



# October Newsletter 2021



# *World Mental Health Day!*



October 10, 2021

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The 10th of October is recognised as the World Mental Health Day every year. The objective of this day is to raise awareness of the mental health problems that people face around the world and to call up for more efforts to be put in support of mental health.

This year the president of the World Federation for Mental Health(WFMH), Dr Ingrid Daniels announced the theme for World Mental Health Day 2021 to be 'Mental Health in an unequal world'. This year's theme was selected to call attention to the fact that the accessibility of mental health services still remains unequal - around 75 to 95 % of people with mental health problems in middle to lower-income countries have no access to mental health services and the situation is not any better in high-income countries. Not enough investment is being put into this sector leading to the mental health treatment gap. This year's campaign and theme aim to identify the mental health inequalities locally and globally and to encourage researchers to share what they know about mental health and also share different strategies to tackle these inequalities.

With pandemic-induced isolation and unemployment due to the COVID 19 outbreak, the number of people suffering from mental health problems significantly increased. In India, around 56% of young adults(18-24) suffer from reported symptoms of anxiety and/or depressive disorder. Cases of home violence and financial problems are also some major contributors to mental health issues in the Indian population.  
[1-4]

India was one of the first post-colonial non-white countries to have mental health reforms. In 1982, The National Mental Health program was introduced with the objective of making minimum mental health care accessible to the underprivileged and to increase awareness of the importance of mental healthcare. But even today mental health problems are stigmatised and perceived with a sense of judgement in our country and we have a long way to go to fully understand mental disorders and combat the mental health pandemic!

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ON THE

# *Nobel Trail*

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'Tis the Nobel Season! Let's look at some recent research in Biology that this prestigious award has recognized!

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# Ft. CRISPR: Genetic Scissors

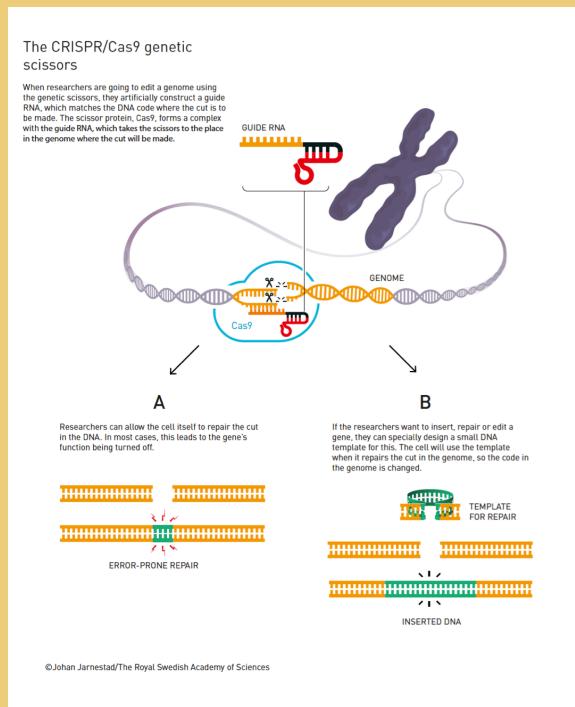
Nobel Prize in Chemistry 2020 [5,6]

The Nobel prize for Chemistry in 2020 was awarded to Jennifer Doudna and Emmanuelle Charpentier for their discovery of a precise gene-editing technique - the modular CRISPR/Cas system. The story of the discovery of CRISPR started in the lab of Emmanuelle Charpentier. While studying the pathogen *Streptococcus pyogenes*, Charpentier discovered that a previously unknown RNA, called the tracrRNA, was involved in the antiviral immune system of the bacteria. Meanwhile, Jennifer Doudna was studying RNA enzymes and was also aware of the role of RNAs in this mechanism. When the two of them met at a conference in 2011, they decided to revamp this RNA-based system to create a modular gene-editing technology. Let's try and understand this discovery starting from within the bacterial cell!

## What is the CRISPR/Cas system?

Expanding to Clustered Regularly Interspaced Short Palindromic Repeats, CRISPR refers to peculiar repeating sequences present in many prokaryotes. It was found that these sequences matched with regions in the genetic material of certain viruses. They were identified by Francisco Mojica, a Spanish researcher and were later found to be part of an immune mechanism present in bacteria and archaea to prevent infection by phages. Simply put, it enables the host prokaryote to identify specific target sequences in the viral genome and cleave it with the help of enzymes, including proteins of the Cas (CRISPR-associated) family. A detailed visual explanation of the bacterial system as given in the Nobel Press Release last year can be found [here](#). Doudna and Charpentier isolated the different players of this bacterial immune system. They showed that Cas 9 (one of the Cas proteins) could be adapted with "guide RNAs" (that help the protein find the target site) to cut specific sites in DNA sequences in vitro.

