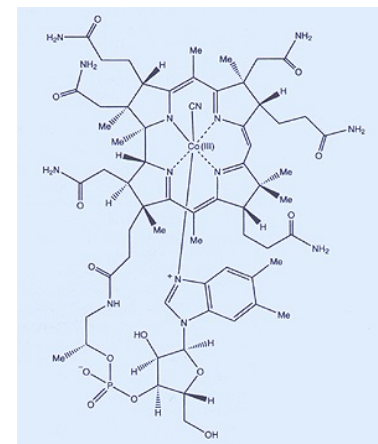
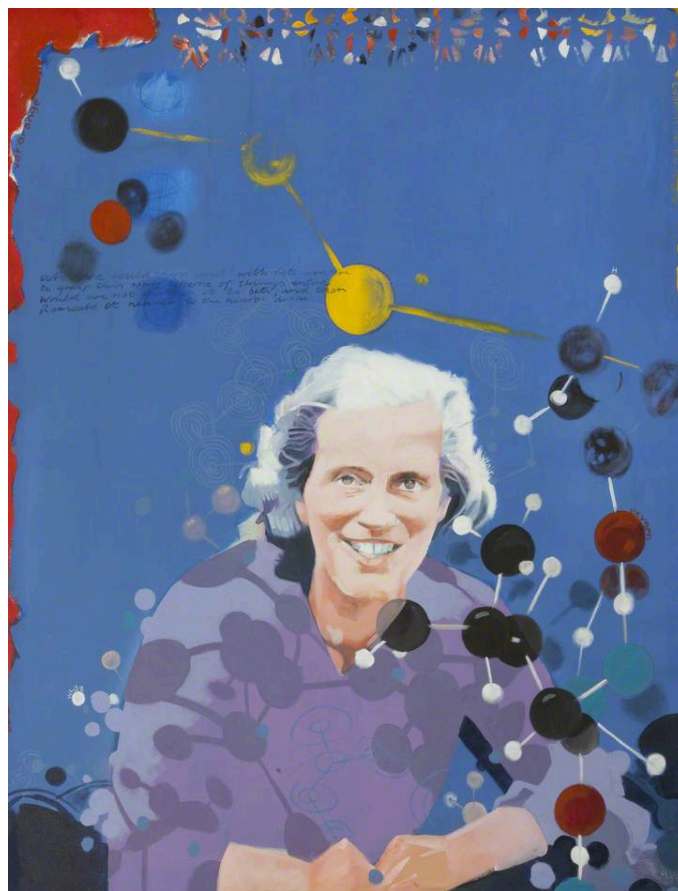
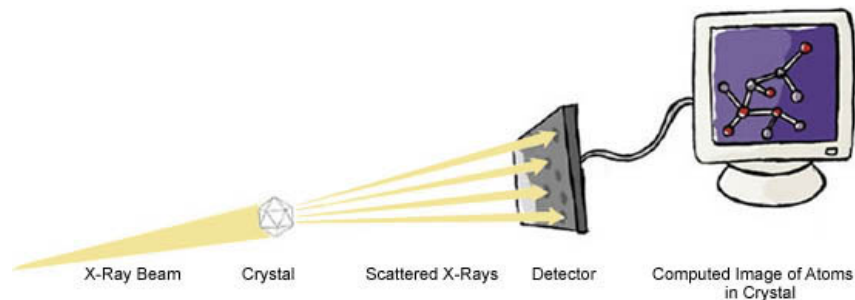
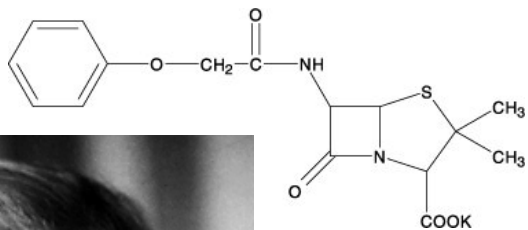


# Charles L. Sawyers

(b. 1959)

