



Nobel Prize 2025: Overview and Winners

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Why in news?

The Nobel Prizes for 2025 were announced between October 6 and October 9, with the Peace Prize scheduled for October 10 (today, as of the current date) and the Prize in Economic Sciences set for October 13.

Below is a detailed summary of the announced winners, including their achievements, backgrounds and significance.

1. Nobel Prize in Physiology or Medicine (Announced October 6, 2025)

- **Laureates:** Awarded jointly to **Mary E. Brunkow** (USA), **Frederick J. Ramsdell** (USA) and **Shimon Sakaguchi** (Japan).
- **Reason:** "For their discoveries concerning peripheral immune tolerance."
- **Details:**
 - The immune system protects against infections but must avoid attacking the body's own tissues, which can lead to autoimmune diseases like type 1 diabetes or rheumatoid arthritis. These laureates uncovered mechanisms of **peripheral immune tolerance**, where regulatory T cells (Tregs) suppress harmful immune responses outside the thymus (central tolerance).
 - **Shimon Sakaguchi** (Osaka University) identified Tregs in the 1990s, showing they prevent autoimmunity. His work built on earlier skepticism and defined a new class of T cells.
 - **Mary E. Brunkow and Frederick J. Ramsdell** (then at the University of Washington) discovered the **FOXP3 gene** mutation linked to immune dysregulation (e.g., in "scurfy" mice models), confirming Tregs' role.
 - **Impact:** Their research has advanced treatments for autoimmune disorders, organ transplants and cancer immunotherapies (e.g., CAR-T cell therapies). It explains why the immune system tolerates the body's own cells while fighting threats.
 - **Backgrounds:**
 - Brunkow: Geneticist specializing in immunology; key in identifying FOXP3 mutations.
 - Ramsdell: Immunologist; focused on T-cell development.
 - Sakaguchi: Pioneering immunologist; his 1995 paper redefined T-cell subsets.
 - **Significance:** This is the first Nobel in Medicine shared among three for Treg research, building on prior immunology prizes (e.g., 2011's for allergies). It highlights the immune system's complexity beyond central tolerance.

2. Nobel Prize in Physics (Announced October 7, 2025)

- **Laureates:** Awarded jointly to **John Clarke** (USA/UK), **Michel H. Devoret** (France/USA) and **John M. Martinis** (USA).
- **Reason:** "For the discovery of macroscopic quantum mechanical tunnelling and energy quantisation in an electric circuit."
- **Details:**
 - Quantum effects were thought limited to atomic scales, but these laureates demonstrated them in larger systems—like handheld electrical circuits—using superconducting Josephson junctions.
 - They observed **quantum tunneling** (particles passing through barriers) and **quantized energy levels** in macroscopic setups, challenging classical physics.
 - **Key Experiments:** Clarke (UC Berkeley) pioneered sensitive quantum sensors; Devoret (Yale) and Martinis (Google Quantum AI) advanced circuit quantum electrodynamics (cQED), enabling qubit control for quantum computers.
 - **Impact:** Foundations for quantum technologies, including quantum computers (e.g., error-corrected qubits), cryptography and sensors for dark matter detection. Builds on 2022's quantum entanglement prize.
 - **Backgrounds:**
 - Clarke: British physicist; expert in SQUIDs (superconducting quantum interference devices) for magnetometry.
 - Devoret: French physicist; bridged quantum optics and circuits.
 - Martinis: American; led quantum chip development at Google.
 - **Significance:** Expands quantum mechanics to "human-scale" systems, accelerating practical quantum tech amid global competition (e.g., US-China quantum race).

3. Nobel Prize in Chemistry (Announced October 8, 2025)

- **Laureate:** **Omar M. Yaghi** (USA/Jordan).
- **Reason:** "For creating molecular constructions with large spaces through which gases and other chemicals can flow." (Focus on metal-organic frameworks, or MOFs.)
- **Details:**
 - Yaghi pioneered **reticular chemistry**, designing porous crystalline materials (MOFs) with atomically precise structures. These frameworks have vast surface areas (up to 7,000 m²/g) for capturing gases like CO₂ or hydrogen.
 - His work started in the 1990s, creating the first MOFs for efficient storage and separation of molecules.
 - **Impact:** Applications in carbon capture (climate change mitigation), hydrogen fuel storage (clean energy), water purification and drug delivery. MOFs could reduce industrial emissions by 10-20%.
 - **Background:** Born in Jordan (1965); PhD from University of Illinois; Professor at UC Berkeley. As a child, inspired by a book on molecules; reflects on "drifting" into chemistry.
 - **Significance:** Chemistry's first solo prize since 2009; complements 2016's for molecular machines. Addresses urgent global challenges like net-zero emissions.