## How it works:



## The Way Forward:

In the past decade, after the technology was published, its use has extended to labs worldwide. Subsequent work from the laboratories of Feng Zhang and George Church also showed how it could be used in mammalian systems. CRISPR is now being used to generate genetically modified crops, design therapeutic strategies for gene therapy, create quick diagnostic devices in cancer therapy, and more. Yet, despite the reach, it's not without flaws. Reducing off-target effects, usage regulation and performing multiple edits at once are some future directions in addition to the tuning involved in repurposing CRISPR for the applications mentioned above. Nevertheless, this quick and elegant technology has revolutionised genome editing and opened up immense possibilities!

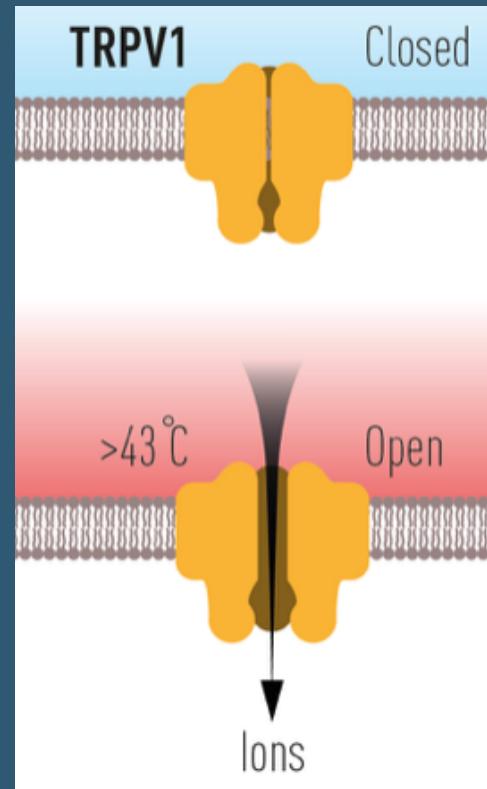
# *How do we sense touch and temperature ?*

Nobel Prize in Physiology and Medicine 2021 [7]

We know that nerve impulses help us process the different stimuli around us. But what is the mechanism by which stimuli are converted into a nerve impulse in our body? The Nobel Prize for Physiology and Medicine 2021 was awarded to David Julius and Ardem Patapoutian, who independently identified receptors involved in sensing touch and temperature. Let us look at how they achieved this.

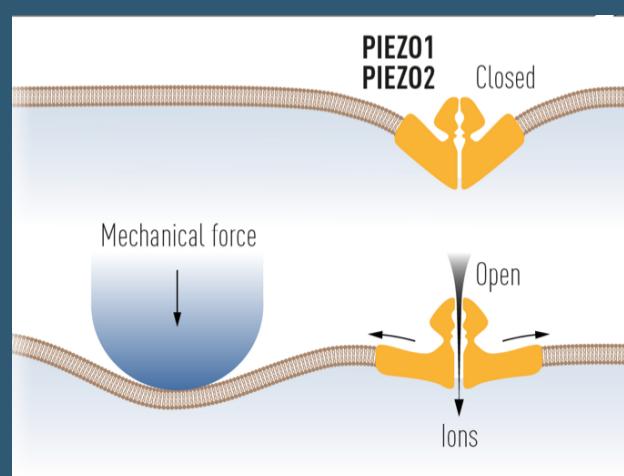
## TRPV1: The Temperature Sensor

David Julius worked with capsaicin, a component of chilli peppers known to cause a burning sensation when brought in contact with the skin. It was already known to cause pain by activating nerve cells, but the Julius lab at UCSF set out to find how. His team created millions of DNA fragments that coded for genes expressed in sensory neurons that respond to pain, heat and touch. They expressed these one by one in a culture of cells that were naturally insensitive to capsaicin. They hypothesised that if a gene induced the culture to become capsaicin-sensitive, it was involved in sensing capsaicin and generating a nerve impulse. After a tedious screening process, they identified one gene- TRPV 1 that achieved this. It was later found to encode an ion channel protein that opened when exposed to a temperature above bearable ranges.



## PIEZ01: The Pressure Sensor

As the receptors involved in temperature sensing were discovered, Ardem Patapoutian wanted to identify the receptors that helped transduce mechanical stimuli. Their lab started by identifying a cell line that could give a measurable electric signal when pressed with a micropipette. They now did the opposite of Julius and initiated a knockout screen to identify the gene target that enabled this response. They shortlisted 72 potential candidates and knocked them out one by one, checking when the electric response was lost. After another laborious search, their lab identified Piezo1, a new ion channel that opened when subjected to mechanical stress.

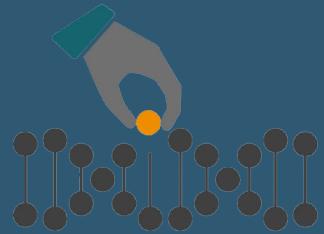


The discovery of these receptors has helped us understand how changes in temperatures or mechanical stress can lead to a nerve impulse. It is further identified that these receptors play an essential role in many physiological functions like blood pressure and respiration and can help us understand disease conditions.