- Interested in the Philadelphia Chromosome, a genetic aberration where 2 chromosomes swap segments, enabling white blood cells to grow without restraint and causing chronic myeloid leukemia
- Focused on determining what turns cancer cells “on” or “off”
- Found the specific oncogenes that control a cancer cell and shut them off
  - Enabled patients to receive a treatment targeted specifically for *their* cancer, rather than a general treatment for all kinds of cancer
- **2013** – won the *Breakthrough Prize in Life Sciences*

# Dorothy Crowfoot Hodgkin





# Dorothy Crowfoot Hodgkin

(May 12, 1910 – July 29, 1994)

- One of two girls allowed to study chemistry with the boys at Sir John Leman School in England
- Hodgkin studied chemistry at Somerville College and would later return to teach chemistry
- She set out to collect money for X-ray apparatuses to study crystallography, receiving assistance from the Rockefeller Foundation, among others
- Discovered the structure of penicillin by using these x-ray apparatuses, allowing semisynthetic penicillin to be manufactured.
  - She would later do the same for vitamin B12 and insulin
- **1964** – won the *Nobel Prize in Chemistry*

# Frances Oldham Kelsey



**Drug Detective**

- Her skepticism and insistence on having "all the facts" before certifying the safety of a sleep-inducing drug averted an appalling American tragedy — the birth of many malformed infants.

She resisted persistent petitions of commercial interests who presented data supporting claims the inexpensive drug was harmless. The facts finally vindicated Dr. Kelsey, as evidence piled up to show the drug — thalidomide — when taken by pregnant women, could cause deformed births.

Her action won her the President's Award for Distinguished Federal Civilian Service.

**FRANCES O. KELSEY, M.D.**  
*Food and Drug Administration*

**The Federal Civil Service**  
1883-1963

Four Score Years of Service to America


# Frances Oldham Kelsey

(July 24, 1914 – August 7, 2015)

- **1960** – assigned by the Food and Drug Administration to review a sleeping pill containing thalidomide. Though widely used in Europe, Kelsey noted the data suggested there might be dangerous side effects and, despite strong protest from manufactures, denied approval
- **1961** – reports indicated that pregnant mothers in Europe who had taken the sleeping pill were having children with serious birth defects
- **1962** – the FDA set up a branch to strengthen consumer protection from untested drugs, lead by Kelsey, to regulate and test new drugs
- President John F. Kennedy awarded Kelsey the *President's Award for Distinguished Federal Civilian Service*
  - The 2<sup>nd</sup> woman ever to receive the award
- **2010** – The FDA began giving out an annual award in her name

# Frederick G. Banting & Charles H. Best



 The Nobel Prize in Physiology or Medicine 1923  
Frederick G. Banting, John Macleod

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## The Nobel Prize in Physiology or Medicine 1923

