Giuseppe Benanti

Perhaps it is pleasant to move from serious themes to lighter ones. And what better show than deciding to admire the beauty of nature: it can cheer the soul, for example, what proposes the vision of an oceanic atoll!

MONDAY, MARCH 12, 2018

Possible new use of the Schrödinger equation

The *mechanical* **quantum** is the branch of physics that governs the sometimes strange behavior of the tiny particles that make up our universe. The equations describing the quantum world are generally confined to the subatomic realm - relevant mathematics at very small scales is not relevant to larger scales, and vice versa. A new discovery by a Caltech researcher suggests that the ' *equation* of **Schrödinger** - fundamental equation of quantum mechanics - is extraordinarily useful in describing the long-term evolution of certain astronomical structures.
The work was done by **Konstantin Batygin** ,

assistant professor of planetary sciences Caltech and Van Nuys Page Scholar.
Massive astronomical objects are often surrounded by groups of smaller objects that revolve around them, like the planets around the sun. For example, **supermassive black** *holes* are orbited by swarms of stars, which are themselves orbited by huge amounts of *rock* , *ice* and other space *debris* .

HTTPS://IT.PAPERBLOG.COM/

SUBSCRIBE TO GIUSEPPE BENANTI

Posts

All comments

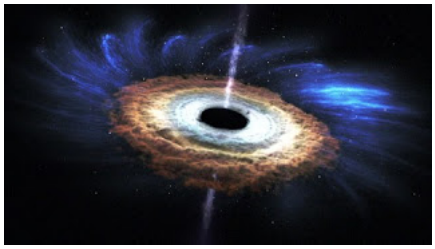
POST FEATURED

Possible new use of the Schrödinger equation

Quantum mechanics is the branch of physics that governs the sometimes strange behavior of the tiny particles that make up the ...

PERSONAL BLOG LIST

Giu47furb's Blog
Biodiversity in Antarctica - Antarctica is a natural laboratory for studying the



Accretion disk, quasar, black hole

Due to gravitational forces, these huge volumes of material turn into flat, round **discs** . These **disks** , consisting of innumerable individual particles orbiting in mass, can vary from the size of the solar system to many light years in diameter.
The *astrophysical* **discs** of material generally do not maintain simple circular forms throughout their life. Over millions of years, these **discs** have evolved slowly to exhibit large-scale distortions, bending and warping like ripples on a pond. These warps emerge and propagate and have long baffled astronomers, and even computer simulations have offered a definitive answer, for a complex and prohibitive process to be able to model directly.
While teaching a Caltech course on planetary physics, **Batygin** (the theoretical physicist behind the proposed existence of the Ninth planet) carried out an approximation scheme called **perturbation theory** to formulate a simple mathematical representation of the evolution of the disk. This approximation is based on equations developed by 18th-century mathematicians by Joseph-Louis Lagrange and Pierre-Simon Laplace. Within these equations, the individual particles and pebbles on each particular orbital trajectory are mathematically stained together. In this way, a **disk** can be modeled as a series of concentric wires that slowly exchange the orbital angular momentum between them.
With an analogy, in our solar system we can imagine breaking each planet and scattering those pieces around the orbit that the planet takes around the Sun, so that the Sun is surrounded by a collection of massive rings that interact gravitazionalmente. The vibrations of these rings reflect the actual planetary orbital evolution that takes place over millions of years, making the approximation accurate enough.
The use of this approximation to model the evolution of the **disk** has had unexpected results.
"When we do it with all the material in a disk, - says **Batygin** - we can become more and more meticulous, representing the **disk** as a growing number of increasingly thinner **cables.In the** end, it is possible to approximate the number of threads in the disk to be infinite, which allows you to fade together mathematically in a *continuum* . When I did, surprisingly, the ' *equation* of **Schrödinger** has emerged in my calculations. "
L ' *equation* of **Schrödinger** is the foundation of quantum mechanics describes the behavior of counterintuitive atomic systems and subatomic scale. One of these non-intuitive behaviors is that **subatomic particles** actually behave more like waves than as discrete particles , a phenomenon called **wave-particle** duality . The work of **Batygin** suggests that large-scale warps in **disch** the *astrophysical* behave in a manner similar to the particles, and the propagation of the warps within the material of the disc can be described by the same mathematics used to describe the behavior of *asingle* **quantum** *particle* if it bounces back and forth between the inner and outer edges of the disk.
L ' *equation* of **Schrödinger** is well studied and the discovery that such an equation for excellence is able to describe the long-term evolution of **disks** *astrophysical* should be useful for scientists modeling these phenomena on a large scale. Furthermore, adds **Batygin** , it is intriguing that two seemingly unrelated branches of physics - those that represent the largest and smallest scale in nature - can be governed by similar mathematics.
"This discovery is surprising because the ' *equation* of **Schrödinger** , -says **Batygin** - is a formula that is unlikely when viewing distances of light years. The equations that are relevant to the subatomic physics are generally not relevant for the massive astronomical phenomena Therefore, I have been fascinated by finding a situation in which an equation that is typically used only for very small systems also works in the description of very large systems ".
"Basically, the ' *equation* of **Schrödinger** , - has yet claimed **Batygin** - governs the evolution of the wave disturbances. In a sense, the **waves** that represent the warps and the roughness of the **disks** astrophysicists are not too different from the waves on a vibrating string , which are not very different from the movement of a **quantum** *particle* in a box.In retrospect, it seems an obvious connection, but it is exciting to start discovering the mathematical backbone behind this reciprocity. "

