EPMagazine

History of Science and Technology

Technology for Green Energy

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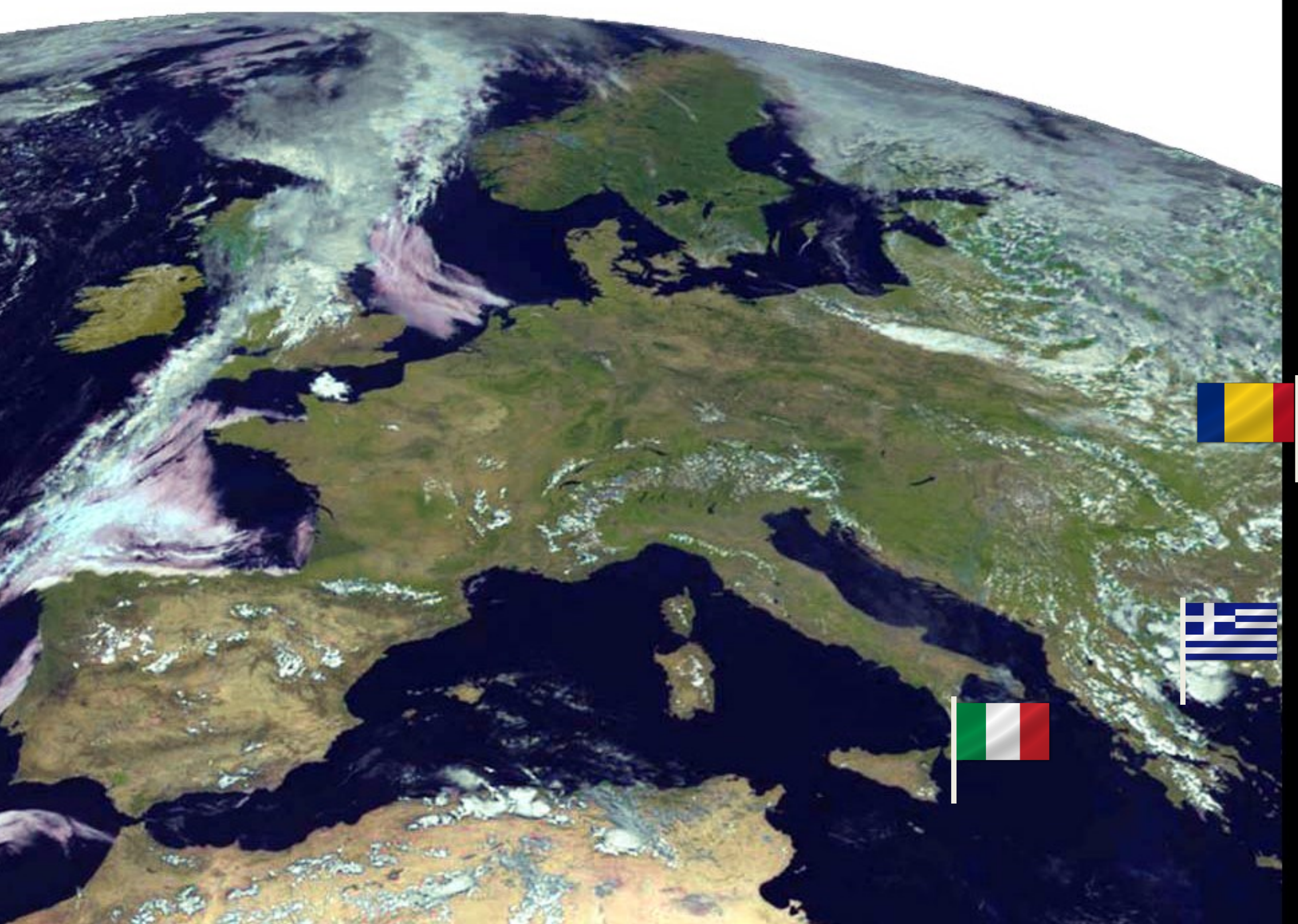
Transilvania University
Brasov, Romania

Experimental High School
Thessaloniki, Greece

E. BOGGIO LERA
LICEO SCIENTIFICO STATALE

E. Boggio Lera
Catania, Italy



EPMagazine

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Laura Patanè

I.s.s. E. Boggio Lera, Catania, Italy

laura.patane18@gmail.com

Nino Porto (It)

È con grande dolore che dedichiamo questo editoriale alla memoria del nostro caro amico e collaboratore Antonino Porto. Morto il 28 Febbraio e che sin da allora resta nei nostri cuori.

Dall'inizio del nostro percorso all'interno di EPM lui ci ha supportato, dato idee e lavorato alla rivista con tanta passione; infatti a lui dobbiamo il primo sito Mirror di EPM e l'interessante articolo sui motori di ricerca. Tutti coloro che hanno conosciuto Porto nel convegno a Catania del 2007 lo ricordano per la sua appassionata partecipazione.

Antonino Porto

La notizia della morte di un uomo come Antonino Porto che è stato uno dei pilastri più importanti di EPM, che ha lavorato arduamente per renderlo ciò che è oggi, che ha insegnato a tantissimi studenti come portare avanti questa grande opera, come lottare per avere ciò che si desidera, ma soprattutto, la scomparsa di un uomo di buon cuore come lui ha sconvolto tutta la comunità di EPM, riposi in pace.

Inoltre vorremmo aggiungere dei messaggi che sono stati mandati da alcuni nostri amici da tutta l'Europa.

Sono molto triste di sentirlo. Il Corano dice che Allah è sempre con i migliori …

Senol, Kastamonu, Turchia

Siamo attoniti per la repentina scomparsa del nostro amico e compagno di EPM, Nino.

Noi non dimenticheremo mai la sua

Nino Porto (En)

It is with great grief that we dedicate this editorial to the memory of our dear friend and precious contributor Antonino Porto. He passed away on 28 February and we have missed him ever since.

