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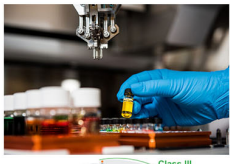

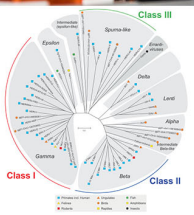

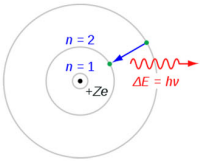

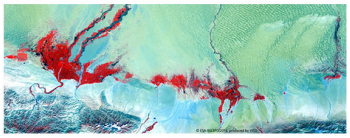

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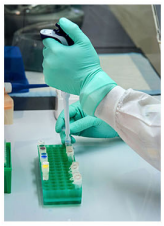

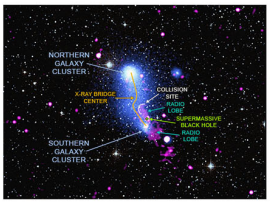

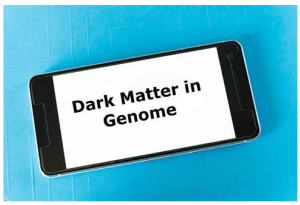

European COVID-19 Data Platform: EC Launched Data Sharing Platform for Researchers

The European Commission has launched www.Covid19DataPortal.org where the researchers can store and rapidly share datasets. The rapid sharing of relevant data would accelerate research and discovery.

With an aim to support researchers by enabling rapid collection and sharing of available research data, the European Commission, as part of the ERAvsCorona Action Plan, has partnered with Erasmus Medical Centre, Elixir Europe, the European Bioinformatics Institute of the European Molecular Biology Laboratory (EMBL-EBI), EOSC-Life, National Institute for Public Health and the Environment (RIVM), Eötvös Loránd University, Technical University of Denmark (DTU) and Universitäts Klinikum Heidelberg to launch 'European COVID-19 Data Platform'.

The portal's Uniform Resource Locator (URL) is www.Covid19DataPortal.org where the researchers can store and rapidly share datasets like DNA sequences, protein structures, data from pre-clinical research and clinical trials, as well as epidemiological data. The rapid sharing of relevant data would accelerate research and discovery.

The link to submit new data to the portal is https://www.covid19dataportal.org/submit-data

Imperative of data sharing in Public Health Emergency notwithstanding, the initiative is also in line with commitment to 'Open Research Data' and 'Open Science'.

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A Novel Approach to 'Repurpose' Existing Drugs For COVID-19

A combination of biological and computational approach to study protein-protein interactions (PPIs) between the viral and the host proteins in order to identify and repurpose drugs for an effective treatment of COVID-19 and possibly other infections as well

A The usual strategies to deal with viral infections involve designing anti-viral drugs and development of vaccines. In the current unprecedented crisis, the world is facing due to COVID-19 caused by SARS-CoV-2 virus, results from both the above approaches seem quite distant to deliver any hopeful results.

A team of international researchers recently (1) have adopted a novel approach (based on how viruses interacts with the hosts) for "re-purposing" existing drugs identifying new drugs under development, that could help fight COVID-19 infection effectively. In order to understand how SARS-CoV-2 interacts with humans, the researchers used a combination of biological and computational techniques to create a "map" of human proteins that the viral proteins interact with and uses to cause infection in humans. The researchers were able to identify more than 300 human proteins that interact with the 26 viral proteins used in the study (2). The next step was to identify which of the existing drugs as well as those under development that might be "repurposed" to treat COVID-19 infection by targeting those human proteins.

The research led to the identification of two classes of drugs that could effectively treat and reduce COVID-19 disease: protein translation inhibitors including zotatifin and ternatin-4/plitidepsin, and drugs that are responsible for protein modulation of Sigma1 and Sigma 2 receptors inside the cell including progesterone, PB28, PD-144418, hydroxychloroquine, the antipsychotic drugs haloperidol and cloperazine, siramesine, an antidepressant and anti-anxiety drug, and the antihistamines clemastine and cloperastine.

Of the protein translation inhibitors, the strongest antiviral effect in vitro against COVID-19 was seen with zotatifin, which is currently in clinical trials for cancer, and ternatin-4/plitidepsin, which has been FDA-approved for the treatment of multiple myeloma.

Among the drugs that modulate Sigma1 and Sigma2 receptors, the antipsychotic haloperidol, used to treat schizophrenia, exhibited antiviral activity against SARS-CoV-2. Two potent anti-histamines, clemastine and cloperastine, also displayed antiviral activity, as did PB28. The anti-viral effect shown by PB28 was approximately 20 times greater than hydroxychloroquine. Hydroxychloroquine, on the other hand, showed that, in addition to targeting the Sigma1 and -2 receptors, also binds to a protein known as hERG, known for regulating electrical activity in the heart. These results might help explain the possible risks associated with using hydroxychloroquine and its derivatives as a potential therapy for COVID-19.

Although the above-mentioned in vitro studies have produced promising results, the 'proof of the pudding' will depend on how these potential drug molecules fare in clinical trials and lead to an approved treatment for COVID-19 soon. The uniqueness of the study is that it extends our knowledge on our basic understanding of how the virus interacts with the host leading to identifying human proteins interacting with viral proteins and unveiling compounds that might have otherwise not been obvious to study in a viral setting.

This information revealed from this study has not only helped scientists to identify promising drug candidates quickly for pursuing clinical trials, but can be used to understand and anticipate the effect of the treatments already happening in the clinic and can also be extended for drug discovery against other viral and non-viral diseases.

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Securenergy Solutions AG to Provide Economic and Eco-Friendly Solar Power

The three companies SecurEnergy GmbH from Berlin, Photon Energy Solar GmbH, and IWE group from Denmark have combined their common skills and expertise to become Securenergy solutions AG

The three companies SecurEnergy GmbH from Berlin, Photon Energy Solar GmbH, and IWE group from Denmark have combined their common skills and expertise to become Securenergy solutions AG which will focus on ground-mounted photovoltaic systems within Germany.
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The tag line of the company is “Think Economically – Act Ecologically”. Since 2015, the company has successfully installed solar modules with a total output of over 60 megawatts on over 250 roofs.t

Securenergy AG plans to build large-scale photovoltaic systems to actively increase their contribution to environmental protection. The company's main focus is on ground-mounted and FIT (feed-in-tariff) – free solar power in Germany. Securenergy AG has managed to procure a pipeline of 800 megawatts, and in this new constellation have the chance to further expand their potential.

– from Editor's Desk

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Irish Research Council Takes Several Initiatives to Support Research

Irish government announces €5 million in funding to support 26 projects under the COVID-19 rapid response research and innovation program.

Irish government announces €5 million in funding to support 26 projects under the COVID-19 rapid response research and innovation program. This initiative is being coordinated by Rapid Response Research, Development and Innovation programme established by the Health Research Board (HRB), Irish Research Council (IRC), Science Foundation Ireland (SFI), IDA Ireland and Enterprise Ireland (EI).