Posted by Joseph Benanti at 17:20:00 No comments: Links to this post

G+

THURSDAY, MARCH 8, 2018

Probiotics help in irritable bowel and depression

small number of plant and animal species living in the community. Microbial life plays a role ...
1 week ago

ALLOSANFANE
Medical robot stimulates the growth of stunted organs - * Boston Children's Hospital * * Boston Children's Hospital researchers * report that a * implanted and programmable * medical robot * can lengthen graduation ...
1 week ago

The blogs of giuseppebenanti.over-blog.com
-

SYRACUSE

The magnificent Piazza Duomo

DISCLAIMER

DISCLAIMER

This blog is not a newspaper and is updated without any periodicity. Therefore it can not be considered an editorial product according to the law n. 62 of 7.03.2001.
The author, moreover, has no responsibility for the sites that can be accessed through links within the site, provided as a simple service to users of the network. The same for sites that provide links to the resources contained here. The fact that this blog provides these links does not imply a tacit approval of the contents of the sites themselves, whose quality, reliability and graphics declined every responsibility.
The author declares that he is not responsible for the comments included in the posts. Any comments from readers, damaging the image or good repute of third parties, are not attributable to the author, even if the comment is expressed anonymously or encrypted. The author of the blog reserves the right to remove without notice and at its sole discretion comments that are offensive, vulgar, blasphemous, useless, highly provocative or that have content of an advertising nature.
In addition, the author is in no way responsible for the content of the comments posted by users of the blog: the latter, therefore, assume full responsibility.

DETECTIONS AND STATISTICS

BLOG ARCHIVE

RHYTHM OF LIFE OR NON SENSE!

Why always strive to chase your life? Sometimes it would be interesting to just let yourself live! In this bailamme of life, characterized by a more or less media aspect, how many can effectively enjoy the beauty of life, managing to coexist or defeat the continuous stress that characterizes it?

At **McMaster University** found probiotics that help in the symptoms of depression, and help in gastrointestinal disorders.

Intestinal bacteria in situ

A recent study, at the **Health Research Institute Farncombe** Family **Digestive,** has found that many adults with irritable *bowel syndrome* (**IBS**) report improvements from the coexisting depression by taking a specific **probiotic** compared to adults with **IBS** who take only a *placebo* . It's a further test, **-said Premysl Bercik** , professor of medicine at **McMaster** and gastroenterologist for **Hamilton Health Sciences -** on how the ***microbiota*** in the intestines is in direct communication with the brain. "It is shown - he said - that the consumption of a ***specific probiotic*** is able to improve intestinal symptoms and psychological problems in **IBS,** in short, new ways not only for the treatment of patients with intestinal disorders functional, but also for patients with primary psychiatric illnesses ". **IBS** is the most common gastrointestinal disorder in the world, very common in Canada : the large intestine is affected and patients suffer from abdominal pain and altered intestinal habits, such as diarrhea and constipation. They are also often affected by chronic anxiety or depression. The study involved 44 adults with **IBS**and mild to moderate anxiety or depression. Followed for 10 weeks and half took a daily dose of **probiotic** *Bifidobacterium longum NCC3001* ,

