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# Science & Technology

***(2-Minute Series)***

**2020**

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## 1. NEONs: NEO (new) + Human

- First project of Samsung's STAR (Samsung Technology & Advanced Research) Labs
- They are being called the world's first artificial humans who look and behave like real humans, and could one day develop memories and emotions
  - ✓ They can show emotions when manually controlled by their creators
- The idea is for NEONs to become intelligent enough to be fully autonomous, showing emotions, learning skills, creating memories, and being intelligent on their own

### Technology

- There are two core technologies
  - A. CORE R3: It drives the reality, real time and responsiveness. It is like a rendition engine, converting mathematical models to look like actual humans. CORE R3 can also connect to other domain-specific and value-added services like language kits.
  - B. SPECTRA: It will complement CORE R3 with the "spectrum of intelligence, learning, emotions and memory"
- CORE R3 is the front-end reality engine that is able to give you that real expression. The spectrum of emotions and knowledge will come only when the NEONs are "actually in the field"

### Difference between NEON & Virtual Assistant

- Virtual Assistants learn from all the data they are plugged into. NEONs will be limited to what they know and learn. Their leaning could potentially be limited to the person they are catering to, and maybe her friends but not the entire Internet.
- They will not be an interface for you to request a song, rather they will be a friend to speak to and share experiences with

### Privacy

- NEONs will not have collective memory and cannot share data among themselves. So what is known to one NEON cannot be useful for another

## 2. Public Health Emergency of International Concern (PHEIC)

- The term is defined in International Health Regulation 2005 as an extraordinary event which is determined as
  - ✓ to constitute a public health risk to other States through the international spread of disease
  - ✓ to potentially require a coordinated international response
- It implies a situation that is:
  - ✓ serious, unusual or unexpected
  - ✓ carries implications for public health beyond the affected State's national border
  - ✓ may require international action

- WHO implemented the procedures to declare a PHEIC in 2005, as a response to the outbreaks of SARS and H5N1 (bird flu) in the early 2000s

### Who decides?

- The responsibility to determine such an event lies with the WHO Director-General and requires the convening of a committee of experts (IHR Emergency Committee)
- This committee advises the Director General on the recommended measures to be promulgated on an emergency basis, known as temporary recommendations.
  - ✓ Temporary recommendations include health measures to be implemented by the State Party experiencing the PHEIC, or by other States Parties, to prevent or reduce the international spread of disease and avoid unnecessary interference with international traffic

### What does PHEIC mean?

- It would lead to a boost in public health measures, funding and resources to prevent and reduce international spread
- It could include recommendations on trade and travel, including airport screening of passengers, although the WHO generally aims to avoid disruptive trade restrictions.

### Emergencies

- Only five emergencies have been declared since then:
  - ✓ the H1 virus that caused an influenza pandemic (2009),
  - ✓ West Africa's Ebola outbreak (2014-2016),
  - ✓ Polio (2014),
  - ✓ Zika virus (2016), and
  - ✓ the ongoing Ebola outbreak in the Democratic Republic of Congo (2019).
- WHO Emergency Committee has postponed making a decision whether the Coronavirus outbreak in Wuhan in China constitutes a PHEIC

## 3. Genome Mapping

- Government has given clearance to gene mapping project
- According to Human Genome Project, there are estimated to be over 20,500 human genes
  - ✓ In humans, each cell consists of 23 pairs of chromosomes in each cell
- Genome refers to an organism's complete set of DNA, which includes all its genes and mapping these genes simply means finding out the location of these genes in a chromosome
- Some of the genes are lined up in a row on each chromosome, while others are lined up quite close to one another and this arrangement might affect the way they are inherited
  - ✓ If the genes are placed sufficiently close together, there is a probability that they get inherited as a pair