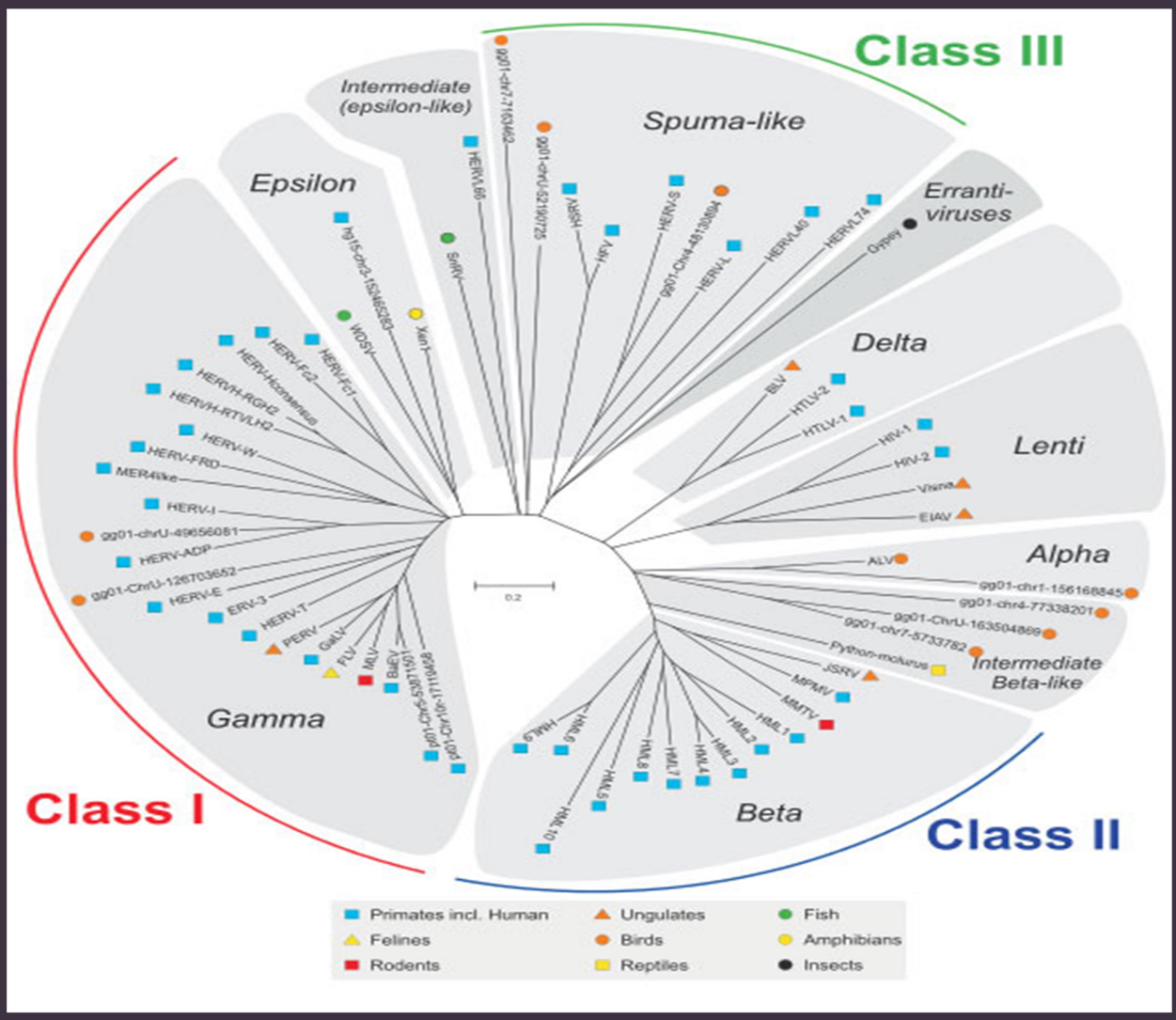
The 26 projects will address key areas such as front-line healthcare, diagnostics, infection control, contact tracing, mental health, potential treatments, and management of the mitigation measures related to social distancing and isolation to prevent the spread and treat the COVID-19 disease.

The Irish Research Council also launched its new strategic plan that lays out the Council's ambitious vision for the next five years starting from 2020 – 2024. This plan seeks to consolidate the unique role of the IRC in supporting all disciplines within the Irish research funding landscape by funding excellent research, support the education and skills development of excellent individual early-stage researchers, enrich the pool of knowledge and expertise available for addressing Ireland's current and future needs and provide policy advice on higher education and research matters. IRC through its strategic plan aims to maximise its contribution to national progress and ambitions over the coming years.

– from Editor's Desk

Humans and Viruses: A Brief History of Their Complex Relationship And Implications for COVID-19

Humans would not have existed without viruses because viral protein plays a key role in the development of human embryo. However, at times, they pose existential threats in the form of diseases as in the case of current COVID-19 pandemic. Ironically, viruses comprise ~8% of our genome, that has been acquired during the course of evolution, making us "virtually a chimera".



The most infamous and dreadful word of the year 2020 without doubt is 'virus'. The novel coronavirus is responsible for the current unprecedented COVID-19 disease and an almost near collapse of the world economy. All this is caused by a tiny particle which is not even considered as 'fully' living because it is in a non-functional state outside the host, while only perpetuating inside upon infecting the host. More surprising and shocking is the fact that the humans have been carrying the viral "genes" since times immemorial and currently viral genes constitutes ~8% of the human genome (1). Just to put this in perspective, only ~1% human genome is functionally active responsible for making proteins that determine who we are.

The story of relationship between humans and viruses started 20-100 million years ago when our ancestors got infected by viruses. Each endogenous retrovirus family is derived from a single infection of the germline cells by an exogenous retrovirus that after integrating into our ancestor, expanded and evolved (2). The propagation followed by the horizontal transfer from parents to offspring and today we have these viral genomes embedded in our DNA as human endogenous retroviruses (HERVs). This is a continuous process and may even be happening at the moment. Over the course of evolution,

these HERVs acquired mutations, became stabilised in the human genome and lost their ability to cause the disease. The endogenous retroviruses are not only present in humans but are omnipresent in all living organisms. All these endogenous retroviruses grouped into three classes (Class I, II and III) occurring across different animal species exhibit a phylogenetic relationship based on their sequence similarity (3) as depicted in Figure below. HERVs belong to the Class I group.

Of the various embedded retroviruses present in the human genome, a classic example worth mentioning here, is that of a retroviral protein that is highly fusogenic envelope protein called syncytin, (5) whose original function in the virus was to fuse with host cells to cause infection. This protein has now been adapted in humans to form placenta (fusion of cells to make multinucleated cells) that not only provides food to foetus from the mother during pregnancy but also protects the foetus from the mother's immune system due to the immunosuppressive nature of the syncytin protein. This particular HERV has proven to be beneficial to the human race by defining its very existence.

HERVs have also been implicated in providing innate immunity to the host by preventing further infection from related viruses or reducing the severity of the disease upon re-infection by similar type of viruses. A 2016 review by Katzourakis and Aswad (6) describes that endogenous viruses can act as regulatory elements for genes that control immune function, thereby leading to immunity development. In the same year, Chuong et al (7) demonstrated that certain HERVs act as regulatory enhancers by modulating the expression of IFN (interferon) inducible genes thereby providing innate immunity. HERV expression products can also act as pathogen-associated molecular patterns (PAMPs), triggering the cellular receptors responsible for host first line of defences (8-10).

Another interesting aspect of HERVs is that some of them show insertion polymorphisms, i.e. different number of copies are present in the genome due to insertional events. A study of 20 subjects belonging to different ethnic groups revealed insertion polymorphism patterns between 0-87% in all subjects (11). This can have implications in causing diseases by activation of certain genes that are otherwise silent.

Certain HERVs have also been shown to be associated with the development of autoimmune disorders such as multiple sclerosis (12). Under normal physiological conditions, HERV expression is tightly regulated while under pathological conditions due to changes in the external/internal environment, hormonal changes and/or microbial interaction can cause dysregulation of HERV expression, leading to disease.

The above characteristics of HERVs suggest that not only their presence in human genome is inevitable but they possess the ability to regulate the homeostasis of the immune system either by activating or suppressing it, thereby causing differential effects (from being beneficial to causing a disease) in hosts.

The COVID-19 pandemic is also caused by a retrovirus SARS-nCoV-2, that belongs to the influenza family, and it may be plausible that, during the course of evolution, genomes related to this family of viruses got integrated into the human genome and are now present as HERVs. It is surmised that these HERVs might exhibit different polymorphisms, as mentioned above, among people of different ethnicity. These polymorphisms may be in the form of differential copy number of these HERVs and/or presence or absence of mutations (changes in the genome sequence) accumulated over a period of time. This variability in the integrated HERVs may offer an explanation for the differential mortality rates and the severity of COVID-19 disease in different countries effected by the pandemic.

