Covid and wastewater surveillance

- Waste-water-based surveillance for COVID-19 comes as an efficient and fool proof way of gauging these parameters.
- The method has multiple advantages.
- Trends of increasing or decreasing viral load can be gauged well before the waves take off.
- "Unlike RT-PCR on a single person's sample [where the test result can come quickly], it takes us a couple of weeks to do the sequence analysis of the sample.
- New variants can be spotted in advance, as can different viruses, such as those that cause dengue, Zika, or TB.
- This would help the health department to be prepared to deal with epidemics.
- Studies can monitor antimicrobial resistance genes and point out to civic authorities as to which antibiotics are failing.

THE HINDU

Sir Francis Galton and Mendel

- We are celebrating the 200th birth anniversary of Gregor Johann Mendel and Sir Francis Galton this year.

Sir Francis Galton

- He was the first to apply statistical methods to the study of human differences and inheritance of intelligence, and introduced the use of questionnaires and surveys for collecting data on human communities
- He was a pioneer of eugenics, coining the term itself in 1883, and also coined the phrase "nature versus nurture". His book Hereditary Genius (1869) was the first social scientific attempt to study genius and greatness.
- He devised a method for classifying fingerprints that proved useful in forensic science.
- He also conducted research on the power of prayer, concluding it had none due to its null effects on the longevity of those prayed for.
- As the initiator of scientific meteorology, he devised the first weather map, proposed a theory of anticyclones, and was the first to establish a complete record of short-term climatic phenomena on a European scale.
- He also invented the Galton Whistle for testing differential hearing ability.

- Eugenics is a set of beliefs and practices that aim to improve the genetic quality of a human population, historically by excluding people and groups judged to be inferior or promoting those judged to be superior.
- In recent years, the term has seen a revival in bioethical discussions on the usage of new technologies such as CRISPR and genetic screening, with a heated debate on whether these technologies should be called eugenics or not.
- The concept predates the term; Plato suggested applying the principles of selective breeding to humans around 400 BC
- Early advocates of eugenics in the 19th century regarded it as a way of improving groups of people. In contemporary usage, the term eugenics is closely associated with scientific racism.

Mendel Law's

- Our modern understanding of how traits may be inherited through generations comes from the principles proposed by Gregor Mendel in 1865.
- However, Mendel didn't discover these foundational principles of inheritance by studying human beings, but rather by studying Pisum sativum, or the common pea plant.
- Law of Segregation: When gametes form, alleles are separated so that each gamete carries only one allele for each gene
- Law of Independent Assortment: The segregation of alleles for one gene occurs independently to that of any other gene*
- Principle of Dominance: Recessive alleles will be masked by dominant alleles†.

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Black beauty

- More than 4.5 billion years ago, it's possible that Mars, the Red Planet, had a crust comparable to Iceland today.
- This discovery, hidden in the oldest Martian fragments found on Earth, could provide information about our planet that was lost over billions of years of geological movement and could help explain why the Earth developed into a planet that sustains a broad diversity of life and Mars did not.
- A 4.48-billion-year-old meteorite, informally named Black Beauty, recorded the first stage of the evolution of Mars and, by extension,

of all terrestrial planets, including the Earth.

- the chemical and physical properties of Black Beauty to pinpoint where it came from; they determined it was from Terra Cimmeria-Sirenum, one of the most ancient regions of Mars.
- They were able to isolate the most plausible ejection site the Karratha crater that excavated ejecta of an older crater named Khujirt.

THE HINDU

Quantum computing and Kyber

- Future quantum computers might be able to break the cryptographic keys that protect everything.
- Now, the National Institute of Standards and Technology, United States, has officially endorsed cryptographic technologies that are thought to be resistant to attack from quantum computers, which include CRYSTALS-Kyber.

Quantum computing

- Quantum computing is a rapidly-emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers.

Need

- When scientists and engineers encounter difficult problems, they turn to supercomputers. These are very large classical computers, often with thousands of classical CPU and GPU cores. However, even supercomputers struggle to solve certain kinds of problems.
- Quantum computers are built for complexity
- Quantum algorithms take a new approach to these sorts of complex problems creating multidimensional spaces where the patterns linking individual data points emerge.
- Classical computers cannot create these computational spaces, so they cannot find these patterns.

Qubit

- Just like a binary bit is the basic unit of information in classical (or traditional) computing, a qubit (or quantum bit) is the basic unit of information in quantum computing.
- Quantum computing is driving new discoveries in healthcare, energy, environmental systems, smart materials, and beyond.
- A qubit uses the quantum mechanical phenomena of superposition to achieve a linear combination of two states.

- A classical binary bit can only represent a single binary value, such as 0 or 1, meaning that it can only be in one of two possible states.
- A qubit, however, can represent a 0, a 1, or any proportion of 0 and 1 in superposition of both states, with a certain probability of being a 0 and a certain probability of being a 1.

Kyber

- Kyber is a key encapsulation method (KEM) designed to be resistant to cryptanalytic attacks with future powerful quantum computers. It is used to establish a shared secret between two communicating parties without an (IND-CCA2) attacker in the transmission system being able to decrypt it.
- In cryptographic protocols, a key encapsulation mechanism (KEM) is used to secure symmetric key material for transmission using asymmetric (public-key) algorithms.
- It is used to establish a shared secret between two communicating parties without an (IND-CCA2) attacker in the transmission system being able to decrypt it
- Cipher text indistinguishability (IND-CCA2) is a property of many encryption schemes.
- Intuitively, if a cryptosystem possesses the property of indistinguishability, then an adversary will be unable to distinguish pairs of cipher texts based on the message they encrypt.

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Deep Mind

- DeepMind Technologies is a British artificial intelligence subsidiary of Alphabet Inc. and research laboratory founded in September 2010.
- DeepMind was acquired by Google in 2014. The company is based in London, with research centres in Canada, France, and the United States
- DeepMind has created a neural network that learns how to play video games in a fashion similar to that of humans, as well as a Neural Turing machine, or a neural network that may be able to access an external memory like a conventional Turing machine, resulting in a computer that mimics the short-term memory of the human brain.

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