



Mathematical Approaches to Cutting-Edge Problems in Physiology or Medicine

Professor Dr. Syed Arif Kamal profdrakamal@gmail.com

[Göran K. Hansson's comments](#)



Ex-Acting Vice Chancellor and Ex-Dean, Faculties of [Science & Engg.](#), [University of Karachi](#), Karachi, Pakistan



There are 108 Nobel prizes awarded in physiology or medicine to date (not including the 2018 Nobel prize, which is to be awarded right after this seminar). [Additional Information](#)

A total of 214 scientists have been awarded Nobel prize in physiology and medicine to date. [Seminar before the award of Nobel prize in physics](#)

12 women have been awarded

Nobel prizes in physiology or medicine to date.

Nobel prize in physiology or medicine is announced every year on the first Monday of October at 1130h CEST (Central European Summer Time — Swedish Local Time), which corresponds to 1430h PKT (Pakistan Standard Time) and live streamed at <https://www.nobelprize.org>

Medicine Nobel prize is awarded (live streamed) in the Stockholm Concert Hall on October 10 (this year at 1630 CET → 2030 PKT) — the anniversary of Alfred Nobel

What are the qualities you need to win a Nobel prize in physiology or medicine?

Born in Stockholm on October 21, 1833, Alfred Nobel was a descendant of Olof Rudbeck. On November 27, 1895, Alfred Nobel signed his third and final will on November 27, 1895, opened and read after his death on December 10, 1896 in San Remo, Italy. In this excerpt of the will, Alfred Nobel dictates that his entire remaining estate should be used to endow “prizes to those who, during the preceding year, have conferred the greatest benefit to humankind”. Alfred Nobel had an active interest in medical research. Through Karolinska Institutet, he was introduced to the Swedish physiologist Jöns Johansson around 1890. Physiology or medicine was the 3rd prize area Nobel mentioned in his will. Nobel Prize in Physiology or Medicine is awarded by the Nobel Assembly at Karolinska Institutet, Stockholm, Sweden on discoveries, which may be an amalgamation of basic and clinical sciences, and may have the potential of greatest benefit to mankind, provided the problem were investigated from multiple perspectives, [mathematics](#), [biophysics](#) and [physiology](#). Cutting-edge problems may be solved utilizing [the power of mathematics](#), in addition to employing [statistics](#) for data interpretation and data analysis. Some examples are [solutions of childhood obesity*](#), [crystal-structure concepts applied to static and dynamic modeling of the human spinal column[§]](#) and [deformed-ellipsoidal model of the human heart](#). This lecture is dedicated to [May-Britt Moser](#), FRS, Physiology or Medicine Nobel Laureate from Norway. She was born on January 4, 1963 in Fosnavåg, Norway. She is a psychologist and a neuroscientist, who is Professor of Physiology and Neuroscience at [Norwegian University of Science and Technology \(NTNU\)](#), Trondheim, Norway (the audience should be pleased to learn that the speaker invited a Professor of Physics, K. Razi Naqvi from the same university to [Department of Mathematics, University of Karachi](#) on August 6, 2005, who give a [lecture](#) of his current research, with [Vice Chancellor of University of Karachi](#) in attendance). She and her ex-husband [Edvard Ingjald Moser](#), shared half of [the 2014 Nobel prize in physiology or medicine](#), “for their discoveries of cells that constitute a positioning system in the brain” (exact citation from [the Nobel prize website](#)), the other half given to John O’Keefe. Since 2012, she has led the Center for Neural Computation. Together with Edvard Moser, she founded Moser Research Environment at NTNU, which they head to date. May-Britt received her education at [Department of Psychology, University of Oslo](#) and obtained her doctorate in neurophysiology at the [Faculty of Psychology in NTNU](#) and promoted to Professor in 2000. Besides Nobel Prize, awards and honors she received include Prize for Young Scientists (Royal Norwegian Society of Science and Letters) in 1999, 28th Annual W. Alden Spencer Award (College of Physicians and Surgeons of Columbia University) in 2005, 14th Betty and David Koetser Award for Brain Research (University of Zürich) and 10th Prix "Liliane Bettencourt pour les Sciences du Vivant" (Fondation Bettencourt, Paris) both in 2006, 30th Eric K. Fernström’s Great Nordic Prize (Fernström Foundation, University of Lund) in 2008, Louis-Jeantet Prize for Medicine and Anders Jahre Award both in 2011, Perl-UNC Neuroscience Prize in 2012, Louisa Gross Horwitz Prize in 2013, Louisa Gross Horwitz Prize and Körber European Science Prize both in 2014 as well as Erna Hamburger Prize (EPFL, WISH Foundation, Lausanne, Switzerland) in 2016. Significance of the Nobel-Prize winning work (as given on [the Nobel Prize website](#)) may be understood as, “The awareness of one’s location and how to find the way to other places is crucial for both humans and animals. In 2005, May-Britt Moser and Edvard I. Moser discovered a type of cell that is important for determining position close to the hippocampus, an area located in the center of the brain. They found that when a rat passed certain points arranged in a hexagonal grid in space, nerve cells that form a kind of coordinate system for navigation were activated. They then went on to demonstrate how these different cell types cooperate.” The life history of May-Britt Moser teaches us persistence, superb leadership, high ethical-standards, family-work balance and a stubborn sense of purpose. The speaker chose May-Britt Moser to be the featured Nobel Laureate of this seminar, firstly, because the event was held at [Jinnah University for Women](#) and her personality should be a motivation for the young girls aspiring to achieve excellence and, secondly, because of the speaker’s own work leading to a PhD in mathematical neuroscience (Dissertation: [Spacetime Representation in the Brain](#)) was on [the modeling of global electrocortical activity of the brain](#) and [effects of weak electromagnetic fields on global electrocortical activity[¶]](#).

Keywords: Alfred Nobel • Karolinska Institutet • May-Britt Moser • Nobel prize • **Related Links:** [Nobel minds 2018](#) • [Prize announcement 2018](#) • [Physiol. or medicine Nobel lectures 2018 JPA TH](#) • [The Nobel prize award ceremony 2018](#)

Web address of this document: https://www.ngds-ku.org/Presentations/Nobel_Prize_Physiology_Medicine_2018.pdf

*Update 2023 ⇒ The most-recent solution of childhood obesity-and-malnutrition: Kamal, S. A. (2023). Growth-and-Obesity Roadmaps 5.0 for children of still-growing parents — the eleventh-generation solution of childhood obesity-and-malnutrition. *International Journal of Biology and Biotechnology*, **20** (2): 243-267, full text: <https://www.ngds-ku.org/Papers/J70.pdf>

§Update 2019 ⇒ The same ideas applied to develop model based on cross-lattice structure: Kamal, S. A. (2019). Cross-lattice-structure-based modeling of the human spinal column. *International Journal of Biology Research (Karachi)*, **7** (2): 121-134, full text: <https://www.ngds-ku.org/Papers/J53.pdf>

¶Update 2021 ⇒ Generalization of model constructed for the PhD work: Kamal, S. A. (2021). The covariant-enhanced-coupling model of global-electrocortical activity. *International Journal of Biology and Biotechnology*, **18** (3): 547-560, full text: <https://www.ngds-ku.org/Papers/J61.pdf>