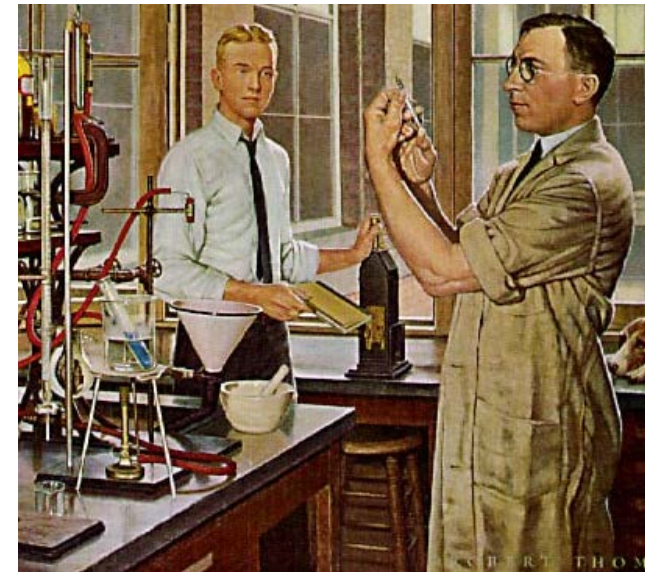
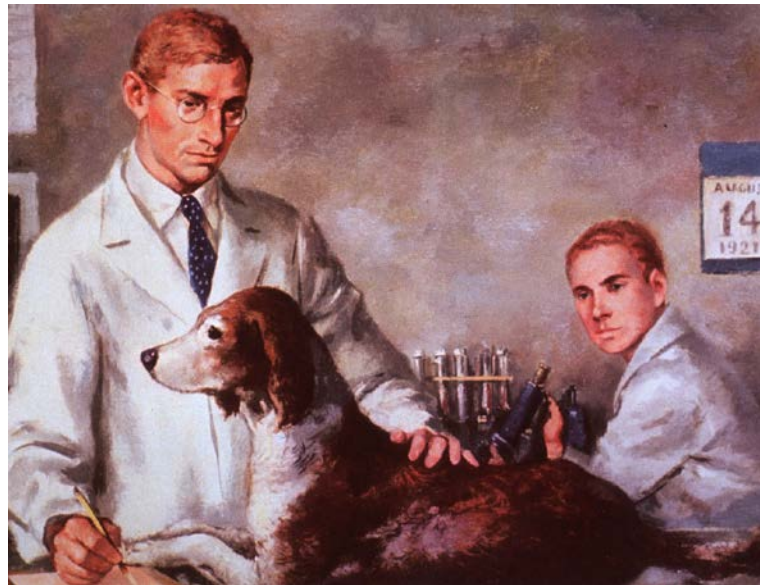


Frederick Grant Banting  
Prize share: 1/2



John James Rickard Macleod  
Prize share: 1/2

The Nobel Prize in Physiology or Medicine 1923 was awarded jointly to Frederick Grant Banting and John James Rickard Macleod "for the discovery of insulin"





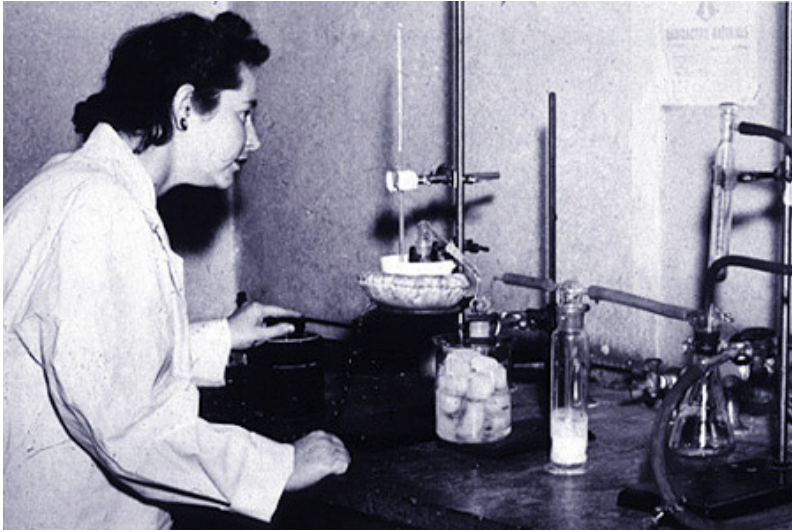
# Frederick G. Banting & Charles Best

(November 19, 1891 – February 21, 1941)

(February 27, 1899 – March 31, 1978)

- In the early 1920s, diabetes was a deadly disease with very little effective treatments or cures
- Banting, and his assistant, Best, proved that a lack of insulin – a substance created by the pancreas – was the cause of diabetes and that it could effectively be treated with insulin injections
- **1922** – Banting successfully tested insulin on a diabetic boy
- **1923** – the *Nobel Prize in Physiology or Medicine* was awarded to Banting and John MacLeod, who provided the experimental facilities
  - Banting shared his prize money with Best