while the others took only one *placebo* . At six weeks, **14** of the 22, or 64%, of the patients who took the **probiotic** showed a decrease in the scores that test the state of depression, compared with **7** of the 22 (or 32%) of the patients treated with *placebo* . " functional magnetic resonance imaging (**fMRI**) showed that improvement in depression scores, associated with changes in multiple brain areas involved in mood control. To identify the **probiotic** , it has been tested in preclinical models - said **Bercik** - and investigating the pathways through which signals from the intestine reach the brain. "" The results of this study, - said **Maria Pinto Sanchez** , researcher **McMaster** "They are very promising but must be confirmed in the future, with a larger test." The **probiotic** is a bacterium

which is able to have a beneficial and beneficial effect on health. In particular, **probiotics** perform a healthy beneficial action on **the intestinal bacterial flora** - today called **microbiota** - being able to restore its delicate balances. To be effective, however, these bacteria must be taken live and in this form must reach the intestine . The **microbiota** is different from individual to individual, already from birth: the **natural birth** allows to acquire part of the bacteria from the mother, while those born through **cesarean delivery** will develop a different bacterial flora. The ***breast milk*** transmits*bacteria* that colonize the intestine, but also the compounds that, arriving in the baby's intestine, facilitate the growth of bacteria with a more favorable effect. **A healthy intestine is populated by a large number of different bacterial strains** : a *rich*

What are the effective and regenerating breaks for real? A good book, some would say. But reading in the most cases, it becomes well analyzed, going down on the problems that have triggered the desire to write and "download" the author's problems!

intestinal flora protects from many disorders. In many situations of illness, however, a bacterial strain ends up "dominating" over the others, and the number of strains is reduced more or less greatly.

Often there is a confusion between two very similar terms that work differently. the **probiotic supplements are composed of physiological live bacteria** that do not harm health and are beneficial. The **prebiotics** rather not live microorganisms , however, they represent the **food for probiotics** . Fiber-rich foods are an example . The **bacteria** , in fact, feeding on the fibers, grow, reproduce and colonize the intestine . These are important for:

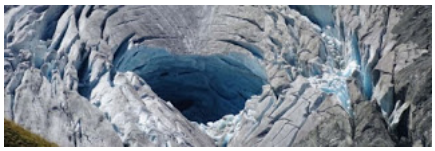
- *Stimulate the metabolism*
- *Increase the absorption of mineral salts*
- *Help the immune system*
- *Take advantage of vitamins*

Posted by Joseph Benanti at 14:43:00 No comments: Links to this post

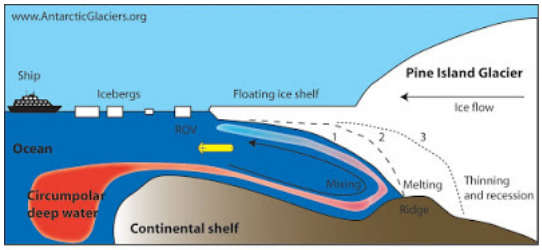
FRIDAY 2 MARCH 2018

Large slabs of Antarctic ice will be detached from Pine Island and Thwaites

Thousands of *deep engravings* on the Antarctic subsoil, caused by the *icebergs* that got rid of the glaciers more than ten thousand years ago, show how part of the ***Antarctic ice sheet*** quickly retreated at the end of the last ice age precariously balanced on the inclined terrain and became unstable.
Today, as the **global climate** continues to heat up, rapid and sustained withdrawal may be close to happening again and could trigger an uninterrupted withdrawal of ice into the interior of the continent, which could cause an increase in sea level even faster than that so far supposed.