From the very start of the magazine he had been a keen supporter of the idea and worked on it and for it with great passion; in fact his was the first Mirror site of EPm and an interesting article on the Research machines. Those who met him at Catania Meeting in 2007 will remember his silent, passionate participation.

The news about Porto's dead who was a pillar of EPM, who worked so hard to build what it is now, who taught some students to fight to reach what they want, but overall the loss of a men with a good heart like him, shocked all EPM group which is close to Porto's family in this sad moment and wishes he rest in peace

We received many communications from:

Kastamonu, Turkey
Kaiseri, Turkey
Bucharest, Romania
Thessaloniki, Greek
Landgraaf, Netherlands
Catania, Italy
Cadice, Spain
Le Mans, France

We also wish to include some of the messages we received from our friends all over Europe, we know that you also will miss him.

gentilezza e amicizia durante il nostro soggiorno a Catania. Riposi in pace.

Gruppo EPM di Salonicco, Grecia

Se ne va una persona speciale, un gran signore, una compagnia deliziosa, colta e ironica.

Elena Calcagno, BoggioLera, Catania, Italia

Sono veramente dispiaciuto; il suo lavoro mi ha aiutato a crescere. Spero che il lavoro di EPM possa continuare e coinvolgere sempre più i ragazzi, mi ha aiutato tantissimo.

Manuele Gangi, Università di Catania Italia

Il prof. Porto: una brava persona, reazionaria ma giusta, un uomo che non aveva paura a mostrarsi come era e non ipocrita, e invecchiando apprezzo sempre di più questa dote, quasi scomparsa.

Maria Teresa Ciancio, Catania Italia

il prof. porto è stato davvero un maestro e la cosa fondamentale che mi ha insegnato è permettere che gli altri mi insegnino le cose della vita, e quindi ad aver fiducia nel prossimo e tutto questo solo col suo comportamento, il suo modo di essere e di fare.

Daniela Trippa, Università Catania

Addio Nino, resterai sempre nei nostri cuori!

Bye Nino, you will always be in our hearts!

So sad to hear that. the Quran says that Allah is always with the good ones...

Senol, Kastamonu, Turkey

We are shocked for the sudden death of our friend and partner in EPM, Nino.

We will never forget his kindness and friendship during our visit in Catania.

May God rest his soul in peace.

EPM Editorial Group, Thessaloniki Greece

An educated person, a funny one, a good company; a special person has gone.

Elena, Catania, Italy

I'm really sorry, I did not know him but his work helps me really much. EPM continues to work, it helps me really much.

Manuele, University of Catania, Italy

I'm really sorry for Porto's dead, a good man, without fear to show him how he really was, I love this skill, almost disappeared nowadays

Maria Teresa, Catania Italy

I can say that Porto was a life teacher and he taught me to let the other people teach me something, now I trust other people and this is only thanks his behaviour.

Daniela, University of Catania, Italy

Nino Porto (Ro)

Este dureros să dedicăm acest editorial memoriei dragului nostru prieten și colaborator de neînlocuit Antonino Porto. A trecut la cele veșnice în 28 februarie și îi simțim încontinuu lipsa.

De la începutul editării revistei a fost un temerar susținător al ideilor pe care le-a promovat cu mare pasiune, de fapt, lui îi aparține prima imagine a site-ului EPM și

Nino Porto (Tr)

Büyük bir üzüntüyle, bu yayını sevgili arkadaşımız, değerli katkı sağlayıcı Antonino Porto'yu hatırlamak üzere adadık. O, 28 Şubat'ta vefat etti ve bizler onu ölümünden bu yana özlüyoruz.

Derginin başlangıcından bu yana, O daima büyük bir gayretle çalışmış, düşüncesinin kesin bir destekçisi olmuş, büyük bir tutkuyla bunun articolul de mare interes despre instrumentele cercetării. Cei care au participat la Intâlnirea din Catania din 2007 își vor aminti depre participarea sa discretă și entuziastă.

Vestea despre moartea lui Porto care a fost stâlpul de susținere pentru EPM, care a muncit mult ca EPM să fie ceea ce este acum, care a învățat elevii să lupte pentru a-și atinge scopurile, a șocat pe toți membrii EPM, care este alături de familia lui în aceste momente de tristețe și transmite sincere condoleanțe.

Am primit condoleante din:

Kastamonu, Turkey
Kayseri, Turkey
Bucharest, Romania
Thessaloniki, Greek
Landgraaf, Netherlands
Catania, Italy
Cadice, Spain
Le Mans, France

Dorim să includem aici câteva din mesajele primate de la prietenii din toată Europa, cărora de asemenea Porto le lipsește.

Adio Porto, vei rămâne pentru totdeuna în inima noastră!
Grupul Editorial EPM, Italia

Atât de trist să auzim această veste. Coranul spune că Alah este întotdeauna cu cei buni...
Senol, Kastamonu, Turkey

Suntem șocați de moartea subită a prietenului și partenerului nostru la EPM, Nino.

Balcony to Valle del Bove

için çalışmıştır; aslında onun fikri EPM'nin ilk yansımalarıydı ve Makinalar araştırması üzerine ilginç bir makale idi. 2007 Catania Toplantısında onunla tanışanlar, onun sessiz ve tutkulu katılımını hatırlayacaklardır.

EPM'nin bir ayağı olan ve bugünü inşa etmek için çok çalışan, öğrencilerini istediklerine ulaşmaları için savaşmaları konusunda düşündüren Porto'nun ölümü hakkındaki haberler, Porto'nun ailesine bu kötü anında yakın olan EPM grubunu şok etti, huzur içinde olmasını dileriz.

Bize çok sayıda iletişim formu ulaştı:
Kastamonu, Türkiye
Kayseri, Türkiye'den
Bucharest, Romanya'dan
Thessaloniki, Yunanistan'dan
Landgraaf, Hollanda'dan
Catania, İtalya'dan
Cadice, İspanya'dan
Le Mans, Fransa'dan

Ayrıca, Avrupanın her yerindeki arkadaşlarımızdan bize ulaşan mesajları da dahil etmek isteriz, ayrıca bizim de onu özleyeceğimizi biliyoruz.
Hoşça kal Nino, Her zaman kalbimizde olacaksın!