# Gertrude B. Elion



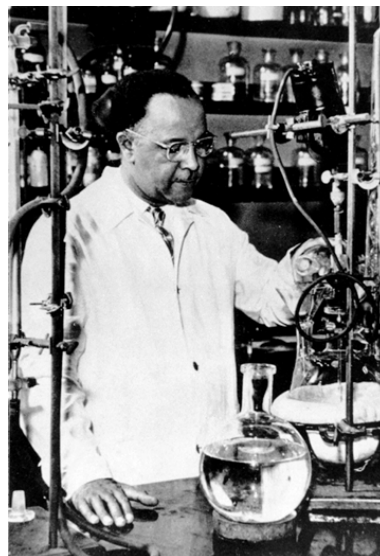
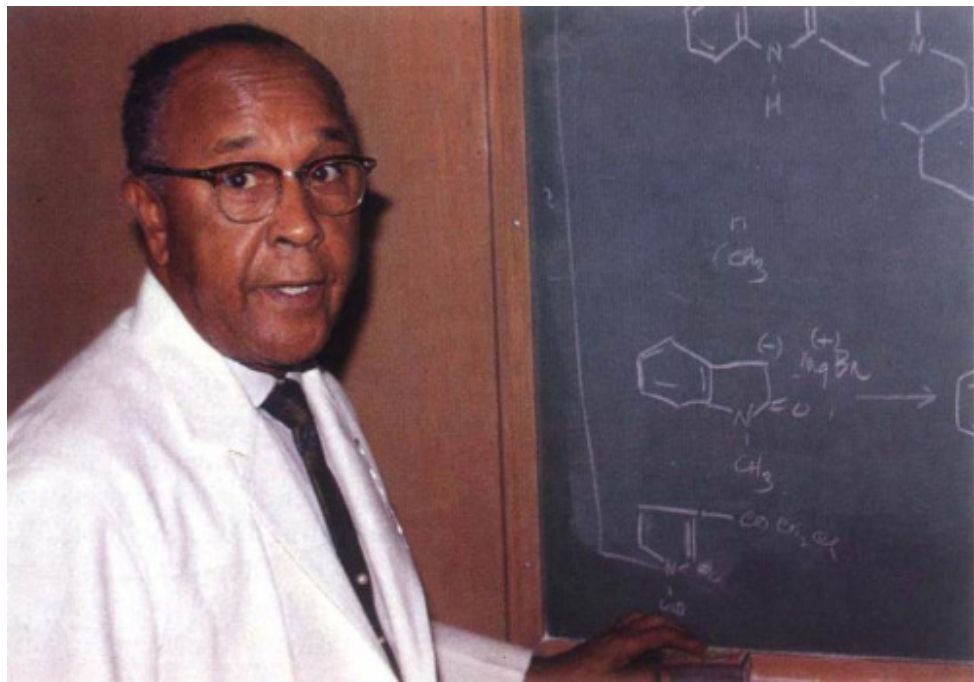
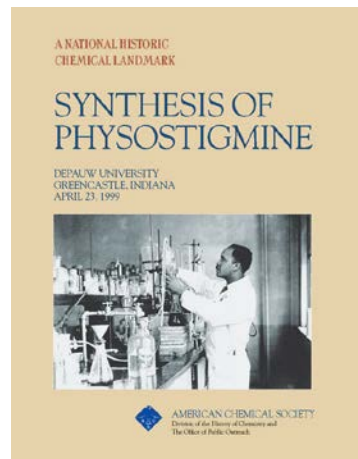
# Gertrude B. Elion

(January 23, 1918 – February 21, 1999)

- Focused on the differences in the biochemistry between normal human cells and the cells of diseases
- Targeted specific pathogens that differed between them, hoping to destroy disease cells and leave normal ones unchanged
- Massive difference from previous trial-and-error methods researchers used, resulting in new drugs to treat leukemia, autoimmune disorders, urinary-tract infections, gout, malaria, viral herpes and organ rejection by the body
- **1988** – won the *Nobel Prize in Physiology or Medicine*, along with her collaborators George H. Hitching and Sir James Black