Thwaites Glacier



1. Early 1970s. Pine Island Glacier is grounded at a bedrock ridge.
2. Warm, inflowing Circumpolar Deep Water melts the base of the glacier. The glacier steepens and accelerates.
3. Present day, observed by a remotely operated vehicle (ROV). Glacier is thinning and receding.

Pine Island evolutionary scheme of ice

The **researchers at the University of Cambridge** , the **British Antarctic Survey** and the ' **Stockholm University** have photographed the seabed of **Pine Island Bay** in West Antarctica. They discovered that when the seas warmed at the end of the last ice age, the **Pine Island** glacier retreated to a point - *the point where it enters the ocean and begins to float* - perched precariously at the end of a slope. The rupture of a floating ice shelf on the front of the glacier left very high cliffs at its edge. The height of these cliffs made them unstable, triggering the release of ***thousands of icebergs***in **Pine Island** Bay and causing the glacier to rapidly retreat to its ground line. The *ice of the island* of **Pine Island** ,

today it is about 50-60 meters above the water, (the ice cliffs at the end of the last ice age would have been about 100 meters above the water). Today, the warming waters caused by climate flow flow beneath the ice shelves floating in **Pine Island Bay** , and the ***Antarctic ice sheet*** is once again at risk of losing mass, from the rapidly retreating glaciers. Significantly, if ice retreat has been triggered, there are no relatively shallow points in the frozen bed, viewed along the **Pine Island course** and the **Thwaites** glaciers to avoid possible ice shelters in the West Antarctic interior. "Today the glaciers of **Pine Island** and **Thwaites** are in a very precarious position, and you can already see a major retreat, mainly caused

February (13)
January (10)
December (11)
November (20)
October (23)
September (7)

PAPERBLOG

PAPERBLOG

THE FAUNA AT CAPO PULMO - MARINE RESERVE -

Cabo Pulmo: una historia de é Mar)

from **Mares Mexicanos**

07:44

Cabo Pulmo: a historia de éxito (Voces del Mar series) from Mares Mexicanos on Vimeo .

"We would never have dreamed of such an extraordinary recovery of marine life in Cabo Pulmo," said National Geographic's researcher Enric Sala, "in 1999 there were only average fish, but after ten years is full of large parrotfish, groupers , snappers and even sharks. " Fish communities in an impoverished site can recover to a comparable level over time, to uncontaminated places never used for fishing by humans. "The results are surprising, - said Octavio Aburto-Oropeza, Scripps researcher - a 463 percent increase in biomass in a large reserve like Cabo Pulmo (71 Kmq) represents tons of new fish, produced every year".

by warm waters that melt under the ice shelves that come out of each glacier into the sea. *If you are removed these ice shelves, unstable ice thicknesses would cause the western Antarctic land ice sheet to retreat again in the future* . " Since there are no potential sources of stabilization now at the origin to prevent any shrinkage extending deeply into the Western Antarctic hinterland, this could cause an increase in sea level faster than previously expected. "The **Pine Island** glacier and the one near **Thwaites** are responsible for nearly a third of the total ice loss from the ***Antarctic Ice sheet*** , and this contribution has increased significantly over the past 25 years. In addition to basal melting, the two glaciers also lose ice by breaking or joining the *icebergs*

