



A Report on The Recipients of The ‘Nobel Prize’ (Natural Sciences) in 2018

In early October, 2018 the names of the recipients of the prestigious Nobel Prize in Physics, Chemistry and Medicine (including Physiology) have been announced. A brief report of the same is given below.

PHYSICS: This year the Nobel Prize in Physics has been shared by three pioneer scientists working in the field of Lasers. Arthur Ashkin of the USA is an American. He is at the age of 96 the oldest man ever to win the coveted award. He has invented optical tweezers that grab particles, atoms and molecules with laser beam fingers. With this he was able to use the radiation pressure of light to move physical objects. In 1987, came a major breakthrough when Ashkin used the tweezers to capture living bacteria without harming them. Dr. Ashkin made his discovery while working at AT & T Bell Laboratories, USA from 1952 to 1991. He has been awarded one half of the nine million Swedish Kronor (about \$1.01 million or 870,000 Euros).

Professors Gerard Mourou of France and Donna Strickland of Canada shared the other half of the prize money.

Gerard Mourou is aged 74 and he was affiliated with the Ecole Polytechnique of France and the University of Michigan in the USA. His student Donna Strickland is a Professor at the University of Waterloo in Canada. Mourou and Strickland’s research centred on developing the most intense laser pulses ever created, by human beings. This paved the way for manufacturing precision instruments used today in corrective eye surgery

and industrial applications. The technology developed by the duo in 1985, is now standard for all high-intensity lasers with potential applications in physics, chemistry and medicine.

Canada’s Professor Donna Strickland becomes only the third woman scientist to win a Nobel Prize for Physics after Madame Marie Curie in 1903 and Dr. Maria Goeppert-Mayer in 1963.

The inventions by the three physicists date back to the mid-1980s and over the years they have revolutionised laser physics. Advanced precision instruments are opening up new avenues of research and a multitude of industrial and medical applications.

CHEMISTRY: Two US scientists Professor Frances H. Arnold of the California Institute of Technology and Professor George P. Smith from the University of Missouri along with a British Scientist Professor Gregory P. Winter of the MRC Laboratory of Molecular Biology at Cambridge University won the Nobel Chemistry Prize for 2018. The three scientists have been inspired by the power of evolution and have used the same principles, genetic change and selection, to develop proteins for solving mankind’s chemical problems. Nobel Chemistry Committee’s head, Professor Claes Gustafsson told reporters that “The 2018 Nobel Laureates in Chemistry have taken control of evolution and used it for purposes that bring the greatest benefit to humankind. ...They have applied the principles of Darwin in test tubes. They have used the molecular understanding we have of the evolutionary process and recreated

the process in their labs....They have been able to make evolution many 1000s of times faster and redirect it to create new proteins.”

Frances H. Arnold is 62 years old, is a breast cancer survivor and a single mother to three sons. She is a Professor of Chemical Engineering at the California Institute of Technology. She is winner of one half of this year's Chemistry Nobel Prize. In 1993 she achieved the first directed evolution of enzymes, proteins that catalyse chemical reactions. These methods discovered by her, are now routinely used for developing new catalysts. She was successful in rewriting DNA to mimic evolution, which helped solve problems such as replacing toxic chemicals such as fossil fuels. In 2016, Professor Arnold had said “The most beautiful, complex and functional objects on the planet have been made by evolution. We can now use evolution to make things that no human knows how to design.....Evolution is the most powerful engineering method in the world, and we should make use of it to find new biological solutions to problems. Instead of pumping oil out of the ground for making gasoline, now we can use sunlight stored in plants.” Her discovered enzymes have helped in converting renewable resources like sugar cane into biofuels and producing environmentally friendly chemical substances to improve everyday products like detergents.

Meanwhile, the winners of the other half of the 2018 Nobel Prize in Chemistry, Professor George Smith developed an ‘elegant method’ known as phage display, where a bacteriophage – a virus that infects bacteria – can be used to evolve new proteins. In 1985, Smith's idea demonstrated that phage's simple construction could be used by researchers to find an unknown gene for a known protein. 67 year old genetic engineer of the Cambridge University in UK used this technique for the directed evolution of antibodies to produce new pharmaceuticals. These medicines have been used for curing rheumatoid arthritis, psoriasis and inflammatory bowel diseases. Phage display has also been used to produce antibodies that can neutralize toxins, counteract autoimmune diseases and cure metastatic cancer.

It may be noted that Frances H. Arnold was the fifth woman to win the Nobel Prize for Chemistry after Madame Marie Curie (1911), Irene Joliot-Curie (1935), Dorothy Hodgkin (1964) and Ada Yonath (2009).

MEDICINE (INCLUDING PHYSIOLOGY):

The Nobel Prize for medicine in 2018 was shared by two immunologists, James Allison from USA and Tasuku Honjo from Japan. They have been awarded this year's coveted prize for research into how the body's natural defences can fight cancer. J. Allison, who is a Professor at the MD Anderson Cancer Centre of the University of Texas, in 1995, identified the CTLA-4 protein molecule as an inhibitory receptor on T-cells. T-cells are a type of white blood cells that play a central role in the body's natural immunity to disease. He realised that if this could be blocked, a brake would be released, unleashing immune cells to attack tumours. T. Honjo is a Professor at Kyoto University in Japan since 1984. In the nineties, he separately discovered a second protein called PD-1 and found that it too acted as an immune system brake, but with a different mechanism.

The two scientists work in the 1990s has since swiftly led to new and dramatically improved therapies for cancers such as melanoma and lung cancer, which had previously been extremely difficult to treat. The Nobel Assembly at Sweden's Karolinska Institute said “The seminal discoveries by the two Laureates constitute a landmark in our fight against cancer....Allison and Honjo showed how different strategies for inhibiting the brakes on the immune system can be used in the treatment of cancer.”

The discovery by this year's Nobel Laureates has revolutionized the treatment process of cancer and has fundamentally changed the approach to cancer management.

[Photographs of these Nobel Laureates are given in the front cover]

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