4. Nobel Prize in Literature (Announced October 9, 2025)

- **Laureate:** László Krasznahorkai (Hungary).
- **Reason:** "For his compelling and visionary oeuvre that, in the midst of apocalyptic terror, reaffirms the power of art."
- **Details:**
 - Known as the "master of the apocalypse," Krasznahorkai's novels blend dystopian melancholy, biblical rhythms and Eastern European existentialism. His prose features long, hypnotic sentences exploring collapse, faith and human frailty.
 - Debut: *Satantango* (1985), a rural apocalypse tale adapted into Béla Tarr's film. Other works: *The Melancholy of Resistance* (1989), *Seiobo There Below* (2004).
 - **Impact:** Influences global literature; won 2015 Man Booker International for *Satantango*. Praised by Susan Sontag; reaffirms art's resilience amid chaos.
 - **Background:** Born 1954 in Gyula, Hungary; studied philosophy; screenwriter for Tarr's films. Lives reclusively; said the prize proves "literature exists beyond non-literary expectations."
 - **Significance:** First Hungarian winner; 118th Literature prize. Follows 2024's Han Kang; emphasizes Central European voices post-Cold War.

5. Nobel Peace Prize (Announced October 10, 2025)

- **Status:** To be announced today at 11:00 CEST (5:00 AM EDT) by the Norwegian Nobel Committee in Oslo.
- **Details:** Among 338 nominees (244 individuals, 94 organizations). Focuses on efforts for fraternity among nations, disarmament, or human rights. Recent themes: nuclear abolition (2024 to Nihon Hidankyo). Watch live on nobelpeaceprize.org.
- **Significance:** Often the most publicized; past winners include Malala Yousafzai (2014) and UN agencies.

Prize Amount and Date

- Total amount: 11 million Swedish kronor (approximately US\$1.2 million)
- Prize Distribution Date: December 10, 2025 (Alfred Nobel's death anniversary)

Other Nobel Prize Announcements

- Physics: October 7
- Chemistry: October 8
- Literature: October 9
- Peace: October 10
- Economic Sciences: October 13

Background of the Nobel Prize

- The Nobel Prize was established by Swedish scientist, chemist and inventor Alfred Nobel.
- Alfred Nobel was the inventor of dynamite and held approximately 355 patents in his lifetime.

Establishment

- Alfred Nobel died in 1896.
- He wrote in his will that a large portion of his estate be kept as a fund.
- This fund was to be awarded annually to individuals who had performed "the most beneficial work for mankind."
- Based on this will, the Nobel Prizes began to be awarded in 1901.

Fields of the Nobel Prize

According to Alfred Nobel's will, the prizes are awarded in the following fields:

1. Physics
2. Chemistry
3. Medicine or Physiology
4. Literature
5. Peace

Later, in 1968, the Swedish Central Bank (Sveriges Riksbank) established an additional prize in the field of economics, called the "Nobel Memorial Prize" (The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel).

Awarding Institutions

- Royal Swedish Academy of Sciences—for Physics, Chemistry and Economics
- Karolinska Institute—for Medicine or Physiology
- Swedish Academy—for Literature
- Norwegian Nobel Committee—for the Peace Prize

Award Form

- Each prize consists of a gold medal, a certificate (Diploma) and a cash prize are awarded.
- Currently, this amount is approximately 11 million Swedish kronor (approximately US\$1.2 million).
- The prize is awarded annually on December 10th—the anniversary of Alfred Nobel's death.

Question: What is the subject of the 2025 Nobel Prize in Physiology or Medicine?

- A) Gene therapy in cancer
- B) Vaccine development
- C) Peripheral immune tolerance
- D) Artificial organ development