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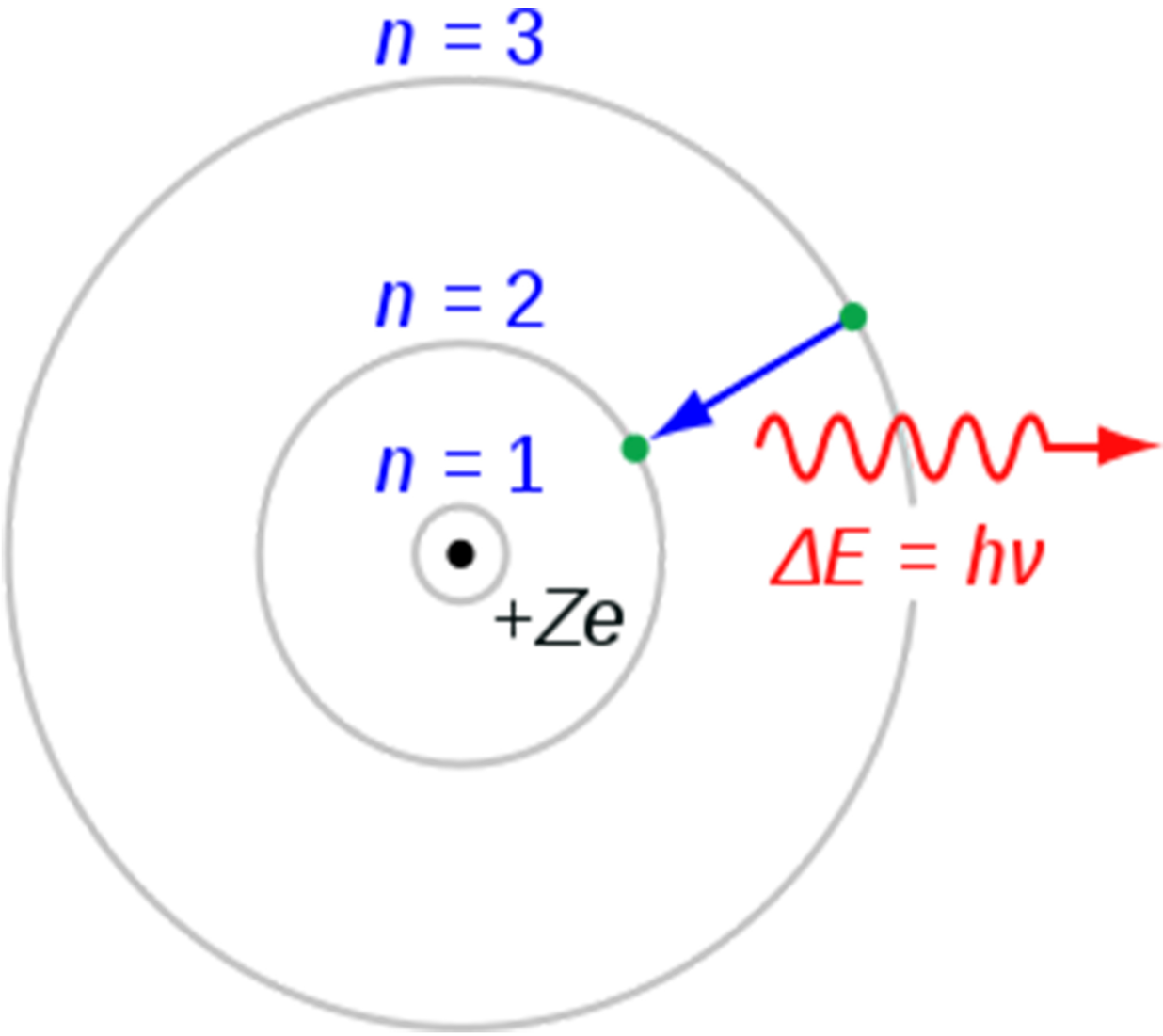
PENTATRAP Measures Changes in Mass of an Atom When it Absorbs and Releases Energy

The researchers at Max Planck Institute for Nuclear Physics have successfully measured infinitesimally small change in the mass of individual atoms following quantum jumps of electrons within by using the ultra-precise Pentatrap atomic balance at the Institute in Heidelberg.

In classical mechanics, the 'mass' is an important physical property of any object which does not change – the weight changes depending upon 'acceleration due to gravity' but the mass remains constant. This notion of constancy of mass is a basic premise in the Newtonian mechanics, however, not so in the quantum world.

The Einstein's theory of relativity gave the notion of mass-energy equivalence which basically implied that the mass of an object need not remain constant always; it can be converted to (an equivalent amount of) energy and vice versa. This inter-relationship or interchangeability of mass and energy into each other is one of central thinking in science and is given by the famous equation E=mc2 as a derivative of Einstein's special theory of relativity where E is energy, m is mass and c is the speed of light in vacuum.



This equation E=mc2 is in play universally everywhere but is observed significantly, for example, in atomic reactors where partial loss of mass during nuclear fission and nuclear fusion reactions gives rise to vast amount of energy.

In the sub-atomic world, when an electron jumps 'to' or 'from' one orbital to another, an amount of energy equivalent to 'energy level gap' between the two quantum levels is absorbed or released. Therefore, in line with the formula of mass-energy equivalence, the mass of an atom should increase when it absorbs energy and conversely, should decrease when it releases energy. But the change in the mass of an atom following quantum transitions of electrons within the atom, would be extremely small to measure; something that has not been possible so far. But not anymore!

The researchers at Max Planck Institute for Nuclear Physics have successfully measured this infinitesimally small change in the mass of individual atoms for the first time, possibly the highest point in precision physics.

To achieve this, the researchers at Max Planck Institute used the ultra-precise Pentatrap atomic balance at the Institute in Heidelberg. PENTATRAP stands for 'high-precision Penning trap mass spectrometer', a balance which can measure infinitesimally small changes in the mass of an atom following quantum jumps of electrons within.

PENTATRAP thus detects metastable electronic states within atoms.

The report describes observation of a metastable electronic state by measuring the mass difference between the ground and excited states in Rhenium.

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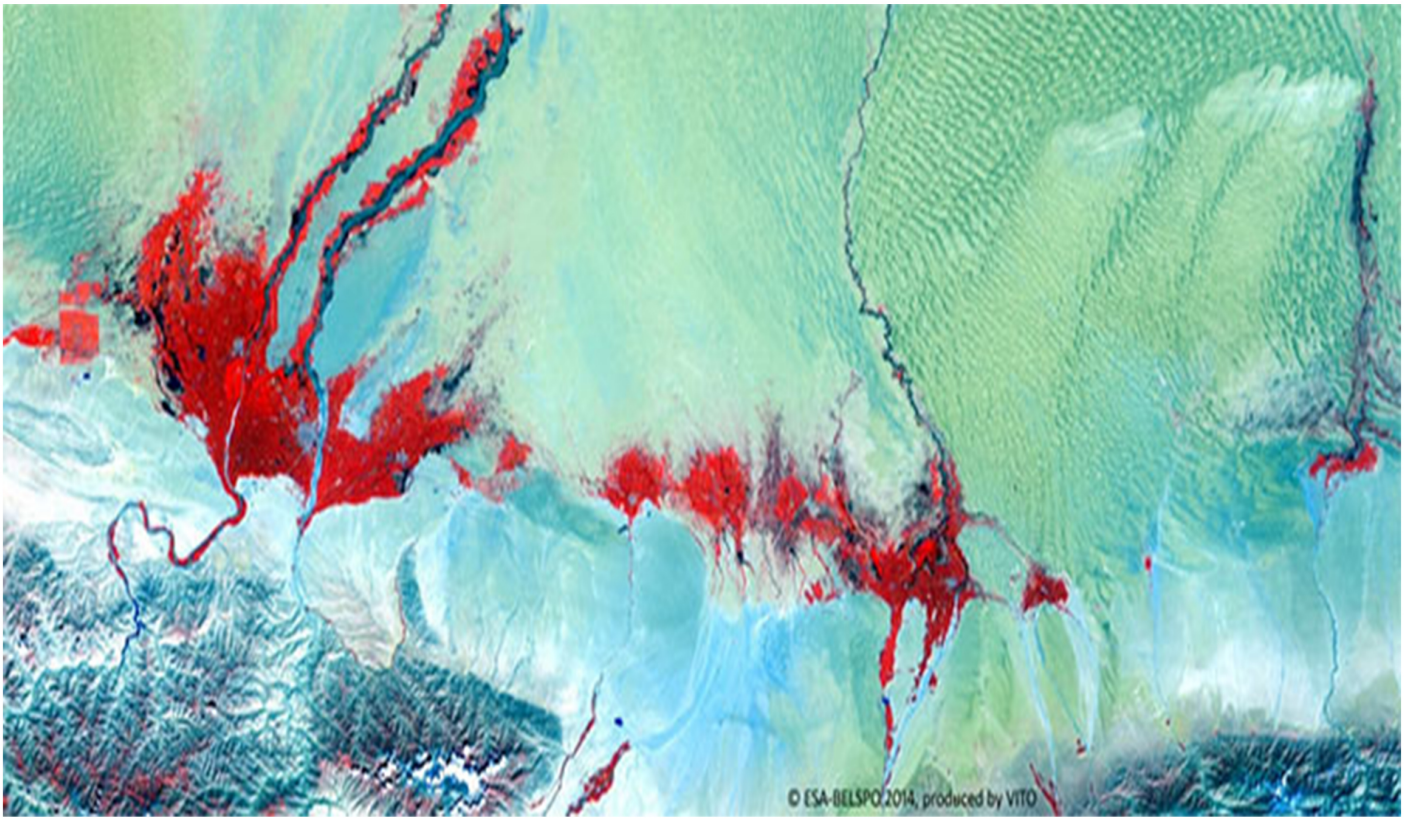
PROBA-V Completes 7 years in the Orbit Serving Humankind

The Belgian satellite PROBA-V, developed by European Space Agency has completed 7 years in orbit providing daily data on the state of vegetation at the global scale.