Bunu duymak çok üzücü, Kuran, Allah'ın daima iyi olanlarla birlikte olduğunu söyler.
Şenol, Kastamonu,Türkiye

EPM ortağı ve arkadaşımız Nino'nun ani ölümü bizi şok etti. Catania'yı ziyaretimiz

Nu o să uităm niciodată amabilitatea și prietenia dovedită pe parcursul vizitiei noastre în Catania.

Domnul să-l odihnească în pace!

Grupul Editorial EPM, Thessaloniki, Greece

A dispărut o ființă specială, educată, veselă, un bun companion.

Elena, Catania, Italy

Îmi pare foarte rău. Nu l-am cunoscut, dar munca lui m-a ajutat foarte mult! Sper ca EPM să continue, deoarece îmi este foarte mare folos.

Manuele, University of Catania, Italy

Îmi pare foarte rău pentru moartea lui Porto, un om bun, neînfricat în a arăta lumii cine era cu adevărat! Îmi place această abilitate, deși azi a dispărut.

Maria Teresa, Catania Italy

Pot spune că Porto a fost un învățător pentru viață care m-a învățat să-i las pe ceilalți să mă învețe câte ceva! Acum am încredere în alți oameni, și asta datorită comportamentului său.

Daniela, University of Catania, Italy

süresince onun arkadaşlığı ve şefkatini asla unutmayacağız. Tanrı, huzur içinde ruhunu rahatlatsın.

EPM Yayın Grubu, Thessaloniki, Yunanistan.

Eğitimli bir kişi, komik biri, iyi arkadaş; özel bir kişi gitti.

Elena, Catania, İtalya.

Gerçekten üzgünüm, onu tanımıyordum fakat çalışmaları bana gerçekten çok faydalı oldu. EPM çalışmasını sürdürür, bu bize gerçekten çok yardım eder.

Manuele, Catania Üniversitesi, İtalya

Böylesi iyi ve korkusuz bir adam olan Porto'nun ölümüne gerçekten çok üzgünüm.

Maria Teresa, Catania, İtalya.

Porto'nun bir yaşam öğretmeni olduğunu söyleyebilirim, diğer insanların bana bişeyler öğretmesine izin vermeyi bana düşündürdü, şimdi diğer insanlara güveniyorum ve bu sadece onun davranışı sayesinde.

Daniela, Catania Üniversitesi, İtalya.

Nino Porto (El)

Με μεγάλη μας λύπη αφιερώνουμε αυτό το εκδοτικό σημείωμα στον αγαπημένο φίλο και πολύτιμο συνεργάτη μας Antonino Porto. Έφυγε στις 28 Φεβρουαρίου και από τότε μας λείπει συνεχώς.

Από το πρώτο τεύχος του περιοδικού EPM υπήρξε ένας ένθερμος υποστηρικτής του και εργάσθηκε γι αυτό με μεγάλο πάθος. Στην πραγματικότητα η πρώτη ιστοσελίδα αντίγραφο (mirror site) του EPM αλλά και ένα ενδιαφέρον άρθρο για τις μηχανές αναζήτησης ήταν δικά του. Αυτοί που τον

Nino Porto (Bg)

С голяма скръб посвещаваме тази уводна статия в памет на нашия скъп приятел и благороден сътрудник Антонио Порто. Той почина на 28 февруари и оттогава ни липсва.

От самото начало на създаването на списанието той е бил запален привърженик на идеята и е работил върху него и за него с голяма страст, а в действителност това беше първият сайт-огледало на EPM и публикува интересна статия относно Изследователските търсещи машини. Онези, които го γνώρισαν στη συνάντηση της Κατάνιας το 2007 θα θυμούνται πάντοτε τη σεμνή αλλά γεμάτη πάθος συνεισφορά του.

Ο Porto ήταν ένας πυλώνας του EPM και εργάστηκε σκληρά για να φτάσει το περιοδικό στη σημερινή του μορφή, διδάσκοντας στους μαθητές πώς να παλεύουν για να φτάσουν στο στόχο τους. Η είδηση του θανάτου του αλλά πάνω απ' όλα η απώλεια ενός ανθρώπου με τόσο καλή καρδιά όσο αυτός, σόκαρε όλη την ομάδα του EPM, η οποία είναι κοντά στην οικογένειά του αυτήν τη δύσκολη στιγμή και η οποία εύχεται να αναπαύεται εν ειρήνη.

EPM team In conference room

Πήραμε αρκετά μηνύματα από:

Κασταμονή, Τουρκία
Καισάρεια, Τουρκία
Βουκουρέστι, Ρουμανία
Θεσσαλονίκη, Ελλάδα
Landgraaf, Ολλανδία
Κατάνια, Ιταλία
Cadice, Ισπανία
Le Mans, Γαλλία

Θα θέλαμε να συμπεριλάβουμε μερικά από τα μηνύματα που λάβαμε από φίλους από όλη την Ευρώπη. Ξέρουμε ότι λείπει και σε σας.

Αντίο Νίνο, θα είσαι πάντα στις καρδιές μας!

Πόσο άσχημο να ακούς αυτό το νέο, το Κοράνι λέει ότι ο Αλλάχ είναι με τους καλούς...

Senol, Kastamonu, Τουρκία

срещнаха по време на срещата Катания през 2007 г. ще си спомнят неговото тихо и страстен участие.

Новината за смъртта на Порто, който беше стълб на ЕРМ, който е положилил толкова труд да се изгради това, което то е сега, който научи някои ученици да се борят да постигнат това, което те искат, но като цяло загубата на един мъж с добро сърце като него, шокира цялата група на ЕРМ, която е близо до семейството на Порто в този тъжен момент и желае той почива в мир.