# Interesting research articles

## A Programmable Dual-RNA-Guided DNA Endonuclease in Adaptive Bacterial Immunity

The Charpentier and Doudna paper that came out in 2012 and showed that the CRISPR/Cas 9 system can be used as programmable genetic scissors



## Does Sleep Deprivation affect only the brain?

We know that sleep is essential for survival and that constant sleep deprivation can have lethal consequences. This paper talks about a mechanism for that lethality and turns out, it has got nothing to do with the brain! CW: Death

## The coronavirus (COVID-19) pandemic's impact on mental health

A short take on the potential effects on mental health that the pandemic has wrought.



## SHERLOCK and DETECTR: CRISPR-Cas Systems as Potential Rapid Diagnostic Tools for Emerging Infectious Diseases

Discusses two new rapid diagnostic tools with cool acronyms ;) that were designed based on the CRISPR/Cas technology.



# Upcoming talks and conferences

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Beyond the Barries: New Perspectives and Advances in Life Sciences

Cells in Motion - International Max Planck Research School (CiM-IMPRS) WWU Münster

**20-22**

October

**25**

October

Regn- Deadline

IITM-EMBL-EBI Winter School 2021

Reproducible Modelling in Systems Biology

6th - 9th December, 2021

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An Inclusive History of Science Communication

26th Oct, 5:30 PM IST

**26**

October

14th Annual BIDMC Cancer Center Symposium Targeted and Immune-based Therapeutics

26th- Starts at 6:30 PM IST

**18**

November

Emerging role of glia in neurodegenerative disorders

organised by University of Cambridge and UKDRI  
7:30 - 11:30 PM IST

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Seminars on Intrinsically disordered proteins

Thursdays: 10:30 PM IST

**Biweekly**

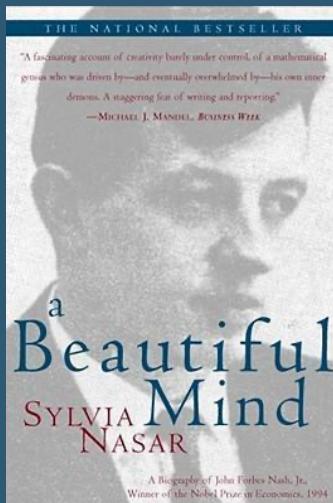
**Weekly**

Bioinformatics/Human Genetics Seminar Series  
by UCLA  
Mondays 11:30 PM IST

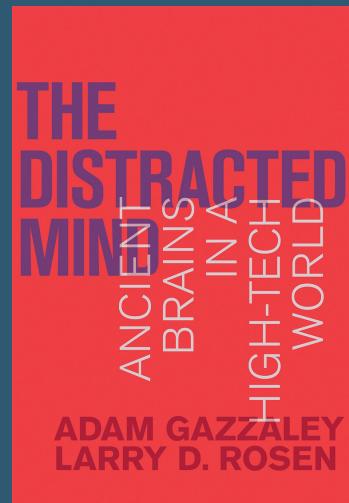
(click the title of each talk for more details)



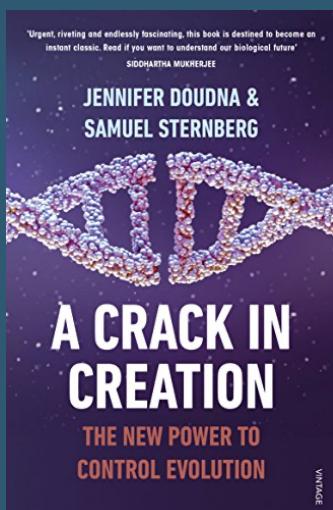
# Books and Podcasts to keep you occupied!



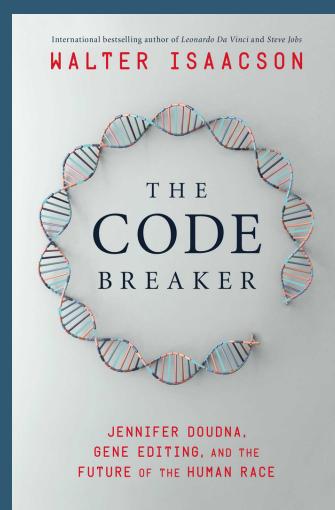
A Beautiful Mind by  
Sylvia Nasar



The Distracted Mind by  
Adam Gazzaley and Larry D. Rosen



A Crack in Creation  
by Jennifer Doudna and  
Samuel Sternberg



The Code Breaker  
by Walter Isaacson

## CRISPR Cuts

Synthego's genome engineering podcast  
that features an expert in every episode to  
talk about the impact of CRISPR in our  
lives.

**CRISPR Cuts**

# Write to us



What worked for you? What didn't?

We'd love to hear your feedback and suggestions on the content and reccos!

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# Write for us

# *References:*

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Wed. 20 Oct 2021.
6. A CRISPR view of the 2020 Nobel Prize in Chemistry
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# *Get in touch!*



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