News Review

NOBEL PRIZE – 2016 [Science News]

NOBEL PRIZE (Medicine):

Japanese scientist Yoshinori Ohsumi has won the 2016 Nobel Prize for medicine. He has done ground-breaking experiments with yeast which exposed a key mechanism in the body's defences where cells degrade and recycle their components. Understanding the science behind the above mentioned process is called 'autophagy' or 'self-eating'. This has led to a better understanding of diseases such as Cancer, Parkinson's disease and type 2-diabetes. Ohsumi's discoveries have led to a new paradigm in the understanding of how the cell recycles its content. According to experts in the field of medical and physiological sciences, Ohsumi has provided scientists around the world with 'critical tools' to help unravel how disrupted autophagy can contribute to illnesses including infectious diseases, cancers and neuro-degenerative diseases such as Huntington's disease and Parkinson's disease. Ohsumi's work also helps to explain crucial processes in human development, from growing up to ageing to succumbing to disease.

NOBEL PRIZE (Physics):

Three British born scientists David J. Thouless, Duncan Haldane and Michael Kosterlitz have shared the 2016 Nobel Prize for Physics. Professor Thouless is an Emeritus Professor at the University of Washington, U. S. A. Professor Haldane is a professor at the Princeton University and Professor Michael Kosterlitz is at the Brown University of U.S.A. They won the Nobel Prize for discoveries about strange form of matters. Their discoveries relate to abrupt changes in the properties or phases of ultra-thin materials. The study of 'strange matters' which may one day yield superfast and small computers earned them the coveted prize. The trio, working in the highly specialized mathematical field of 'topology' studied unusual phases or states of matter. This year's laureates have opened the door on an unknown world where matters can assume strange states.

Topology is a branch of mathematics that investigates the physical properties of matter and space-shape in essence – that remains unchanged under certain deforming forces. These include stretching, compressing, bending, but not piercing, tearing or gluing. In practical terms, these properties of matters may one day lead to the reshaping of common materials into 'topological states' that can transport energy and information in very small spaces without overheating. The trio's pioneering work has boosted research in condensed matter physics. Phases are obvious when matter goes from solid to liquid to gas, but materials also undergo topological step changes that affect their electrical properties. One example is a superconductor, which at low temperatures conducts electricity without resistance.

Senior condensed matter physicist Professor G. Baskaran of Institute of Mathematical

Sciences, Chennai, said: "Kosterlitz and Thouless' work on planar X-Y model came into condensed matter physics in a big way. They described non-trivial effects which could not be reproduced simply." The influence of Professor Haldane's work stretches on "from forming the basis of topological field theories to the Haldane-Sastry model to topological insulators and conceptualising the 'Haldane-gap', a critical parameter in the study of chains of anti-ferromagnetic atoms. Indians have made important contributions, for example, J. K. Jain's work on composite fermions is famous. The work on topological insulators by C. L. Kane etc. is another significant work which take up where they leave off." In conclusion, Professor Baskaran said "this prize clears the way for other prizes".

Professor Thouless was awarded half the prize and the other half was divided between Professor Haldane and Professor Kosterlitz.

NOBEL PRIZE (Chemistry):

A trio of European scientists has won the Nobel Prize for 2016 in Chemistry for developing the world's smallest machines – 1000 times thinner than hair – that may one day act as artificial muscles. It could revolutionize computer technology and lead to a new type of battery. Frenchman Jean-Peare Sauvage, Professor Emeritus at the University of Strasbourg and Director of Research Emeritus at France's National Centre for Scientific Research, Scotland's J. Fraser Stoddart, Professor of Chemistry at Northwestern University in Evanston, Illinois and Bernard Feringa of Netherlands who is a professor at the University of Groningen, Netherlands have shared the 2016 Nobel Prize for Chemistry. They have developed molecular machines that could one day be injected to fight cancer or be used to make new types of materials and energy storage devices. The three Nobel laureates have developed molecules that produce mechanical motion in response to a stimulus, allowing them to perform specific tasks. Such molecular machines can be developed in smart medicines that seek out disease or damage and then deliver drugs to fight and fix it. Molecular machines of these kinds can also be developed in smart materials that can adapt in response to external triggers such as changes in light or temperature.

Professor Feringa thinks that his work has endless opportunities and may eventually be used to manufacture a tiny micro-robot that a doctor in the future can inject in a patient's blood and it may go to search a cancer cell or deliver a drug.

Molecular machines are molecules with controllable movements, which can perform a task when energy is added. Professor Stoddart has already developed a molecular-based computer chip with 20 KB memory. Professor Sauvage made the first breakthrough in 1983 when he linked two ring shaped molecules together to form a chain. Professor Stoddart took the next step in 1991 by threading a molecular ring onto a molecular axle. In 1999, Professor Feringa was the first man to develop a molecular motor, when he got a molecular rotor blade to spin continuously in the same direction.

(Photographs of these Nobel Laureates are in cover)

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