The Belgian satellite PROBA-V, developed by ESA on the initiative of Belgium has completed 7 years in orbit and has helped the scientific community with the provision of daily data on the state of vegetation at the global scale. The operating life of PROBA-V, was initially fixed at 2.5 years but has practically been tripled.

During the past 7 years, the satellite has enabled more than 4,000 users, from 120 countries around the planet and representing around 1,300 different organizations or companies, to download some 600,000 products corresponding to 1 petabyte (1015 bytes or 1 million gigabytes) of data. These data have been and will continue to be exploited for many applications in the future, such as climate change impact assessments, water resource management, deforestation, agricultural control or food security.



The supply of daily and decadal products by PROBA-V will indeed be ensured in almost real time until June 30. After this date, due to orbital drift, the mission will go into experimental mode and will provide, on a less regular basis, data mainly focusing on Europe and Africa.

– from Editor's Desk

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HEROES: A Charity Founded by NHS Workers to Help NHS Workers

Founded by NHS workers to help NHS workers, has raised funds to financially support workers during the national health crisis caused by the COVID-19 pandemic.

A UK charity HEROES has raised £ 1 million to financially support NHS to cover the costs of anything from childcare to transport during the national health crisis caused by the COVID-19 pandemic.

Founded by NHS workers to help NHS workers, HEROES managed to reach this milestone in four weeks and has collected and delivered 44,462 units of gifts (such as food, hand creams, drinks) and personal protective equipment (PPE) to the frontline across 46 hospitals in the UK.s.

Co-Founder and CEO of HEROES (Healthcare; Extraordinary; Response; Organisation; Education; Support), Dr Dominic Pimenta is thankful to all those who have contributed for the cause. HEROES co-founder and Director Dr Roshana Mehdian feels honoured and excited to work with Childcare.co.uk to help provide NHS staff with the childcare that they need in this difficult time.

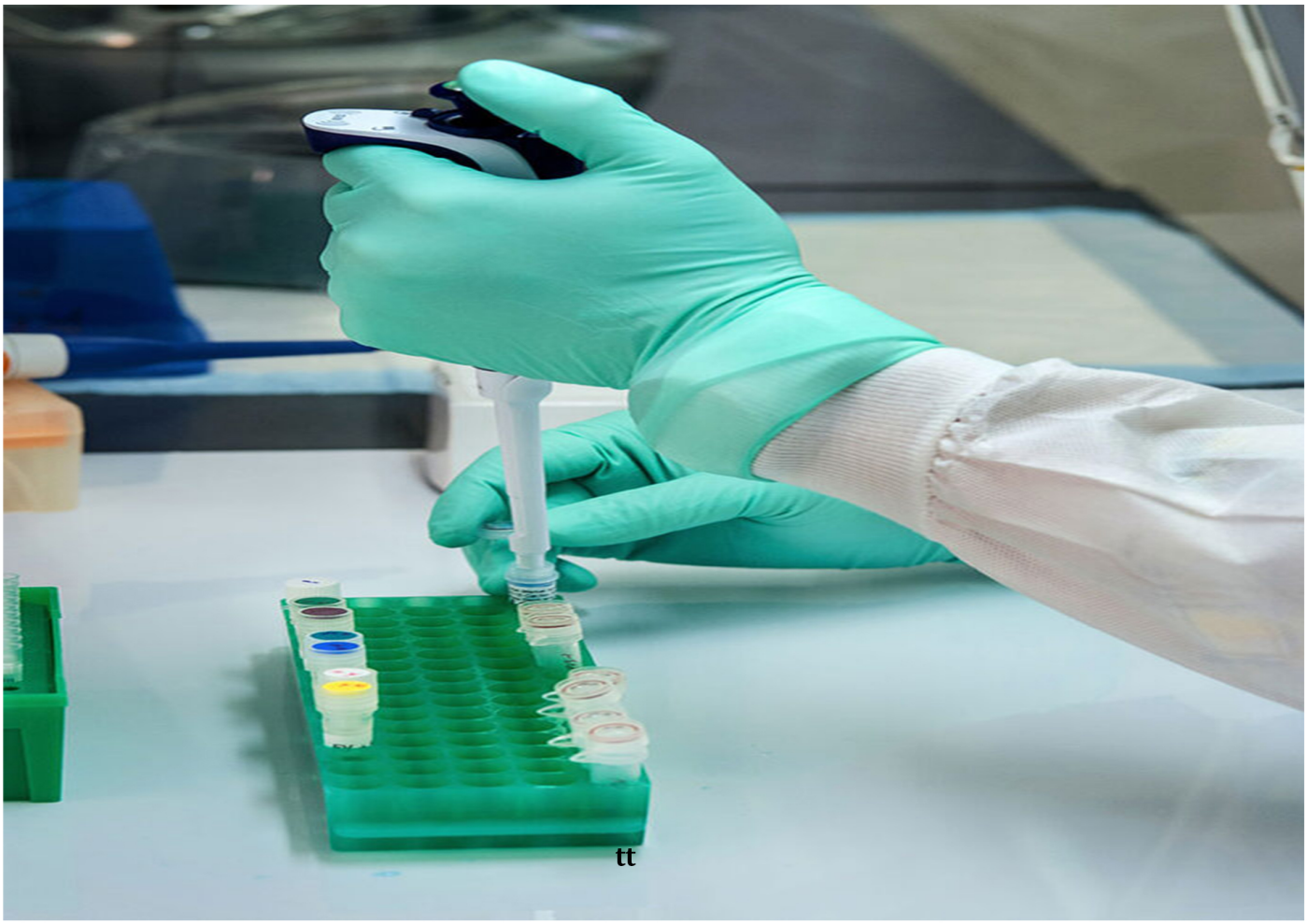
HEROES Ambassador and England Cricketer Sam Curran says that he is excited to be a part of the HEROES team as an ambassador to help raise awareness of the work being done to support the incredible NHS staff.

– from Editor's Desk

NLRP3 Inflammasome: A Novel Drug Target for Treating Severely Ill COVID-19 Patients

Several studies indicate that activation of NLRP3 inflammasome is responsible for acute respiratory distress syndrome and/or acute lung injury (ARDS/ALI) seen in severely ill COVID-19 patients which often result in death due to multiple organ failure. This suggests NLRP3 may be playing a very significant role in clinical course. Hence, there is an urgent need to put this hypothesis to test for exploring NLRP3 as a possible drug target to combat COVID-19.

COVID-19 disease has played havoc around the world affecting the millions of lives and disrupting the entire world economy. Researchers in several countries are working against time to find a cure to combat COVID-19 so that people can be cured quickly and normalcy can be returned. The main strategies being exploited currently include developing novel and repurposing existing drugs1,2 that are based upon, the drug targets identified by studying viral host interactions, targeting viral proteins to arrest viral multiplication and vaccine development. Understand the pathology of COVID



-19 disease in further detail by understanding its mechanism of action, can lead to identification of novel drug targets that can be used to develop new and repurpose existing drugs against these targets.

