

Genetic mutations in cellular mechanism of temperature, pain sensation are insightful

This year's Nobel Prize for Physiology or Medicine — awarded to the researchers, David Julius and Ardem Patapoutian from the University of California, San Francisco and Scripps Research in La Jolla, California, respectively — recognises their seminal work in identifying the gene and understanding the mechanism through which our body perceives temperature and pressure.

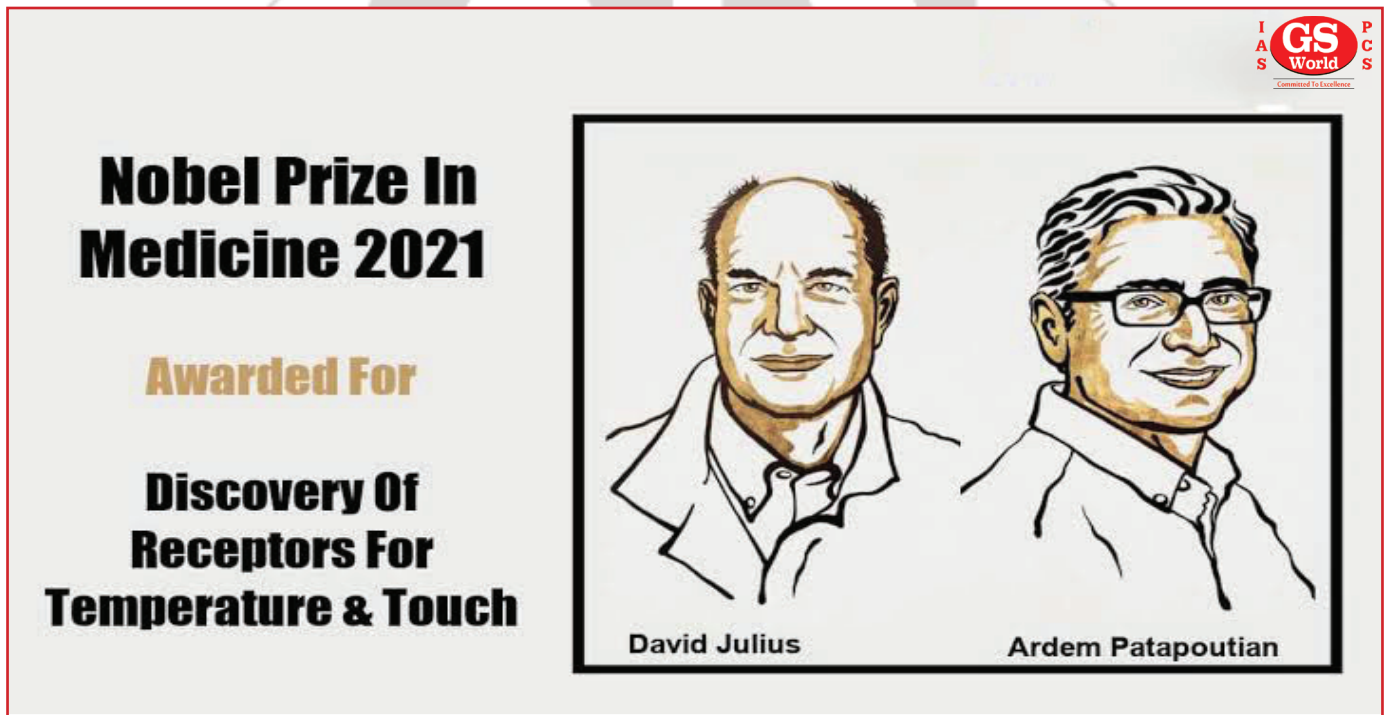
Our ability to sense touch and temperature — particularly noxious temperature — is essential for our survival and determines how we interact with our internal and external environment; chronic pain results when the pain response goes awry. Dr. Julius utilised capsaicin, a key ingredient in hot chilli peppers that induces a burning sensation, to identify a sensor in the nerve endings of the skin and the cellular mechanism that responds to uncomfortably hot temperatures.

The receptor for heat gets activated only above 40° C, which is close to the psychophysical threshold for thermal pain, thus allowing us to react to external heat. In 2002, five years after the heat sensor was discovered, the two laureates, and independently, used menthol to discover the receptor that senses cold temperatures. Recent studies have found that discrimination between warm and cool temperatures is possible only through simultaneous activation of warmth-sensing nerve fibres and inhibition of cold-sensing nerve fibres.