- Genome Mapping means figuring out the location of a specific gene on a particular region of the chromosome and also determining the location of and relative distances between other genes on that chromosome
- Genome mapping enables scientists to gather evidence if a disease transmitted from the parent to the child is linked to one or more genes. Furthermore, mapping also helps in determining the particular chromosome which contains that gene and the location of that gene in the chromosome
- According to the National Human Genome Research Institute (NHGRI), genome maps have been used to find out genes that are responsible for relatively rare, single-gene inherited disorders such as cystic fibrosis and Duchenne muscular dystrophy
- Genetic maps may also point out scientists to the genes that play a role in more common disorders and diseases such as asthma, cancer and heart disease among others
- According to the Genome News Network, unlike conventional geographical maps, genome maps are onedimensional, much like the DNA molecules that make up the genome

## 4. Aditya-L1

- It is India's first dedicated scientific mission to study the sun
- It was conceived as a 400 kg class satellite and planned to be launched in an 800 km Low-earth orbit (Aditya 1)
  - ✓ But it was later realised that a satellite placed in the halo orbit around the L1 Lagrangian point of the SunEarth orbit has the amazing advantage of continuously viewing the Sun without any obstructions that eclipses may offer
- Aditya L1 will be inserted in a halo orbit around the L1, which is located some 1.5 million km from the Earth and will carry an additional six payloads
  - ✓ The distance also means that the orbit is greater than the orbit of the moon around the Earth, hence the luxury of remaining unaffected by an eclipse

### Tasks

- Primary Payload will be Coronagraph which is meant to observe the solar corona
- Perform experiments and observe the Sun's Photosphere and the Chromosphere as well
- Measure the Particle flux originating from the Sun and reaching the L1 orbit
- Measure the variation in magnetic field strength at the halo orbit
- It will also be collecting information about the solar photosphere and chromosphere while monitoring solar winds and magnetic fields

### Lagrangian Point

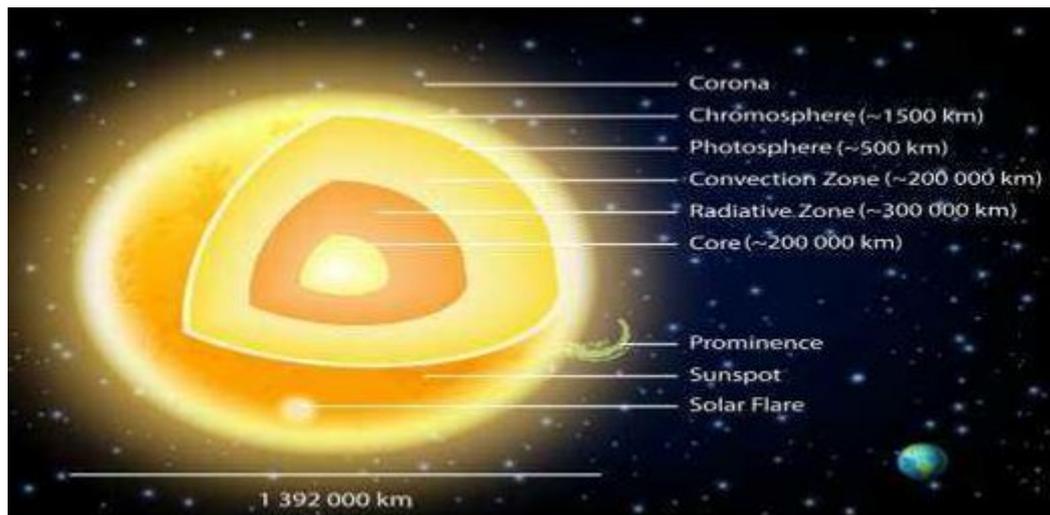
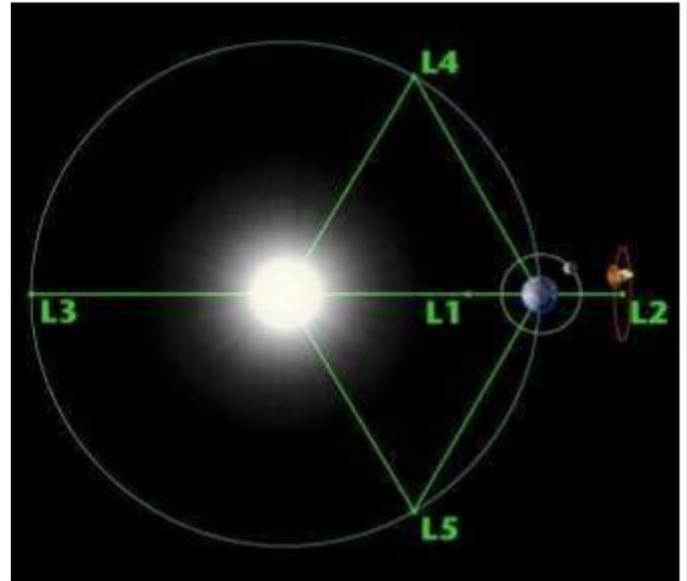
- It refers to positions in orbits of two large bodies wherein a small object affected only by the gravitational forces from the two larger objects, will maintain its position relative to them.