Получихме много съобщения със съболезнования от:

Кастамону, Турция
Кайсери, Турция
Букурещ, Румъния
Солун, гръцки
Ландграаф, Холандия
Катания, Италия
Кадиче, Испания
Льо Манс, Франция

Ние също желаем да се включат някои от посланията, които сме получили от нашите приятели в цяла Европа, ние знаем, че на вас също ви липсва.

Толкова е тъжно да чуя това. В Корана се казва, че Аллах е винаги с добрите...

Най-добри пожелания,

Шенол, Кастамону, Турция

Потресени сме от внезапната смърт на нашия приятел и партньор в ЕРМ, Нино.

Ние никога няма да забравим неговата доброта и приятелство по време на посещението ни в Катания.

Нека Бог да го прости в мир.

Всички наши съчувствия от гръцкия екип на ЕРМ, Солун.

Είμαστε σοκαρισμένοι από τον ξαφνικό θάνατο του φίλου και συνεργάτη μας στο EPM, Nino. Δε θα ξεχάσουμε ποτέ την ευγένεια και τη φιλία του κατά τη διάρκεια της επίσκεψής μας στην Κατάνια. Ο Θεός ας αναπαύσει την ψυχή του.

Εκδοτική ομάδα του EPM, Θεσσαλονίκη, Ελλάδα

Ένας μορφωμένος άνθρωπος, πρόσχαρος, ένας καλός φίλος. Ένα σπουδαίο πρόσωπο έφυγε.

Elena, Catania, Ιταλία

Lunch time

Λυπάμαι πραγματικά, δεν τον γνώριζα, αλλά η δουλειά του με βοηθάει πάρα πολύ. Το EPM συνεχίζει την πορεία του και με βοηθάει πραγματικά.

Manuele, University of Catania, Ιταλία

Λυπάμαι πολύ, πραγματικά, για το θάνατο του Porto ενός καλού ανθρώπου, που δεν φοβόταν να δείξει το πραγματικό του πρόσωπο. Μου αρέσει αυτή η ικανότητα, που έχει χαθεί στις μέρες μας.

Maria Teresa, Catania, Ιταλία

Μπορώ να πω ότι ο Porto ήταν ένας δάσκαλος της ζωής και μου έμαθε να αφήνω τους άλλους ανθρώπους να μπορούν να με διδάξουν κάτι. Τώρα εμπιστεύομαι τους άλλους ανθρώπους και αυτό οφείλεται αποκλειστικά στη συμπεριφορά του.

Daniela, University of Catania, Ιταλία.

Аз не знаех за случилото се. За нещастие съм болен, така че аз няма да дойда на погребението.

Специален човек почина, преподавател, сладък, интелигентен и приятен.

Елена Калканьо, Катания, Италия

Аз наистина съжалявам, аз не го познавам, но работата му ми помага наистина много. За лош късмет утре ще бъде в университета и няма да бъда в състояние да отида на погребението. С надежда EPM да продължава да работи, той ми помага наистина много. Хубава вечер,

Мануеле Ганжи, Университет, Катания, Италия

Наистина съжалявам за починалия Порто, добър човек, без страх показваше какъв е той наистина, аз обичам това умение.

Мария Тереза Чанчио, Катания, Италия

Казах ужасната новина за моите съученици... и аз чакам техния отговор. Мога да кажа, че Порто бе господар на живота и той ме научи да позволя на другите хора ме научат на нещо, сега аз вярвам на другите хора и това е само благодарение поведението му.

Даниела Триппа, Университет, Катания, Италия

Чао Нино, ще бъдеш винаги в сърцата ни!

Monica Cotfas, Dinu Mihaela
Colegiul Tehnic “Mircea Cristea”, Brasov
monicacotfas@yahoo.com

Photovaltaic Energy

The exponential development of industry and population in the last century lead to a high consumption of fossil fuels, such as oil, natural gas, coal and hydrocarbons. The prognosis is worrying both as far as the time left until these fossil fuels will be exhausted, and for the quality of life on Earth, as severe climatic changes are severely felt.

1. Introduction

The solar energy is one of the most suitable and widely used forms of renewable energies, one in which the modern age has become gradually interested as an alternative to fossil fuels.

The most optimistic estimation for the durability of fossil fuels, in the conditions of nowadays exploitation, is: 32 years for oil, 72 years for natural gas and 252 years for coal. The uneven distribution of resources on earth leads to the monopoly of some countries and the disadvantaging of others. In addition to this, the use of fossil fuels has side effects such as the greenhouse effect, emission of polluting substances (SO_2, potentially acid) that lead to acid rain, radioactive material emission after burning and many others. As Jeremiah Creedon underlined, “What would be worse than the exhaustion of oil supplies? It would be worse if they were inexhaustible!”

This article describes the history of photovoltaic energy since its discovery, and the major steps in the development of photovoltaic cells, the heart of photovoltaic systems.

2. History of photovoltaic energy

The solar cell can be traced back to 1839, when the physicist Alexandre- Edmond Bequerel discovered the photovoltaic effect on an electrode immersed in a conduc-

Pollution caused by fossil fuels
Poluarea cauzată de combustibilii fosili

Energia fotovoltaică

Dezvoltarea exponențială a industriei și în ultimul secol a dus la o exploatare excesivă a combustibililor fosili, cum ar fi petrolul, gazele natural, cărbunele și hidrocarburile. Prognozele sunt îngrijorătoare atât din punct de vedere al timpului rămas până la epuizarea completă a acestor resurse, cât și din punct de vedere al calității vieții pe pământ, dinb moment ce schimbări climatice drastice sunt simțite drastic.

1. Introducere

Energia solară este una dintre cele mai viabile și des folosite forme ale energiilor regenerabile, una în care epoca modernă devine din ce în ce mai interesată ca alternativă la exploatarea combustibililor fosili.