While majority (~80%) of COVID-19 disease patients develop mild fever, cough, experience muscle pain and recover in a span of 14-38 days, most severely ill patients and those who do not recover develop acute respiratory distress syndrome and/or acute lung injury (ARDS/ALI), leading to multiple organ failure resulting in death3. Cytokine storm has been implicated in the development of ARDS/ALI4. This cytokine storm is possibly triggered by the activation of NLRP3 inflammasome (a multimeric protein complex that initiates inflammatory responses upon activation by various stimuli5) by SARS-Cov -2 proteins6-9 which implicates NLRP3 as a major pathophysiological component in the development of ARDS/ALI10-14, that leads to respiratory failure in patients.

NLRP3 plays an important role in the innate immune system. In a normal physiological condition, NLRP3 exists in an inactive state bound by specific proteins in the cytoplasm. Upon activation by stimuli, it triggers inflammatory responses that ultimately causes death of infected cells which are cleared from the system, and NLRP3 returns to its inactive state. NLRP3 inflammasome also contributes to platelet activation, aggregation and thrombus formation in vitro15. However, in a pathophysiological condition such as COVID-19 infection, dysregulated activation of NLRP3 occurs causing a cytokine storm. The release of proinflammatory cytokines causes infitr

ation of alveoli in the lungs leading to fulminant pulmonary inflammation and subsequent respiratory failure but also may cause thrombosis by rupturing of plaques in vessels due to inflammation. Inflammation of heart muscle has been in a substantial portion of patients hospitalised with COVID-1916.

In addition, NLRP3 inflammasome has been shown, upon specific stimulation, to participate in male infertility pathogenesis via inflammatory cytokine induction in Sertoli cells17.

Therefore, in view of the above-mentioned roles, NLRP3 inflammasome appears to be playing a very significant role in clinical course of severely ill COVID-19 patients. Hence, there is an urgent need to put this hypothesis to test for exploring NLRP3 inflammasome as a drug target to combat COVID-19. This hypothesis is being put to test by Greek scientists who have planned a randomised clinical trial study called GRECCO-19 to investigate inhibitory effects of colchicine on NLRP3 inflammasome18.

In addition, studies on roles of NLRP3 inflammasome will also provide further insights about the pathology and progression of the COVID-19 disease. This will help clinicians better manage patients especially those with co-morbidities such as cardiovascular disease and elderly patients. In elderly patients, the age-related defects in T and B-cells causes increased expression of cytokines, leading to more prolonged proinflammatory responses, potentially leading to poor clinical outcome16.

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An Accurate Diagnostic Marker for "Ancient Beer" Research and Evidence of Malting in Neolithic Central Europe

A team involving the Austrian Academy of Sciences have presented a novel microstructural marker for malting in the archaeological record. In doing so, the researchers have also provided evidence of malting in later stone age central Europe. The development of this 'novel technique' and the 'evidences of malting in Neolithic central Europe' is a milestone in 'ancient beer' research.

Brewed alcoholic beverage have played significant role in social lives and have been part of dietary practices since stone age period when there was shift from 'hunting gathering' to 'cultivation of cereals'. However, the archaeological science had been unable to provide direct evidences of beer making and its consumption from the archaeological records. This gap is now addressed by the researchers.

The key stages in beer making are malting (involving the sprouting and subsequent drying or

roasting of cereals), mashing (heating the mixture of milled grain with water allowing saccharification or conversion of the starch in the grain to sugars by the enzymes in the malt), lautering (separation of the sugary liquid, wort from the grain), and fermenting (conversion of sugar to ethanol by the yeast).

During the malting stage (when the cereals convert to malt), the seed germs resort to saccharification of starch in endosperm and cellulose and hemicelluloses of cell walls to sugars as source of energy. As a result, there is noticeable thinning of cell walls in the endosperm and aleurone layer. All the malted grains show this characteristic (of significant thinning out of aleurone cell walls) even after milling or grinding of the malted grains as preparation for mashing. This thinning of aleurone walls can be used as a marker to detect malting. In this research, the investigators used this feature for detecting evidence of malting in charred archaeological remains.

The archaeologists in this study first created a simulation of archaeological preservation by artificially charring (incomplete combustion) modern malted barley in the laboratory. Microscopic examination of the simulated sample showed the above discussed marker of malting. The real archaeological samples obtained from the sites also showed similar signs (thinning out of aleurone cell walls).

The scanning electron microscope (SEM) examination of burnt black residues found in the ceramic brewing vats of ancient Egyptian breweries (4th millennium BCE) showed thinning out of aleurone walls as seen in the simulated laboratory sample.

The samples from Late Neolithic lakeshore settlements in Central Europe (roughly 4th millennium BCE) also showed the similar markers in the archaeological residues.

The evidences of the barley malt were found in the archaeological bread crust residues from two sites at the banks of Lake Constance – the settlements at Zürich Parkhaus Opéra, Switzerland and at Sipplingen-Osthafen and Hornstaad-Hörnle.

Barley mash in a cup shaped object found at the site of Hornstaad-Hörnle may indicate early beer production in Central Europe but fermentation could not be confirmed. Therefore, while there is definite evidence of malting, production of 'alcoholic beer' could not be ascertained.

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Harnessing Waste Heat to Power Small Devices

The scientists have developed a suitable material for use in thermo-electric generators based on 'anomalous Nernst effect (ANE)' that increases the voltage generating efficiency manifold. These devices can be comfortably worn in flexible shapes and sizes to power small gadgets, thus replacing batteries.

Thermo-electric effect entails inter-conversion of heat energy and electricity; called Seebeck effect, when heat is converted to an electrical potential at the junction of two dissimilar metals and, the reverse is called Peltier effect, i.e. the conversion of an electrical potential to generation of heat.

The heat is in abundance, and at times goes waste, which could be harvested to power electrical devices. There have been a lot of efforts in the past to develop commercially viable technology to harvest heat. The one based on Seebeck effect could not see the light of the day due to several limitations.

A lesser known phenomenon called Anomalous Nernst Effect (ANE), i.e. application of temperature gradient in a magnetic material generates electric voltage perpendicular to heat flow and has also been applied in the past for harvesting heat and its conversion to electricity. However, its potential has been limited for want of suitable non-toxic, readily available and inexpensive materials.

The search for this right material seems over now! The researchers have recently reported making an alloy that is non-toxic, easily available,

inexpensive and malleable enough to be made into thin films to suit the requirements. Using the process of doping, researchers made Fe3Al or FE3Ga (75% iron and 25% aluminium or gallium). When this material was used, the voltage generated was increased 20 times.

This newly developed material seems to be very promising and can be used to design thin and flexible materials capable of harvesting the waste heat efficiently to convert to electric voltage, adequate enough to power small devices.

The discovery of this material which is just right in terms of properties, could be possible because of availability of high-speed, automated numerical computational technologies, effectively overcoming the limitations of the erstwhile method of material development based on 'repetition' and 'refinements'.