## Corona

- It is an aura of plasma that envelops the Sun and other stars and is visible to the naked eye during a total solar eclipse.
- It will also be studied by the Parker Solar Probe.

## Photosphere and Chromosphere

- These two layers are still above the surface, but below the corona and not as hot.
- Photosphere is the lowest layer and around 500 km thick. This is where the Sun's energy is released as light.
- Photosphere is where the Sun's magnetic field breaks through the surface. It can be observed by detecting the 'sunspots' over the sun's disk. The movement of the sunspots is what led scientists to discover that the Sun isn't stagnant — it actually rotates.
- Photosphere is also where solar flares originate.



## 5. 5G

- It is the 5th generation mobile network
- It is expected to deliver peak data rates up to 20 Gbps
- It will provide much more network capacity by expanding into new spectrum, such as millimeter wave (mmWave).
- 5G will also deliver much lower latency for a quicker immediate response, and an overall more uniform user experience so that the data rates stay consistently high even when users are moving around. Moreover, the new 5G NR (New Radio) mobile network will be backed up by Gigabit LTE coverage foundation, which will provide ubiquitous Gigabit-class connectivity

- Like 4G LTE, 5G is also OFDM-based and will operate based on the same mobile networking principles. However, the new 5G NR (New Radio) air interface will further enhance OFDM to deliver a much higher degree of flexibility and scalability.

### Why important?

- Elevate the mobile network to not only interconnect people, but also interconnect and control machines, objects and devices
- Deliver new levels of performance and efficiency that will empower new user experiences and connect new industries
- Deliver multi-Gbps peak rates, ultra-low latency, massive capacity, and more uniform user experience

### Evolution of Mobile Networks

- 1G delivered analog voice
- 2G introduced digital voice (e.g., CDMA)
- 3G brought mobile data (e.g., CDMA2000)
- 4G LTE ushered in the era of mobile Internet

### Applications

- Enhanced Mobile Broadband: Usher in immersive experiences such as VR and AR
- Mission-Critical Communications: Enable new services that can transform industries with ultrareliable/available, low latency links—such as remote control of critical infrastructure, vehicles, and medical procedures
- Internet of Things

### 3GPP (3rd Generation Partnership Project)

- It is an industry collaboration that manages the cellular standards

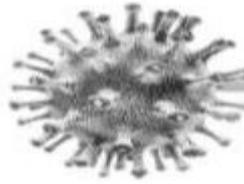
## 6. Corona Virus

- Coronaviruses are a large family of viruses which may cause illness in animals or humans
- In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS)
- The most recently discovered coronavirus causes coronavirus disease COVID-19
- Coronaviruses are zoonotic, meaning they are transmitted between animals and people
- Several known coronaviruses are circulating in animals that have not yet infected humans
- The name coronavirus comes from the Latin word corona, meaning crown or halo. Under an electron microscope, the image of the virus looks like a solar corona

## CHINA

# Coronaviruses

Coronaviruses are a large family of viruses that cause not only the common cold but also more serious respiratory illnesses



### 2019-nCoV OUTBREAK December 31, 2019

#### Symptoms

- Unknown incubation period
- Fever
- Difficult breathing
- Impaired liver and kidney function
- Kidney failure
- Severe cough
- Pneumonia