Cea mai optimistă estimare pentru durabilitatea combustibililor fosili, în condițiile exploatării actuale, este de: 32 ani pentru petrol, 72 ani pentru gaze naturale și 252 ani pentru cărbune. Distribuția inegală a resurselor pe pământ duce la monopolul unor țări și deci la defavorizarea altora. Pe lângă acestea, folosirea combustibililor fosili are și efecte secundare cum ar fi efectul de seră, emisia de substanțe poluante (SO_2, potentially acid) care duc la ploi acide, emisii de materiale radioactive după ardere și multe altele. După spusele lui Jeremiah Creedon, “Ce ar putea fi mai rău decât epuizarea resurselor de petrol? Ar fi mult mai rău ca acestea să fie inepuizabile!”

Acest articol descrie istoria energiei fotovoltaice de la descoperirea acesteia, și tive liquid, and laid the basis of converting solar energy in electric energy.

In 1870, the physicist Heinrich Hertz was the first to study the photovoltaic effect in solids, such as Selenium and a major step forward was the discovery of Selenium photoconductivity in 1873 by Willoughby Smith. Ten years later, in 1883, the American inventor Charles Fritts creates the first solar cell from Selenium, with an efficiency of 1%.

Alexandre Edmond Becquerel

Philipp Lenard, a German physicist, was the first to explain the photoelectric effect in 1904, and he was awarded for his research in the domain the Nobel Prize in 1905.

The theoretical explanation of the photovoltaic effect was given by the great physicist Albert Einstein, in his work on the theory of relativity in 1905. The “Corpuscular” component of light was compared by Einstein with bullets heating the material. These bullets are called photons and they possess an amount of energy that they transmit to the free electrons from the material. They will release themselves from the material structure if the photon has enough energy, which in turn depends on the wavelength of the photon. Albert Einstein was awarded the Nobel Prize for his works in Physics in 1921.

Philipp Lenard

It was in 1916 that the photoelectric effect was experimentally demonstrated by Robert Milikan, and in 1932 Audobert and Stora focused on the photovoltaic effect in CdS.

The first modern solar cell was realized and patented by Russel Ohl in 1941, and later on in 1949 three physicists- William B. Shockley,

principalii pași în dezvoltarea celulelor fotovoltace, inima sistemelor fotovoltaice.

2. Istoria energiei fotovoltaice

Putem discuta despre celule solare începând cu anul 1839, când fizicianul Alexandre - Edmond Bequerel a descoperit efectul fotovoltaic pe un electrod cufundat în lichid conductiv, și a plasat bazele convertirii energiei solare în energie electrică.

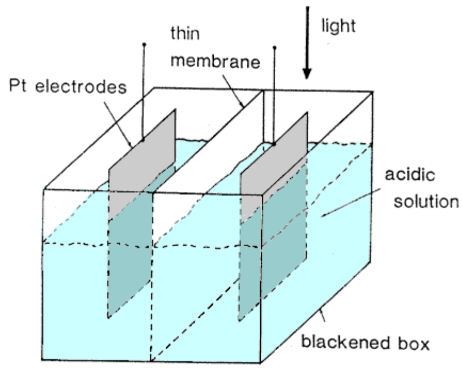
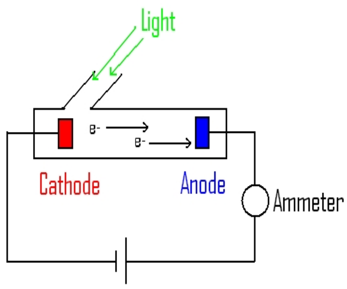


Illustration of Photovoltaic effect

Ilustrarea efectului fotovoltaic

În 1870, fizicianul Heinrich Hertz a fost primul care a studiat efectul fotovoltaic în solide, ca de ezemplu seleniu, iar un pas major înainte a fost descoperirea fotoconductivității seleniului în 1873 de către Willoughby Smith. Zece ani mai tâtziu, în 1883, inventatorul american Charles Fritts a creat prima celulă solară din seleniu, având o eficiență de 1%. Philipp Lenard, un fizician german, a fost primul care a explicat efectul fotoelectric în anul 1904, și a primit pentru cercetările sale în domeniu premiul Nobel în 1905.

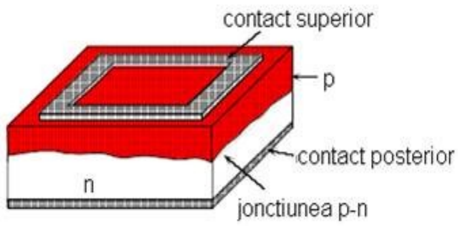


Lenard’s explanation of Photoelectric effect

Explicarea dată de Lenard efectului otoelectric

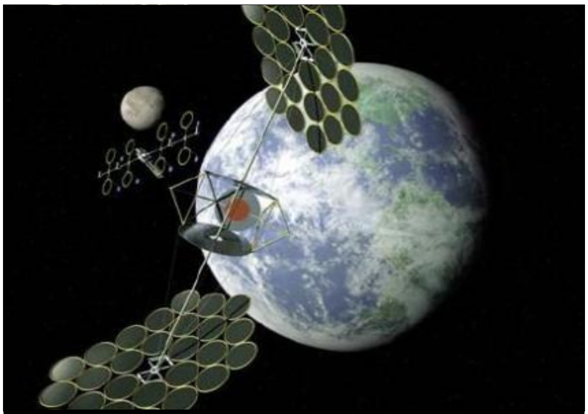
Explicarea teoretică a efectului fotovoltaic a fost dată de marele fizician Albert Einstein, în lucrarea lui despre teoria relativității în anul 1905. Componenta “corpusculară” a

Walther H. Brattain and John Bardeen discovered the p-n junction.



Ohl's cell

A new era began in the '50s, with the major development of electronic components, and it was now that in the Bell laboratories it was discovered while working with a silicon device that if it is exposed to sunlight, it produces more current. This discovery lead to the production of silicon cells in the Bell laboratories in 1954, with efficiencies from 2% to 6%, a discovery highly saluted by the American Scientific community, and in 1956 the first cell was available on market, but at a high price of 300 dollars. The cells were used mainly in space applications.