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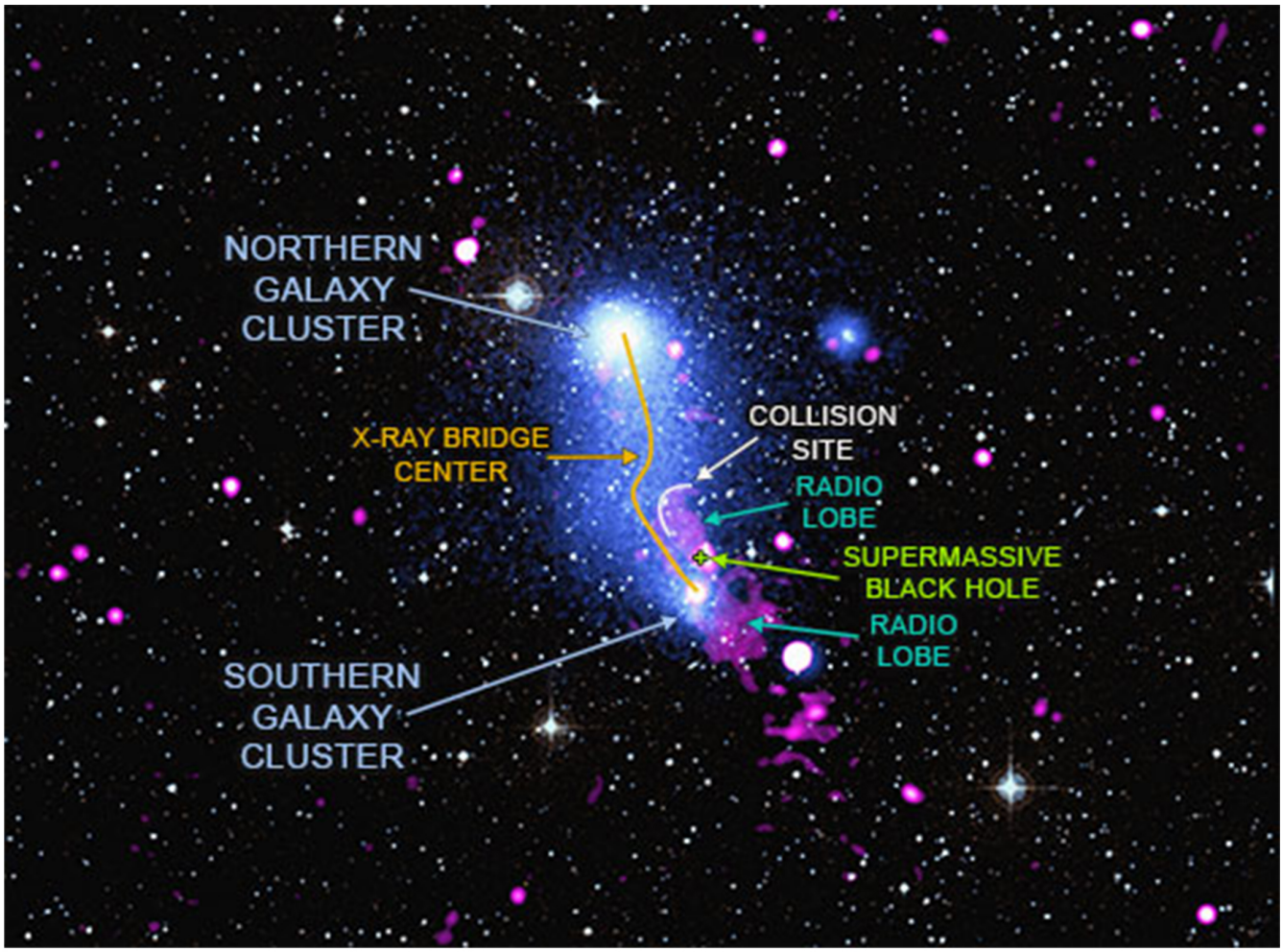
Abell 2384: The New Twist in the Story of Merger of Two 'Galaxy Clusters'

X-ray and radio observation of galaxy system Abell 2384 reveals collision of two galaxy clusters that travelled through each other forming a binodal system with a bridge of superhot gas between two cluster lobes and a bend in the bridge due to powerful jet of hot gas shooting away from a super heavy black-hole in the centre of a galaxy in the cluster.

To put the whole thing in a perspective, the earth along with other planets and their satellites are part of the 'stellar system' of a star called sun. Each star may have such a system comprising of bodies orbiting them. Large number of stars bound together by gravity form a celestial entity called galaxy. For example, our solar system is part of a galaxy called 'milky way' which alone has about 100 thousand million stars, each with their own stellar system. Hundreds of galaxies bound toget-her by gravitational field form what we call 'galaxy cluster'.

'Galaxy clusters' are the largest objects in the universe, each comprising of hundreds of galaxies together with vast amount of super-hot gas cloud and large amount of dark matter. The interspersed superhot (30 – 100 million degrees Celsius) gas cloud is invisible to optical telescope but emits x-rays observable by the x-ray telescope. The dark



matter does not emit, absorb or reflect any electro-magnetic radiation hence is not observable by any kind of telescope, but only by their gravitational interaction with the 'white' matter.

Several hundred million years ago, at a distance of about 1.2 billion light years away from us, two galaxy clusters collided and travelled through each other forming a merger-like system called Abell 2384 or A2384. Located in the constellation capricornus (one of the constellations of Zodiac and is known as 'goat horn'), Abell 2384 is about 17 million light years across in size with two unequal cluster lobes connected by a three million light-year long bridge of hot gas.

Astronomers obtained a detailed composite view of this galaxy clusters system, Abell 2384 using multi-wavelength data from three different type of sources mentioned below:

1. Blue: X-ray data from Chandra X-Ray Observatory (X-ray space telescope launched by NASA in 1999) and XMM-Newton (X-ray space observatory launched by the European Space Agency in 1999).

2. Magenta: Radio data from provided by Giant Metre-wave Radio Telescope (GMRT), India.

3. Yellow: Optical data from Digitized Sky Survey (DSS) by Space Telescope Science Institute.

The x-ray data obtained from the space observatories revealed high-density region extended between the two cluster heads corresponding to the unique hot gas bridge. Radio observation indicated x-ray-radio interaction at the cluster outskirts

indicative of a peculiar radio galaxy. The conclusion is that of a powerful jet shooting away from a supermassive black hole in the centre of a galaxy within the galaxy cluster leading to bend in the shape of the gas bridge.

This study is significant for the developing knowledge base about growth and course of merger of galaxy clusters in the universe. Simulation suggests that the north and south clusters in the system Abell 2384 will eventually merge together with each other.

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Bridging the Gap Between Science and The Common Man: A Scientist's Perspective

The hard work performed by the scientists lead to limited success, which is measured by peers and contemporaries by way of publications, patents and awards. As and when the success happens, it directly benefits the society in terms of novel discoveries and inventions that not only help people lead a better life but also brings adulation, admiration, recognition and respect for the scientists in the society. This can inspire young minds to take up science as a career provided that they become aware of the research performed by the scientist in a manner that is comprehensible to them. This is made possible through the dissemination of knowledge to the common man that resonates with them and necessitates the need for developing a suitable platform for scientists to share their work. Scientific European provides this by encouraging scientists to write about their work and connect them to society as a whole.

Scientists play a major role in the society by not only discovering and inventing new things for the benefit of mankind but can also shape the minds and careers of young students to train and be come budding researchers by inspiring them to adopt science as a career option. The life of a Scientist is a challenging one, leading to success after a failure of umpteen number of experiments.

However, as and when success happens, it provides a feeling of accomplishment and an unmatched sense of exhilaration. These successes lead to celebrations not only in terms of publication of their work in peer-reviewed journals, patenting the work, receiving awards and accolades, but also result in developing such as a device or a gadget (in terms of physical, material, engineering and chemical sciences), a drug (in terms of biological sciences) or a concept (in terms of social and environmental sciences) for the benefit of mankind. Publications in peer-reviewed journals, by far the only means of sharing the success of their hard work, is an expensive affair as each journal rightfully charges for the cost of publication which can run into at least a few hundreds of dollars for each publication. Even after toiling hard, succeeding and publishing in the relevant journals, it is extremely difficult for the content and knowledge described therein to reach the common man. This can be attributed to the inaccessibility of journals due to their cost, limited circulation and lack of awareness on where to find them, in addition to the scientific language and jargon that is used, making it incomprehensible for the general reader.

Scientific European has succeeded in this endeavour of transmission of scientific knowledge to the common man/general audience by providing analysis of news and review of current and upcoming inventions/discoveries that are published in peer-reviewed journals, for the benefit of science and making them understandable to the general reader. This has been accomplished by writing of articles/snippets about the novel discoveries and inventions, in a language that is understandable by the general audience, by the editorial team at the Scientific European.

In addition to the articles written by the team at Scientific European, the magazine also encourages subject matter experts (SME's) in the field of physical, chemical, biological, engineering, environmental and social sciences to contribute articles about their work and about interesting news about science that will be of interest to the general reader and written in a manner that a common man can comprehend, thereby benefitting dissemination of science. These SME's could be lecturers/senior lecturers and/or professors at the Universities, people holding key positions as principal investigators at Research Institutes and privately held companies as well as aspiring young Scientists that are developing their career in respective fields. The promulgation of science is

extremely important in order to inspire the young students to adopt it as a career option, and helping bridge the knowledge gap between the Scientist and the common man.

Keeping in view the cost of publication that is charged to the authors in case of peer-reviewed publications, the management at the Scientific European has decided to provide this opportunity to the scientific community free of cost to the either side. This will help provide SME's with a means of reaching out to general audience by sharing knowledge about their research and/or any current happenings in the field, and in doing so, gain recognition and adulation, when their work is understood and appreciated by the common man.