A novel coronavirus (2019-nCoV) was identified as the source of the illnesses on January 7, with the infection traced to a Wuhan seafood market that also sold live animals



#### Middle East Respiratory Syndrome (MERS)

Identified in Saudi Arabia in 2012 - Spread to 27 countries. 2,494 confirmed cases | 858 deaths



#### Severe Acute Respiratory Syndrome (SARS)

Emerged in southern China in 2002 - Spread to 30 countries. 8,437 cases | 813 deaths



Source: Al Jazeera | Last updated: Jan 21, 2020

@AJLabs



## COVID-19

- COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019

## Transmission

- Person to Person transmission happens through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or exhales
- COVID-19 is mainly transmitted through contact with respiratory droplets rather than through the air
- Coronaviruses are a large family of viruses that are common in animals. Occasionally, people get infected with these viruses which may then spread to other people. For example, SARS-CoV was associated with civet cats and MERS-CoV is transmitted by dromedary camels. Possible animal sources of COVID-19 have not yet been confirmed

## Risk

- While studies are still underway, older persons and persons with pre-existing medical conditions (such as high blood pressure, heart disease, lung disease, cancer or diabetes) appear to develop serious illness more often than others

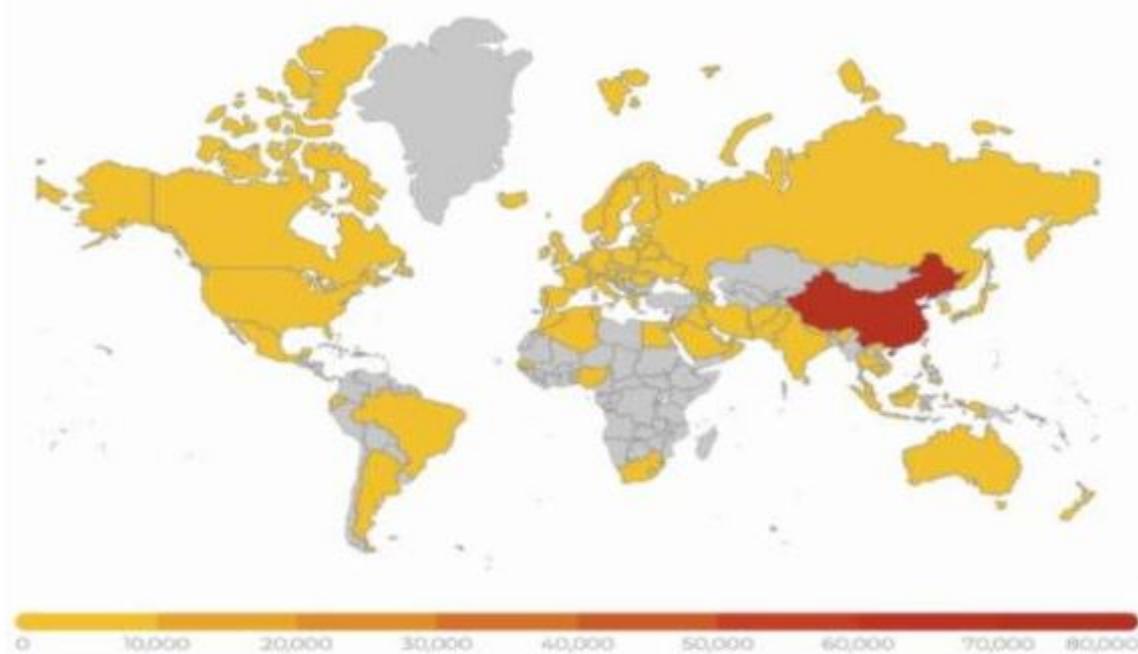
## Vaccine

- Till date, there is no vaccine and no specific antiviral medicine to prevent or treat COVID-19

## Different from SARS

- The virus that causes COVID-19 and the one that causes Severe Acute Respiratory Syndrome (SARS) are related to each other genetically, but they are different

- SARS is more deadly but much less infectious than COVID-19
- There have been no outbreaks of SARS anywhere in the world since 2003