Using pressure-sensitive cells, Dr. Patapoutian discovered a novel class of mechanical sensors that responds to pressure on the skin and internal organs, and the perception of touch and proprioception — the ability to feel the position and movement of our body parts. The cellular mechanism that senses touch also regulates important physiological processes. Besides laboratory work, insights have been gained by studying people carrying genetic mutations in the cellular mechanism of temperature, pain, touch and pressure sensation.

The discovery of pain receptors and the cellular mechanism have attracted pharmaceutical companies as these could be targets for novel medicines. Though there are challenges to be addressed before such drugs can be clinically meaningful, the hope is that newer approaches may one day bypass the hurdles.

Further research will help in understanding the functions of the receptors in a “variety of physiological processes and to develop treatments for a wide range of disease conditions”. This year’s Prize once again underscores the great contributions refugees fleeing war-torn countries can make to science and other fields. Dr. Patapoutian, who is of Armenian origin, grew up in Lebanon during the country’s prolonged civil war and fled to the U.S. in 1986 as an 18-year-old. From being blissfully unaware about science as a career in Lebanon, he not only “fell in love doing basic research”, but has also excelled in it to produce path-breaking discoveries in medicine.



The graphic features a large, faint watermark of the number '2021' in the background. On the right side, there is a logo for 'GS World' with the letters 'I A S' on the left and 'P C S' on the right, and the tagline 'Committed To Excellence' below it. The main text on the left reads: 'Nobel Prize In Medicine 2021' in bold black font, followed by 'Awarded For' in orange, and 'Discovery Of Receptors For Temperature & Touch' in bold black font. On the right, there is a framed illustration of two men: David Julius on the left and Ardem Patapoutian on the right. Below each illustration is their name: 'David Julius' and 'Ardem Patapoutian'.

Nobel Prize In Medicine 2021

Awarded For

Discovery Of Receptors For Temperature & Touch

David Julius

Ardem Patapoutian

GS World Team Input

IN THE NEWS

- American scientists David Julius and Ardem Patapoutian won the prestigious “2021 Nobel Prize for Medicine”.
- They won the prize for their discoveries of receptors for temperature and touch.
- According to award-giving body, these discoveries could make way for new pain-killers.
- These findings have allowed to understand how heat, cold and mechanical force initiate the nerve impulses which in turn allow humans to perceive and adapt to the world around.
- This development and knowledge are being used to develop treatments for a several disease conditions, including chronic pain.
- This year, the Nobel Prize for Physiology or Medicine was shared in equal parts by the two laureates.
- But medicine has been into the spotlight because of COVID-19 pandemic. There were recommendations that, those who developed covid-19 vaccines could be rewarded with Nobel Prizes.

Who is Ardem Patapoutian?

- Ardem Patapoutian was born in 1967 in Lebanon, to Armenian parents. He moved to Los Angeles in his youth and currently he is a Professor at Scripps Research, La Jolla, California. He has done research at the University of California, San Francisco as well as at California Institute of Technology, Pasadena. He was awarded with The Nobel Prize for finding a cellular mechanism and underlying gene which translates a mechanical force on our skin into an electric nerve signal.

Who is David Julius?

- Davis Julius was born in New York. He is a Professor at University of California, San Francisco. He was awarded for his findings on the skin’s sense of temperature on the basis of how certain cells react to capsaicin.

About Nobel Prizes

- The prestigious Nobel prizes for “science, literature and peace” were created and funded in the name of Swedish dynamite inventor and businessman Alfred Nobel. The prize is awarded since 1901.
- The Nobel prize for economics was first conferred in 1969. This century-old prize is worth 10 million Swedish crowns.

Expected Questions (Prelims Exams)

Q. Consider the following statements regarding the Nobel Prize in Medicine for the year 2021-

1. The Nobel Prize for Medicine in the year 2021 has been given for the discoveries of receptors for temperature and touch.
2. This award has been given to scientists David Julius and Ardem Patapoutian.

Which of the above statement is/are true?

- (a) 1 Only (b) Only 2
(c) Both 1 and 2 (d) Neither 1 nor 2

Expected Questions (Mains Exams)

Q. This year's Nobel Prize in medicine has been given for which important discovery? What is the importance of this discovery for mankind? Discuss. (250 Words)

World

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Note: - The question of the main examination given for practice is designed keeping in mind the upcoming UPSC main examination. Therefore, to get an answer to this question, you can take the help of this source as well as other sources related to this topic.