# Percy Lavon Julian





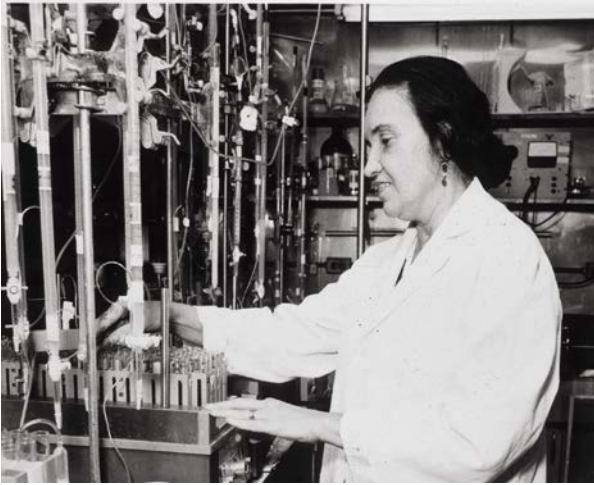
# Percy Lavon Julian

(April 11, 1899 – April 19, 1975)

- Despite not being allowed to attend high school in Montgomery, Alabama, Julian took high school-level classes in the evening and worked during the day to pay his way through college and graduate school
- One of the first African Americans to receive a Ph.D. in chemistry, and the first African American chemist inducted into the National Academy of Sciences
- Created a drug treatment for glaucoma by synthesizing physostigmine, which helps promote the drainage of fluid that builds up and damages the optic nerve
- Isolated soy protein from oil-free soybean meal which was later developed into Aer-O-Foam and used by the U.S. Navy to put out oil and gas fires aboard ships during World War II
- Eventually opened his own lab, Julian Laboratories, and received more than 130 chemical patents



# Rosalyn Sussman Yalow

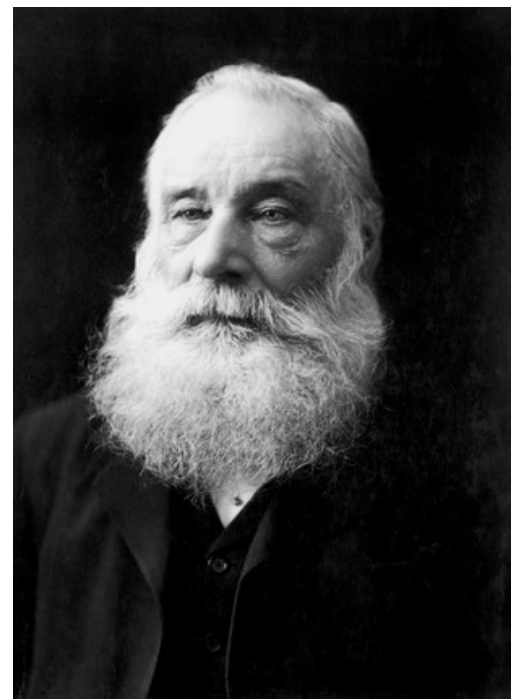
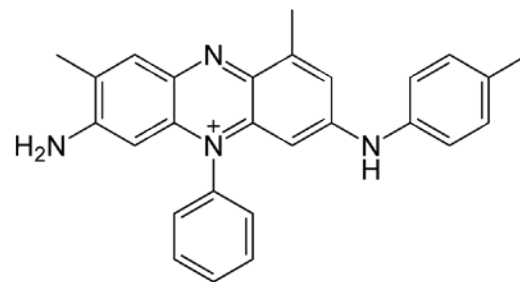
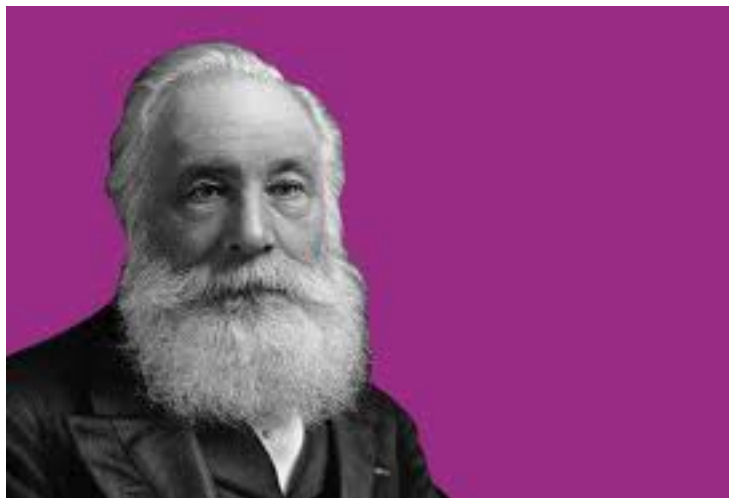