This appreciation and admiration coming from the society, is sometimes otherwise lacking from the peers and contemporaries, especially in the field of sciences in this competitive world. This can help boost the esteem of a scientist, who in turn, will encourage more youngsters to develop a career in science, leading to the benefit of mankind. Scientific European proudly presents a platform where the scientist can make himself/herself known by writing articles for the common man that are intellectually stimulating.

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Drug Trials for COVID-19 Begins in the UK and USA

Clinical Trials to evaluate effectiveness of anti-malarial drug, hydroxychloroquine (HCQ) and antibiotic, Azithromycin in treating older people with COVID-19 begins in the UK and USA with an aim to reducing the severity of symptoms and avoiding hospitalization

Of late, there have been several unconfirmed reports of effectiveness of commonly available drugs particularly anti-malarial drug, hydroxychloroquine in dealing with the symptoms of COVID-19. However, there are no evidence so far to support such repurposing of pre-existing drugs in any setting.

As part of UK government's COVID-19 rapid response and funded by UKRI (UK Research and Innovation) and the DHSC (Department of Health and Social Care) through NICE (National Institute for Health Research), The PRINCIPLE Trial has begun recruiting two groups of people – 'people aged 50–64 with a pre-existing illness', or 'aged 65 and over', into the trial.

The term 'PRINCIPLE' stands for Platform Randomised trial of Interventions against COVID-19 in older peoPLE.

The PRINCIPLE trial is testing pre-existing drugs for older patients in the community who show signs of the disease. Pre-screening of older coronavirus patients can be done online via an online questionnaire to see whether they can be included. The idea behind PRINCIPLE trial is to help elderly people with COVID-19 symptoms get better quickly and stop them needing to go to hospital, thereby reducing the burden on NHS.

In the United States, National Institute of Allergy and Infectious Diseases (NIAID), has started to

enrol adults with mild to moderate symptoms of SARS-CoV-2 infection in a 2000 patients Phase 2b clinical trial to begin evaluating the anti-malaria drug hydroxychloroquine, together with the antibiotic azithromycin, for preventing hospitalization and death from COVID-19.

The key idea behind these trials is to find out whether these two drugs can prevent hospitalization and death due to COVID-19 and whether this experimental treatment is safe and tolerable.

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Oceanic Internal Waves Influence Deep-Sea Biodiversity

Hidden, oceanic internal waves have been found to play a role in deep-sea biodiversity. In contrast to the surface waves, the internal waves are formed as a result of thermal contraction in layers of the water column and help bring in planktons to the bottom of seabed thereby supporting benthonic animals. The study in Whittard Canyon showed that local hydrodynamic pattern associated with internal waves was linked to increased biodiversity.

Organisms living in the aquatic environment are either plankton or nekton or benthos based on their location in the ecosystem. Planktons could be either plants (phytoplankton) or animals (zooplankton) and usually swim (not faster than the currents) or float around in the water column. Planktons could be microscopic or larger ones like floating weeds and jellyfish. Nektons such as fish, squids or mammals, on the other hand, swim freely faster than the currents. Benthos like corals cannot swim, and usually live on bottom or seafloor attached or freely moving. Animals like flatfish, octopus, sawfish, rays mostly live on the bottom but can also swim around hence called nektobenthos.

The marine animals, coral polyps are benthos living on floor of seabed. They are invertebrates belonging to the phylum Cnidaria. Attached to the surface, they secrete calcium carbonate to form a hard skeleton which eventually take the form of large structures called corals reefs. Tropical or surface water corals commonly live in shallow tropical waters where sunlight is available. They require presence of algae that grow inside of them providing them with oxygen and other things. Unlike them, deep-water corals (also known as cold-water corals) are found in deeper, darker parts of the oceans ranging from near the surface to the abyss, beyond 2,000 metres where water temperatures may be as cold as 4 °C. These do not require algae to survive.

Oceanic waves are of two types – surface waves (at the interface of water and air) and internal

waves (at the interface between two water layers of different density in the interior). The internal waves are seen when the water body consists of layers of different densities due to either differences in temperature or salinity. In the ocean ecosystem, the internal waves deliver food particle nutrients to surface waters that stimulate the growth of phytoplankton, and also contribute in transportation of food particles to deep sea animals.

Physical oceanography obviously has bearing on faunal patterns in deep sea biodiversity. In this study, the researchers integrated physical oceanography datasets with acoustic and biological datasets to do predictions, rather than using proxies for environmental variables, of distribution of deep-water corals and megafaunal diversity in Whittard Canyon, North-East Atlantic. The idea was to look for the environmental variables that best predict faunal patterns in canyons. They also wanted to know if incorporation of oceanographic data improved model's ability to predict faunal distributions. It was found that local hydrodynamic patterns associated with internal waves was linked to increased biodiversity. Furthermore, performance of the prediction model improved with the inclusion of oceanographic data.

This research enables better understanding of the faunal pattern formation in deep water ecosystem which will be helpful in better conservation efforts and ecosystem management.

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PHILIP: Laser-Powered Rover to Explore Super-Cold Lunar Craters for Water

Though data from orbiters have suggested presence of water ice, the exploration of lunar craters in the polar regions of moon has not been possible due to the absence of suitable technology to power lunar rovers in the perpetually dark, super cold areas having a temperature of –240°C. The project PHILIP ('Powering rovers by High Intensity Laser Induction on Planets') commissioned by European Space Agency is ready to develop prototypes that would provide laser power to these rovers in an effort to explore evidence of existence of water in these craters.

Moon does not rotate on its axis as it revolves around the earth hence the other side of the moon is never visible from the earth but both sides receive two weeks of sunlight followed by two weeks of night.

However, there are sunken areas in craters situated in the polar regions of moon that never receive sun-light because low angle of sunlight that leave the deep interiors of the craters in shadow forever. This perpetual darkness in the polar craters make them super cold in the range of –240°C corresponding roughly to about 30 Kelvin i.e. 30 degrees above absolute zero. The data received from the lunar orbiters of ESA, ISRO and NASA have shown that these permanently shadowed areas are rich in hydrogen, suggestive of presence of water (ice) in these craters. This information is of interest for science as well as a local source of 'water and oxygen' for future moon human habitation. Therefore, there is a need of a rover that could go down to such craters, drill and bring sample for testing to confirm presence of ice there. Given lunar rovers are usually solar powered, this has not been achieved so far because it has not been possible to ensure power supply to rovers while it explores some of these dark craters.

One consideration was to have nuclear powered rovers but this was found to be unsuitable for ice exploration.

Taking a cue from the reports of use of laser to power drones to keep them aloft for a longer duration, the project PHILIP ('Powering rovers by High Intensity Laser Induction on Planets') was commissioned by European Space Agency to design a complete laser-powered exploration mission.

The PHILIP project is completed now and the ESA is one step closer to powering lunar rovers with lasers to explore the super cold dark lunar craters near the poles.

ESA would now begin to develop prototypes for exploring the dark craters that would provide evidence for confirmation of the presence of water (ice) leading to realisation of human dream to inhabit this satellite.

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mRNA-1273: Moderna Inc.'s mRNA Vaccine Against Novel Coronavirus Shows Positive Results

A biotech firm, Moderna, Inc. has announced that 'mRNA-1273', their mRNA vaccine against novel coronavirus has shown positive results in the phase 1 clinical trials

In the race for the development of vaccines for the treatment of COVID-19, Moderna Inc., made an announcement on 18th May 2020 about positive results of their mRNA vaccine called mRNA-12731. The Phase I study revealed that the mRNA-1273 vaccine mRNA-1273 triggered an immune response resulting in neutralizing antibody levels in all eight initial participants across the 25 µg and 100 µg dose cohorts. The neutralizing antibody titers reached the same level as seen in patients who had recovered from the COVID-19 disease.

mRNA-1273 vaccine was generally safe and well tolerated. The safety profile was consistent with that observed in prior Moderna clinical studies performed with infectious disease vaccines.

Preclinical studies on mice vaccinated with mRNA-1273, after they had been challenged with SARS-CoV-2 virus showed that mRNA-1273 prevented viral replication and resulted in production of neutralizing antibodies with a titre similar to that produced in patients who took part in

Phase I study.