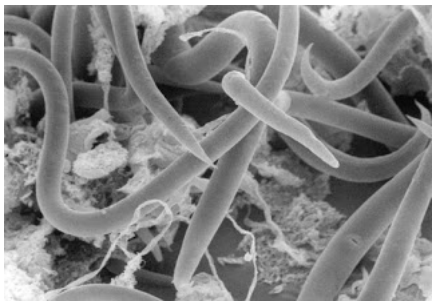
in **Pine Island Bay** Today, the *cebergs* that break from the glaciers of **Pine Island** and **Thwaites** are mostly large blocks at the table, and "these *big icebergs* are grinding along the bottom of the sea. On the contrary, during **the last ice age** ,*hundreds of* comparatively smaller *icebergs* broke free from the **Antarctic ice sheet** and moved to **Pine Island Bay** . These *small icebergs* with a v-shaped structure, like the keel of a ship, have left long and deep individual scars on the sea level . High-resolution imaging techniques, used to investigate the shape and distribution of scar on the seabed in **Pine Island Bay** , have allowed us to determine the relative size and direction of iceberg drift in the past. This analysis showed that these *small icebergs* were released due to a process called**instability of the marine glacier** (**MICI**). More than **12,000** years ago, the glaciers of **Pine Island** and **Thwaites** were based on a large sediment wedge and were supported by a floating ice shelf, making them relatively stable, even if they were below sea level. High-resolution imaging techniques were used to determine the size and direction of icebergs that broke from the **Pine Island** glacier between 11,000 and 12,000 years ago. In any case, the ice shelf floating in front of the glaciers "broke", and this led to their retreat on land inclined downward from the land lines to the inside of the ice sheet. This ***high cliff*** on exposed ice with an unstable height, led to a rapid withdrawal of glaciers from the instability of cliffs consisting of sea ice between 12,000 and 11,000 years ago. This happened in climatic conditions that are relatively similar to those of today. ***Robert Larter*** , of the **British Antarctic Survey**, states: "The collapse of the glaciers has been discussed as a theoretical process that could cause the withdrawal of Western Antarctic ice that could accelerate in the future.Our observations confirm that this process is real and that occurred about **12,000** *years ago* , with consequent rapid withdrawal of the ice sheet in **Pine Island Bay** . Today the two glaciers are getting closer to the point where they can become unstable and, once again cause a rapid ice picking.

Posted by Joseph Benanti at 17:32:00 No comments: Links to this post

G+

MONDAY 26 FEBRUARY 2018

In search of biodiversity in Antarctica



Panagrolaimus sp (Antarctic nematode)

L ' **Antarctica** is a natural laboratory for studying the small number of plant and animal species living in the community. The **microbial life** plays a vital role in the Antarctic ecosystem. Cutting-edge genetic methods for studying the DNA of these microbes can lead to discoveries that would help in the production of new antibiotics and other compounds . In **Antarctica** are some of the most amazing creatures on the planet. It is also a powerful natural laboratory for studying **biodiversity** , **evolution** and the **impacts of climate change**. Discouraged from the rest of the planet, the isolation of Antarctica and its cold climate have allowed the evolution of some unique species. Covered with ice and snow, **Antarctica** is the darkest, coldest but at the same time the most alive of the Earth. Little of its surface can sustain life, so that the communities of plants and animals that survive are just a small number of species that live in simple relationships. Because of the simplicity of these communities, **Antarctica** is an exceptionally useful place to discover how ecosystems work. Some of the creatures in these communities are particularly interesting. Known as **nematodes**, their ancestors survived in small areas of land that were discovered during the last ice ages, more than a **million** years ago. By studying **nematodes** , scientists from the **British Antarctic Survey** (**BAS**) can increase their understanding of evolution and help rebuild the glacial history of **Antarctica** . Unlike the land, the seas around the **Antarctica** host a rich and diverse group of evolved species, according to some unique ways of dealing with the cold. Some ***Antarctic fish*** , for example, are the only vertebrates in the world that do not use red blood cells to carry oxygen into their bodies. To be so adapted to the cold, some of these species may not be able to face life in a warmer world. Climate change could have a major impact on Antarctic species. From research stations on and around *the* **Antarctic** *Peninsula* , the **BAS** study how these species are responding to climate change. We know a lot about the plants and animals of the continent and very little of the *microbial life* of the **Antarctica** . These organisms play a vital role in Antarctic ecosystems and can help produce new antibiotics and other compounds, they are rich but at present they are only an unused resource. At the **BAS**, we are using cutting-edge genetic methods to study the **DNA** of these microbes and, hopefully, to be able to exploit their potential as soon as possible. The **nematode worms** are one of the most important soil groups in **Antarctica** but little is known about their wider distribution, biogeography and history in the region, and the taxonomic information remains confused or incomplete. The fauna of **Alexander Island** (*Southern Maritime Antarctica*) includes elements that have survived the glacial period of the **Pleistocene** in situ, forming a regional center of endemism and also a biodiversity hotspot. The *nematological investigations*they were made on a certain latitudinal gradient along the southern Antarctic Peninsula, comparing the data obtained with the Antarctic marine fauna described in the few previous studies, between the northern **Marguerite bay** and the **southern Orkney** islands . The research is supported by previous discoveries of a lack of species-level overlap between the maritime and continental ocean biogeographic areas, with the vast majority of specimens obtained from all survey sites attributable to known maritime or new and currently endemic marine species. , the collections of **Alexander Island** , **Alamode Island** and the westernmost championship site, of **Charcot Island**, include specimens morphologically very close to two continental species of Antarctica, and could indicate a link between the two regions. The fauna obtained in the northern study sites (**Adelaide Island, Marguerite Bay**) closely corresponds to the one described above. In contrast to the widely described patterns of decreasing diversity in other *Antarctic biota* , species richness has increased markedly in locations on **Alexander Island** , including a substantial element of undescribed species (50% taxa in all locations, 40% taxa) found on **Alexander Island**). Finally, the most southern samples obtained, from the *nunatak* of the hinterland of**Ellsworth Land** , indicate a fauna that does not include nematodes, an exceptional fact not only in an Antarctic context but also for soils all over the world.