## 7. Moons in the Solar System

### Mars

- Phobos is slowly falling apart
  - ✓ It is also closer to its planet than any other moon in the solar system

### Jupiter

- Ganymede: It is the largest moon in our solar system, larger than Mercury and Pluto
- Io: Most volcanically active moon in the solar system, with some volcanoes erupting lava fountains several kilometres high
- Europa: This moon has twice as much water as Earth, although frozen

### Saturn

- Titan: It is also larger than Mercury. It has a thick atmosphere, complete with its own 'water cycle' – except that it's too cold for liquid water and rains liquid hydrocarbons like ethane and methane
- Epimetheus and Janus: Both share their orbits. They avoid crashing into each other due to mutual acceleration and deceleration because of gravity

### Neptune

- Triton: It is the only one of its kind in the solar system to orbit in the opposite direction of its planet's rotation, a retrograde orbit

## Pluto

- Charon: Largest moon of Pluto. It is so big compared to Pluto that Pluto and Charon are sometimes referred to as a double planet system

## 8. Hantavirus

### Context

- China has reported a death due to a new virus called Hantavirus from its Yunnan Province

### About the Virus

- The whole family of hantavirus are spread from rodents and can affect people
- It causes hantavirus pulmonary syndrome (HPS) and haemorrhagic fever with renal syndrome (HFRS)
  - ✓ HPS is a severe, sometimes fatal, respiratory disease in humans
  - ✓ Hantaviruses in the Americas are known as "New World" hantaviruses and may cause hantavirus pulmonary syndrome (HPS). Other hantaviruses, known as "Old World" hantaviruses, are found mostly in Europe and Asia and may cause hemorrhagic fever with renal syndrome (HFRS)
- It has been around since 1970s



### Transmission

- The disease is transmitted if someone breathes in contaminated air
- It spreads as a result of close contact with rodent urine, saliva and droppings
- Human-to-human spread is possible, but very rare

### Symptoms

- Fatigue, Fever, muscle aches, headaches, dizziness, chills and abdominal pains are early symptoms of HPS
- Later symptoms include coughing and shortness of breath
- When the infection reaches the lungs and fills it with liquid
- HFRS has similar symptoms to HPS but can also cause some serious problems like low blood pressure, acute shock, vascular leakage, and acute kidney failure.
- HFRS can rarely transfer from one person to another

### Treatment

- There is no vaccine for treating HPS

## 9. Sodium Hypochlorite Solution

- It is a low cost greenish yellow solution, also called liquid bleach, which acts as a germ killing mechanism – effective against viruses and fungi
- It can be used as a disinfectant but not as a preventive dose
- Its duration of action may last for a few hours, not exceeding 24 hours

### Application

- Used as a bleaching agent, in agriculture, chemical industries, food industries etc.
- Applied in swimming pools
- Clean food preparation surfaces and laundries
- Water purification and disinfection

### Exposure

- Coughing and sore throat
- Stomach ache, burning sensation, diarrhoea and vomiting
- Skin irritation, blindness if it enters the eyes, exposure to the vapours can also cause burning sensation in the respiratory tract and if it enters the respiratory system it may cause choking too.

### Usage

- It releases chlorine which is a disinfectant
  - ✓ Large quantities of chlorine can be harmful
- A normal household bleach usually is 2-10% NaClO
- At a much lower 0.25-0.5%, this chemical is used to treat skin wounds like cuts or scrapes
- An even weaker solution is used as a hand wash (0.05%)

### Why in News?

- Migrant workers travelling to their home states, or their belongings, were sprayed with a disinfectant, apparently to sanitise them
  - ✓ The chemical in the spray was sodium hypochlorite solution
- Officials have used a 1% NaClO solution
  - ✓ It can damage skin and if it gets inside the body, can cause serious harm to lungs
  - ✓ It is corrosive and is meant largely to clean hard surfaces
  - ✓ Not recommended to be used on human beings, certainly not as a spray or shower
  - ✓ Even a 0,05% solution could be harmful for the eyes