Solar cells used for space applications
Celule solare folosite pentru domeniul spațial

From this moment on, the solar cells developed rapidly, both in terms of efficiency and in cost reduction. Antireflective coatings were added and the thickness was reduced, and in 1980 ARCO was the first company to obtain over 1 megawatt output with photovoltaic panels. It was now that photovoltaic cells began to be used for several applications: cars, planes, houses, boats, display boards.


Solar panel included in roof structure
Panou solar inclus în structura acoperișului

Different materials are nowadays used for the fabrication of solar cells, the most important being Si, Ge, CdTe, GaAs,

luminii a fost comparată de Einstein cu gloanțe care lovesc materialul. Aceste gloanțe sunt numite fotoni și ei posedă o cantitate de energie pe care o transmit electronilor liberi din material. Aceștia se vor elibera din structura materialului dacă fotonul are suficientă energie, care la rândul ei depinde de lungimea de undă a fotonului. Albert Einstein a primit premiul Nobel pentru lucrările sale în fizică în anul 1921.

În anul 1916 a fost demonstrat experimental efectul fotoelectric de către Robert Milikan, iar în anul 1932 Audobert și Stora au analizat efectul fotovoltaic în CdS.

Prima celulă solară modernă a fost realizată și patentată de către Russel Ohl în anul 1941, iar mai târziu, în 1949, trei fizicieni- William B. Shockley, Walther H. Brattain și John Bardeen au descoperit joncțiunea p-n.

O nouă epocă a început în anii '50, odată cu dezvoltarea exponențială a componentelor electronice, și acum ăn laboratoarele Bell s-a descoperit, în timpul investigării unei componente de siliciu, că în cazul expunerii la soare, ea produce mai mult curent. Această descoperire a dus la producerea de celule de siliciu în laboratoarele Bell în anul 1954, cu eficiențe de la 2% la 6%, o descoperire foarte salutată de comunitatea științifică americană, iar în 1956 prima celulă era

CuInSe. Trying to reproduce the photosyntezis phenomena, the researchers have also designed organic solar cells. Nowadays, they have a low efficiency, but a great growth potential.

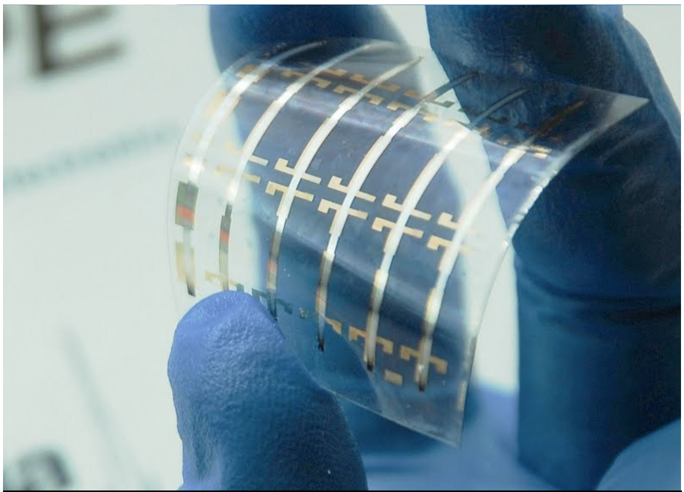
The efficiency of the solar cell depends upon the cell type. From 1-4% in the past, the efficiency of solar cells is nowadays of 40%, in the case of triple junction cells.

In 2001 the first transparent cell is patented, useful as it greatly reduces the space, as it can replace windows in a house, and in 2002 U. C. Berkeley discovers the flexible plastic cells. Among these latest discoveries we can also mention the cylindrical photovoltaic panel based on CIGS technology developed by the Solindra Company, absorbing solar radiation at an angle of 360°.

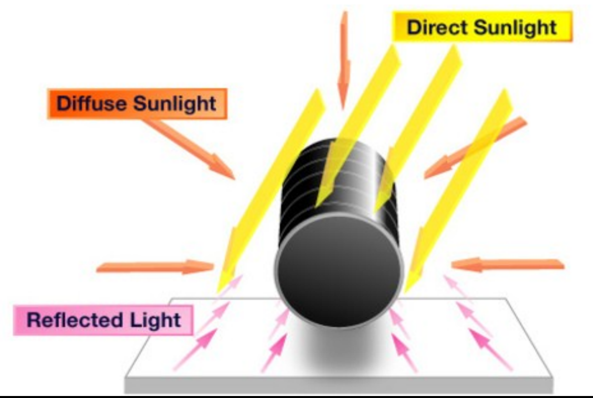
To overcome disadvantages of photovoltaic energy: the day/night cycle, the seasons and the local weather conditions, sun tracker systems were created. These are rotating systems that permit the following of the sun on the sky, just as the sunflower always faces the Sun.

3. Conclusion

As a conclusion, we can refer to the words of Ted Sargent, a teacher at the Toronto University, who said that if we covered 1% of the earth surface with solar cells we could re-



Flexible, transparent cell
Celulă transparentă, flexibilă



Cylindrical cell
Celulă cilindrică

disponibilă pe piață, dar la un preț mare, de 300 dolari. Celulele erau folosite cu precădere în domeniul spațial.

Din acest moment, celulele solare s-au dezvoltat rapid, și din punct de vedere al eficienței, și din punct de vedere al reducerii costurilor. Învelișuri antireflectoare au fost adăugate și grosimea a fost redusă, iar în 1980 ARCO a fost prima companie care a produs peste 1 megawatt cu panouri fotovoltaice. Acum au început să se folosească celule fotovoltaice în multe domenii: mașini, avioane, case, bărci, panouri de afișaj.

Materiale diferite sunt acum folosite pentru fabricarea celulelor solare, cele mai importante fiind Si, Ge, CdTe, GaAs, CuInSe. Încercând să reproducă fenomenul de fotosinteză, cercetătorii au conceput și celule solare organice. În zilele noastre acestea au eficiențe reduse, dar prezintă un fantastic potențial de creștere.