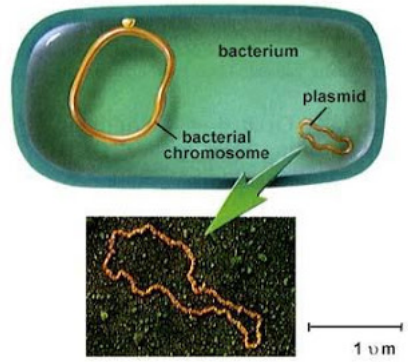
A plasmid infects the microbes of the same species and replicates in the new guests

Scientists at the University of New South Wales (**UNWS**) studying **microbes** in some of the **saltiest** lakes in the **Antarctica** have discovered a new way used by these small organisms to share **DNA** that could have helped them grow and survive.

With the study based on 18 months of sampling water in remote Antarctic locations, even during the very cold Antarctic winter, we could shed new light on the evolutionary history of viruses .

The *team* of ' **UNSW** has unexpectedly discovered a strain of microorganisms lovers of the Antarctic salt containing **plasmids** : small molecules of **DNA** that can replicate independently in a host cell and which often contain useful genes in an organism .

"While viruses have a protective structure of a protein nature called a **capsid** , **plasmids**

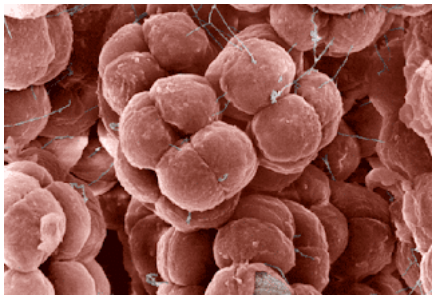


are pieces of 'naked' ***DNA*** , and generally they move from cell to cell by contact, or at least that's what was believed to date. The ***plasmid i*** found in Antarctic microbes, called ***pR1SE*** , protect themselves like viruses through a vesicle, consisting of the same proteins found in the host membrane. Once released by the **Archea** , the vesicle allows the plasmid to infect microbes of the same species, in which no other plasmids are already present and, therefore, to replicate themselves in the new guests ".

"Susanne Erdmann, stresses, that this is the first time this mechanism has been documented. It could be an evolutionary precursor of some of the more structured protective envelopes that viruses have developed to help them spread and become successful invaders. The finding suggests that some viruses may have evolved from the plasmids »

Deep Lake

The *antarctic microbes* studied by the researchers are called **haloarchaea,** known to be promiscuous, since they quickly exchange the **DNA** between them. They can survive in the **Deep Lake,** a 36-meter deep lake, so salty it remains in the liquid state up to minus 20 degrees of temperature. The lake is located about 5 kilometers from the Australian Antarctic Davis station, and was formed about 3500 years ago.



Archaea

Haloarchaea microbes containing plasmids had already been isolated from very rare samples of water collected at the **Rauer** Islands, about 35 km from **Deep Lake** .