The encouraging results obtained from the Phase 1 study will help initiate the remaining trials soon, with Phase 3 expected to start in July 2020, pending finalization of clinical protocol and if all goes well, the vaccine will see the light of the day, ready to be administered to patients sooner than anticipated, since FDA has given Fast Track designation2 to the project.

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How the Mysterious 'Dark Matter' Regions of Human Genome Influence Our Health?

The Human Genome Project revealed that ~1-2% of our genome makes functional proteins while the role of the remaining 98-99% remains enigmatic. Researchers have tried to uncover the mysteries surrounding the same and this article throws light on our understanding of its role and implications for human health and diseases.

From the time the Human Genome Project (HGP) was completed in April 20031, it was thought that by knowing the entire sequence of human genome which consists of 3 billion base pairs or 'pair of letters', genome will be an open book using which researchers would be able to pin point exactly how a complex organism as a human being works which will eventually lead to finding our predispositions to various kinds of diseases, enhance our understanding of why disease occurs and finding cure for them as well. However, the situation became very perplexed when the scientists were only able to decipher only a part of it (only ~1-2%) which makes functional proteins that decide our phenotypic existence. The role of 1-2% of the DNA to make functional proteins follows the central dogma of molecular biology which states that DNA is first copied to make RNA, especially mRNA by a process called transcription followed by production of protein by mRNA by translation. In the language of the molecular biologist, this 1-2% of the human genome codes for functional proteins. The remaining 98-99% is referred to as 'junk DNA' or 'dark matter' which does not produce any of the functional proteins mentioned above and is carried as a 'baggage' every time a human being is born. In order to understand the role of the remaining

98-99% of the genome, ENCODE (ENCyclopedia Of DNA Elements) project2 was launched in September 2003 by the National Human Genome Research Institute (NHGRI).

The ENCODE project findings have revealed that majority of the dark matter'' comprises of non-coding DNA sequences that function as essential regulatory elements by turning genes on and off in different type of cells and at different points in time. The spatial and temporal actions of these regulatory sequences is still not completely clear, as some of these (regulatory elements) are located very far away from the gene they act upon while in other cases they may be close together.

The composition of some of the regions of human genome was known even before the launch of the Human Genome Project in that ~8% of the human genome is derived from viral genomes embedded in our DNA as human endogenous retroviruses (HERVs)3. These HERVs have been implicated in providing innate immunity to humans by acting as regulatory elements for genes that control immune function. The functional significance of the this 8% was corroborated by the findings of the ENCODE project which suggested that majority of the 'dark matter functions as regulatory elements.

In addition to the ENCODE project findings, a vast amount of research data is available from the past two decades suggesting a plausible regulatory and developmental role for the 'dark matter'. Using Genome-wide association studies (GWAS), it has been identified that majority of the noncoding regions of DNA are associated with common diseases and traits4 and variations in these regions function to regulate the onset and severity of large number of complex diseases such as cancers, heart disease, brain disorders, obesity, among many others5,6. The GWAS studies have also revealed that majority of these non-coding DNA sequences in the genome get transcribed (converted to RNA from DNA but not translated) into non-coding RNAs and perturbation of their regulation lead to differential disease causing effects7. This suggests the ability of non-coding RNAs to play a regulatory role in the development of the disease8.

Further, some of the dark matter remains as non-coding DNA and functions in a regulatory manner as enhancers. As the word suggests, these enhancers function by enhancing (increasing) the expression of certain proteins in the cell. This has been shown in a recent study where the enhancer effects of a non-coding region of DNA make patients susceptible to complex autoimmune and allergic diseases such as inflammatory bowel disease9,10, thereby leading to the identification of a new potential therapeutic target for the

treatment of inflammatory diseases. The enhancers in the 'dark matter' has also been implicated in brain development where the studies on mice have shown that the deletion of these regions lead to abnormalities in brain development11,12. These studies might help us to better understand the complex neurological diseases such as Alzheimer's and Parkinson's. 'Dark matter' has also been shown to play a role in the development of blood cancers13 such as chronic myelocytic leukemia (CML) and chronic lymphocytic leukemia (CLL).

Thus, 'dark matter' represents an important part of the human genome than previously realised and has directly influences human health by playing a regulatory role in the development and onset of human diseases as described above.

Does that mean that the entire 'dark matter' is either transcribed into non-coding RNAs or play an enhancer role as non-coding DNA by acting as regulatory elements associated with predisposition, onset and variations in the various diseases inflicting humans? The studies performed till now show a strong preponderance for the same and more research in the coming years will help us exactly delineate the function of the entire 'dark matter', that will lead to identification of novel targets in the hope of finding cure to the debilitating diseases that inflict the human race.

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The Oldest Evidence of Human Existence in Europe, Found in Bulgaria

Bulgaria has proven to be the oldest site in Europe for human existence by virtue of the present scientific evidence using high-precision carbon dating and analysis of proteins and DNA from the homimin remains excavated in the Bacho Kiro Cave, Bulgaria. Data analysis show that the remains are 47000 years old and belonged to Homo sapiens.

Is Bulgaria the oldest centre of human evolution in Europe? Yes, as far as the availability of scientific evidence for the presence of earliest known Homo sapiens in Europe is concerned. The confirmation of finding the oldest Homo sapiens bones in Europe has now been reported in scientific literature.

The excavation at the site of Bacho Kiro Cave, near Dryanovo monastery (a functioning monastery founded in 12th century) in the town of Dryanovo in central Bulgaria, has yielded the oldest human remains ever to be found in the Europe, dating back to 47,000 years.

About 47,000 years ago, a group of humans lived in the Bacho Kiro Cave. They lived on animals like bison, wild horses and cave bears. The cave has yielded lots of artefacts like ivory beads, pendants made with cave bear teeth, etc. and several hominin (belonging to the family hominids) remains including a molar tooth and several bone fragments.

Morphological analysis of the molar tooth suggested its human origin. The rest of the hominin remains could not be initially confirmed whether they were of human origin because all were too fragmented to be identified by appearance. The confirmation came from protein analysis (by study of amino acid sequences in the polypeptide chain in the protein extracted from the bone) using protein mass spectrometry. The researchers used accelerator mass spectrometer, the latest in carbon dating to an extensive dataset of excavated hominin and animal remains and produced a high-precision time-line of the site. The age of hominin remains was ascertained to 47,000 years. The analysis of the mitochondrial DNA extracted from the molar tooth and hominin bone fragments conclusively attribute the remains to modern humans.

These results provide evidence of the earliest human presence in Europe in the caves of central Bulgaria and establishes Bulgaria as the oldest central site of human existence in Europe.

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Scurvy Continues to Exist Among Children

Scurvy, a disease caused due to deficiency of vitamin C in diet is supposed to be non-existent, however there were several reports of cases of scurvy among children, especially among those with special needs due to developmental disorders. Dentists are in a unique position to facilitate diagnosis of such cases for treatment.

Scurvy, a disease caused by the deficiency of vitamin C in the diet, used to be common in the olden days, especially among the sailors or seafarers who had no access to fresh fruits and vegetables for several months and depended mostly on packaged preserved food for survival, while on long voyages on the high sea. But this is not the case now. The science behind this is well understood and the disease is assumed to be rare and non-existent, particularly in OECD countries.

However, here comes the rude surprise – scurvy continues to exist among children!

A research team lead by Prof Priyanshi Ritwik of University of Texas has presented two cases and after reviewing relevant case reports of scurvy among children published in the English language since 2009, found as many as 77 cases suggesting that scurvy continues to affect children particularly those with medical or developmental conditions and/or restricted diet.

The team noted manifestation of scurvy in the mouth (such as swollen and bleeding gum) of the children which subsided on initiation of vitamin C therapy.

The number reported in this study did not include cases reported in other languages. Overall prevalence of scurvy could be much higher if cases reported in other languages and unreported paediatric (and adult) cases anywhere in the world are factored in. Yet, this may not be a public health problem, however, this research draws attention of parents and carers of children with special needs due to developmental conditions and/or restricted diets as well as of clinicians with the duty of oral health care of such children.

There is a general perception that scurvy is uncommon which along with non-specificity of the symptoms, makes the diagnosis difficult, at times. A general physician may not attribute the non-specific symptoms to scurvy due to the perception that it is non-existent in developed countries. The dentists attending children however, may be in unique position to facilitate its diagnosis. The treatment is fairly easy anyway.

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