# Rosalyn Sussman Yalow

(July 19, 1921 – May 20, 2011)

- Investigated why those with type II diabetes build up a resistance to insulin over time
- Technique came to be called radioimmunoassay (RIA)
  - Used radioactive isotopes to track minute amount of antibodies that they found were attacking the foreign animal insulin – later applying the same techniques to viruses, drugs, and proteins
  - Identified that radioactive isotopes could be used in screening blood for viruses and making accurate dosages of medicine, among other things
- **1977** – won the *Nobel Prize in Physiology or Medicine*

# William Henry Perkin



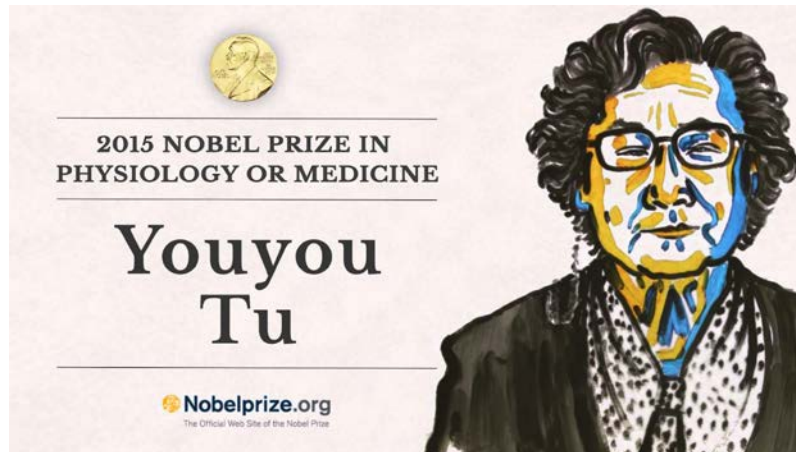


# William Henry Perkin

(March 12, 1838 – July 14, 1907)

- Attempted to manufacture quinine, a treatment for malaria, from a tar waste product called aniline, but only created a dark sludge
- He added potassium dichromate and alcohol and found it created a deep purple solution, creating a synthetic dye
- An extremely popular commercial product, it was also highly useful in medicine, allowing researchers to stain and see things like microbes and bacteria, which had previously been invisible
- **1906** – won the first *SCI Perkin Medal* for his work, now regarded as the highest award in the American chemical industry

# Youyou Tu



# Youyou Tu

(b. December 30, 1930)

- **1969** – Recruited to a secret medical research project in China known as “523”
  - Goal: To find a way to halt the spread of malaria, which had been killing many North Vietnamese troops during the Vietnam War
- In an ancient Chinese manuscript, Tu and her team found that sweet wormwood had once been used to treat malaria
- After isolating artemisinin, a malaria-attacking compound in sweet wormwood, Tu took it upon herself to be the first human tested.
- The success of artemisinin is credited with saving millions of lives
- **2015** – won the *Nobel Prize in Physiology or Medicine*