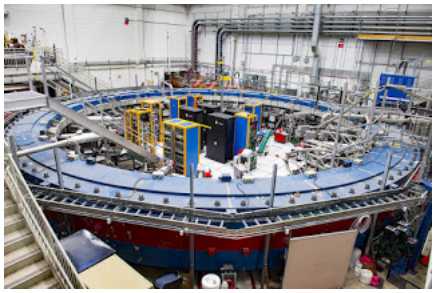
"It was also discovered that the **plasmids** could take some **DNA** from the host microbe, integrate it into their **DNA** , produce membrane vesicles around themselves and then send them to infect other cells. The results are therefore relevant for Antarctic science and for biology as a whole ".

Posted by Joseph Benanti at 22:43:00 No comments: Links to this post

G+

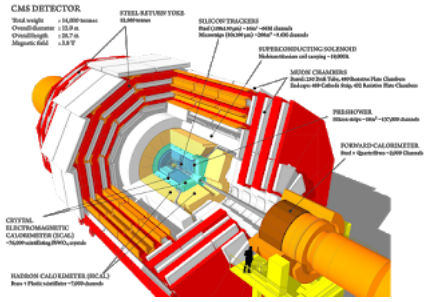
FRIDAY 23 FEBRUARY 2018

The universal muon detector



The ring of the great solenoid

The 27-kilometer **Large Hadron Collider (LHC**) is the largest and most powerful particle accelerator ever built. Accelerate the **protons** almost at the speed of light, clockwise and counterclockwise, and then collide them at four points around its ring. At these points, the energy of particle collisions is transformed into mass spraying particles in all directions.
The *detector of compact solenoid* for **muons** (or **CMS)** is located in one of four collision points. It is a **universal detector** designed to observe any new physical phenomenon that the LHC could reveal. **CMS** acts like a giant high-speed camera, taking 3D "photos" of particle collisions from all directions up to 40 million times per second.
Although most of the particles produced in the collisions are " **unstable** ", they quickly transform into **stable particles** that can be detected by the **CMS** . By identifying (almost) all the **stable particles** produced in each collision, measuring their amount of energy, and then putting the information of all these particles together that is like putting together the pieces of a puzzle, the detector can recreate an "image" of the collision for further analysis.



THE **CMS**

Operation of the CMS
The detector from 14,000 tons to 15 meters in height and 21 meters in length, is really quite compact for all the material it contains. Designed to detect particles known as **muons** very accurately, it has the most powerful solenoid magnet ever created. The **CMS** detector has the shape of a cylindrical onion, with several concentric layers of components. These components help to prepare "photographs" of each collision event by determining the properties of the particles produced in that particular collision. It is made from: **bending particles,** generated by this powerful magnet.
In fact, a powerful magnet needs to bend the charged particles as they fly outward from the point of collision. Folding the trajectories of the particles, helps to identify the charge of the particle and also that the positively and negatively charged particles bend in opposite directions in the same magnetic field.
It allows us to measure the momentum of the particle: in an identical magnetic field, the particles at high moment bend less than those with a low number of pulses.

THE **CMS** *tracker*

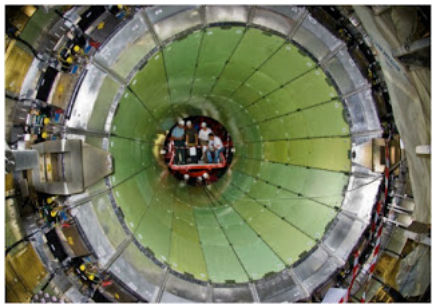
The solenoid magnet gives its last name to **CMS** , and is formed by a cylindrical bobbin of superconducting fibers. When electricity (18,500 amps!) Is circulated in these coils, it does not encounter resistance: the magic of superconductivity - and it can generate a magnetic field of about 4 tesla, which is about 100,000 times the strength of the Earth's

magnetic field. The high magnetic field must be limited to the detector's volume and is made from the steel "yoke" which makes up the bulk of the detector's mass. The magnetic coils and its return yoke weigh to 12,500 tons, by far the heaviest component of the **CMS** . The **solenoid** It is the largest magnet of its kind ever built and allows to place the tracker and calorimeters inside the coil, obtaining a "compact" overall detector compared to similar weight detectors.