Eficienăa celulei solare depinde de tipul acesteia. De la 1-4% în trecut, eficiența celulelor solare este azi de 40%, în cazul celulelor cu triplă joncțiune.

În 2001 a fost patentată prima celulă transparentă, utilă pentru ca reduce mult spațiul de montare, putând înlociu chiar ferestrele unei clădiri, iar în 2002 U. C. Berkeley descoperă celulele flexibile din plastic. Printre ultimele place all polluting sources of energy with a green one, environmental friendly and clean. In the same spirit, Arnulf Jaeger-Walden, a representative of the European Energy Institute, said that Europe's energy needs could be met by capturing only 0.3% of the solar light of Sahara Desert and Middle East.

Sun Tracker System on Colina of "Transilvania" University, Brasov
Sun tracker pe Colina Universității Transilvania

descoperiri putem discuta despre panoul fotovoltaic cilindric bazat pe tehnologia CIGS technology dezvoltată de compania Solindra Company, absorbind radiația solară într-un unghi de 360˚.

Pentru a depăși dezavantajele energiei solare: ciclul zi-noapte, anotimpurile și condițiile meteo locale au fost create sisteme sun tracker. Acestea sunt sisteme rotative care permit urmărirea soarelui pe bolta cerească, întocmai cum floarea soarelui urmărește soarele pe cer.

Ca o concluzie, putem aminti cuvintele lui Ted Sargent, profesor la Universitatea Toronto, care spunea că dacă am acoperi 1% din suprafața pământului cu celule solare am putea înlociutoate sursele de energie poluante cu una verde, nepoluantă și curată. În același spirit, Arnulf Jaeger-Walden, reprezentant al Institutului European de Energie, spunea că necesarul energetic al Europei ar putea fi susținut prin captarea a numai 0.3% din lumina solară din Deșertul Sahara și a Orientului Mijlociu.

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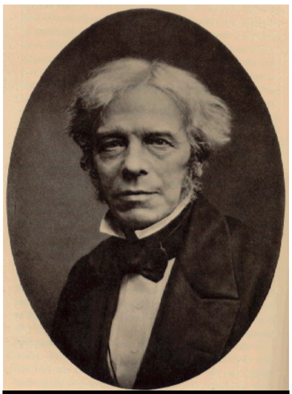
The history of mobile phone

This article presents the origin of mobile phone, very useful nowadays as they allow you to exchange messages quickly and to communicate easily with the entire world. The mobile phone is among the most used objects in the world, thanks to the ensuring of instant communication and the various functions they have.

The mobile phone story is very interesting and began with Michael Faraday, a Chemist, who in 1843 began research on the possibility of transmitting electricity through space and in 1865 Loomis Mahlon, showed that it was possible to transmit electricity through the earth's atmosphere, using two kites with screens and copper wires that were placed on the ground at a distance of 18 km. This discovery was used in Detroit, in 1921. The police department installed on police's cars some mobile radios that operated at 2 MHz, but there were many interferences and malfunctions, so the system did not work very well but in 1934, thinking about a possible solution, U.S. Congress created the Federal Communications Commission (FCC) that decided who could use radio frequencies most of which were reserved for the government and for the emergency services. Afterwards, in 1940, mobiles were upgraded to 40 MHz and some companies began to use them for profit. After five years at St. Louis, born the first system of cellular-radio telephone service was born, with six channels operating at 150 MHz. This project was approved but there were many interferences and this didn't work well. So, in 1947 AT&T proposed at FCC to increased radio frequencies but the requests were not satisfied. Then AT&T made the first radiotelephones for cars, also called push to talk telephone, used only between New York

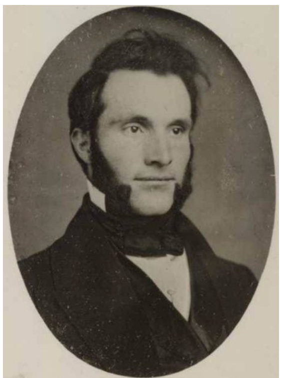
La storia del telefono cellulare

Quest'articolo parla dell'origine del telefono cellulare, uno degli oggetti più utili e utilizzati perché permette di scambiare velocemente messaggi e di comunicare rapidamente e senza difficoltà da ogni parte del mondo.



Michael Faraday

Nel 1843 il chimico Michael Faraday fu il primo a condurre ricerche sulla possibilità di trasmettere elettricità attraverso lo spazio, possibilità che diventerà realtà solo nel 1865 con Loomis Mahlon, che utilizzò due aquiloni con schermi e fili di rame a 18 km di distanza. Questa scoperta venne utilizzata nel 1921 dal dipartimento di polizia di Detroit, che fece installare nelle volanti degli apparecchi radio-mobili operanti a circa 2 MHz; le numerose interferenze e difficoltà di funzionamento fecero però considerare il sistema come non funzionante. Una possibile soluzione si raggiunse con la creazione della Commissione Federale delle Comunicazioni (FCC), nata nel 1934 per volere del Congresso degli Stati Uniti con il compito di decidere la suddivisione delle frequenze radio, la maggior parte delle quali è riservata al governo e ai casi d'emergenza. Nel 1940, le radio mobili, che nel frattempo avevano incrementato la loro potenza fino ad un massimo di 40 MHz, diventarono più comuni ed alcune aziende cominciarono a pensare di poterle usare a scopo di lucro. Cinque anni dopo nasceva a St. Louis il primo sistema di servizi telefonici radio-cellulari, che raggiunse i 150 MHz grazie a sei canali. Il progetto venne approvato, ma funzionava



Loomis Mahlon

and Boston, operating until 44 MHz, but there were again many interferences and the project was considered a failure. In 1949 some companies appeared, authorized by FCC to use radio channels and these companies were called RCC (radio common companies). After some years, in Sweden and then in USA similar systems appeared. But these still had "push to talk" system and were very big. In 1964a system operating at 150 MHz was created without the "push to talk", five years later it was increased to 450 MHz and in 1968 the FCC increased the radio frequencies. To encourage call by car, the AT&T proposed at FCC a system with a transmission tower at low power that would cover determined areas and that would have used some frequencies. Then AT&T proposed at FCC to divide the city in cells.