Trace identification

The curvature particles are not sufficient: the **CMS** must identify very precisely the paths of these folded charged particles. The bending is done by a silicon ***tracker*** consisting of about 75 million individual electronic sensors arranged in concentric layers. When a charged particle flies through the tracker layer, it electromagnetically interacts with the silicon and produces a shot - these single shots can then be combined to identify the trace of the particle it traverses.

The energy measurement



The **ECAL** *calorimeter*

The information on the energies of the various particles produced in each collision is crucial to understand what occurred at the point of collision. This information is collected by two types of "calorimeters" in the **CMS** . The electromagnetic calorimeter **(ECAL**) is the inner layer of the two and measures the energy of *electrons* and *photons by* stopping them completely. The *hadrons* , composite particles composed of **quarks** and **gluons,** fly through the **ECAL** and are stopped by the outer layer called Hadron Calorimeter (**HCAL**).

Detection of muons

The final particle **CMS** observes directly is the **muon** . The **muons** belong to the same family of electron particles, although they are about 200 times more heavy . They are not stopped by the calorimeters, so special sub-detectors must be built to detect them as they pass through the **CMS** . These sub-detectors are intercalated with the solenoid return yoke. The **large magnet** of the **CMS** also allows us to measure the time of each **muon** both within the superconducting coil (by tracking devices) and externally (from the muon) rooms.

High brightness LHC

The **High-Luminosity Large Hadron Collider** (***HL-LHC***) project aims to enhance the performance of the **LHC** in order to increase the potential for discoveries after 2025. The goal is to increase the brightness by a factor of 10 beyond the design value of the ' **LHC** . Brightness is an important indicator of the performance of an accelerator: it is proportional to the number of collisions that occur in a given period of time. The greater the brightness, the more data that experiments can collect to allow them to observe rare processes. The high brightness **LHC** , which should be operational by 2025, will allow precise studies of the new particles observed at the **LHC** , such as the **Higgs boson** . It will allow the observation of rare processes inaccessible to the current sensitivity level of the **LHC** . For example, high-brightness **LHC** will produce up to 15 million ***Higgs bosons*** per year, compared to 1.2 million produced in 2011 and 2012.

The high brightness **LHC** project was announced as the top priority of the "European strategy" for particle physics in 2013 and its funding is ratified by CERN.

This development depends on different technological innovations. The first phase of the project started in 2011 with the "HiLumi LHC" design studio. The first phase brought together many laboratories from CERN member states, as well as from Russia, Japan and the United States. The institutes in the United States took part in the project thanks to the support of LARP (LHC Accelerator Research Program). The design study ended on October 31, 2015 with the publication of a technical design report, which marks the beginning of the construction phase of the project at CERN and in the industry. CERN will allocate CHF 950 million of its budget for a period of 10 years to the development of the high brightness LHC.

The **CERN openlab** has already held its annual technical workshop with the participation of representatives of **CERN openlab** , companies and organizations collaborating in the chamber of CERN Council, highlighting the progress made by the CERN openlab projects active in the last year .

2018 marks the beginning of the sixth phase of **CERN openlab** , and part of the workshop was dedicated to discussing future ICT challenges. These were grouped into

three topics: *data center technologies and infrastructures* , *computing and software performance* and *machine learning* , *data analysis* . The ITC challenges identified in these topics are the basis for progress in various fields of scientific research and will help shape the future work of **CERN openlab** .
"Our annual technical workshop is a great opportunity, - said **Maria Girone, CERN openlab CTO** - for all people working on CERN openlab projects - including our industry collaborators - with representatives of the LHC experiments. year of exciting collaboration, working to conduct joint research and development activities and addressing the cutting edge ICT challenges posed by the ambitious LHC update program. "

Posted by Joseph Benanti at 16:23:00 No comments: Links to this post

Home page Older posts

Subscribe to: Post (Atom)