Dr. Martin Cooper, during the work for Motorola, makes the first mobile phone, the DynaTAC and the phone became very popular and it weighed 2,2 pounds. On 3 April 1973, at New York, Martin Cooper showed it to the public and he made the first call using a mobile phone. He let some people of the public try the phone, to prove that it wasn't a prank. Since then the FCC began to encourage the telephone companies, but in 1974 there was a lawsuit against the Western Electric, that was closest to do it. This law has been done to avoid the monopoly of the company; otherwise it creates the block of activity. Some years later, AT&T ruled its plan for mobile phones at Chicago and in 1977, the FCC allowed both Bell Telephone and AT&T to perform tests on the mobile phone service at Chicago.

The first mobile phone service began to operate at Tokyo, in 1979 but in 1981, Motorola and American Radio began the test for a second and American mobile phone service, in the area of Washington-Baltimore. In 1982, the FCC allowed the use of the AMPS (Advanced Mobile Phone Service), at Chicago to Ameritech and in 1987, there were a million of mobile phones in circulation and because there were so

Martin Cooper, the creator of the first mobile phone
Martin Cooper, il creatore del primo telefono cellulare

a malapena a causa delle interferenze. Nel 1947, dopo aver inutilmente proposto all'FCC di aumentare le frequenze radio, l'AT&T creò i primi radio-telefoni per automobile, chiamati anche *push to talk*, con frequenze con potenza massima di 44 MHz, utilizzabili solo fra New York e Boston; ancora una volta, però, le interferenze rovinarono il progetto. Nascevano intanto nel 1949, con l'autorizzazione dell'FCC, le RCC (Compagnie Radio Comuni). Qualche anno dopo nacquero i primi veri telefoni da auto in Svezia e poi un sistema simile negli Stati Uniti. Tuttavia, questi utilizzavano ancora il sistema *push to talk* ed erano molto grandi. Nel 1964 venne creato un sistema operante a 150 MHz e funzionante senza il *push to talk;* cinque anni dopo si giunse a 450 MHZ, ma già nel 1968 l'FCC aveva aumentato le frequenze radio. Per favorire le chiamate via auto, AT&T propose alla FCC un sistema con torri di trasmissione a bassa potenza, che avrebbero coperto determinate aree e che avrebbero usato solo alcune frequenze, poi propose anche un altro sistema che prevedeva la divisione delle città in celle.

Fu l'ingegnere americano Martin Cooper a creare, per Motorola, il primo telefono cellulare, il DynaTAC, presentato per la prima volta a New York il 3 aprile 1973.

Il primo servizio telefonico entrò in funzione a Tokyo, nel 1979 e di lì a qualche anno il servizio fu operativo anche negli Stati Uniti. Nel 1987 c'era già in circolazione circa un milione di cellulari, un numero enorme che comportava anche fastidiose interferenze; si propose allora di aumentare le frequenze, di dividere le celle in celle più piccole o di migliorare la tecnologia. La FCC non aveva intenzione di aumentare le frequenze, e dividere le celle sarebbe stato molto costoso, così ci si rivolse many, there were interference and then the frequency needed to be raised, cells were split into smaller cells and the technology was improved. FCC didn't want to increase the frequencies and split cells would cost too much, and therefore they tried of stimulate the growth of new technologies and they proposed the use of alternative technologies covered in the 800 MHz. A year later the Cellular Industry Association Technology was born, that contributed to the creation of the TDMA technology(Time Division Multiple Access), available to the public since 1991.

Dyna Tac

After this date, the evolution of mobile phone continued with new technologies as GSM (Global System for Mobile communication) that increased until the 1800 MHz, EDGE (Enhanced Data rates for GSM Evolution) and three times in terms of data transmission speed, GPRS (General Packet Radio Service) that permitted the aggregation of multiple operators and the increase of internet speed, LTE (Long Term Evolution) that reinforcement UTRA (Terrestrial Radio Universal Access) and MIMO (Multiple Input/Multiple Output), the 3G and its technology WCDMA and then HSPA (High Speed Downlink Packet Access) lead to 3G – the quick use at large band and the support of the vocal services. But after about 170 years, the history of this object hasn't finished yet, because the new mobile technologies are evolving, one of this is the 4G, now under testing. This article aimed to present the beginnings of mobile phones and their evolution. Although they nowadays seem to be common objects, the process of their design and production is complex and so was their evolution.

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a tecnologie alternative basate comunque su una potenza di 800 MHz. Un anno dopo nacque l'Associazione dell'Industria Tecnologica Cellulare, che contribuì alla creazione della tecnologia TDMA (Accesso Multiplo a Ripartizione nel Tempo) per un cellulare più evoluto, disponibile al pubblico dal 1991.

Dopo questa data, il telefono cellulare ha continuato ad evolversi con nuove tecnologie come il GSM (Global System for Mobile communication), che ha portato ad un incremento fino a 1800 MHz, l'EDGE (Enhanced Data rates for GSM Evolution), che ha aumentato di tre volte la velocità di trasmissione dei dati, il GPRS (General Packet Radio Service) che ha permesso l'aggregazione di più operatori ed una maggiore velocità di internet, l' LTE (Long Term Evolution) che ha rafforzato l'UTRA (Terrestrial Radio Universal Access) ed il MIMO (Multiple Input / Multiple Output), il 3G e la sua tecnologia WCDMA per sostenerlo e poi l'HSPA (High Speed Downlink Packet Access) che permette al 3G di funzionare velocemente a banda larga e di supportare simultaneamente i servizi vocali. Dopo circa 170 anni di progresso, la storia di quest'apparecchio non è comunque ancora finita, perché ancora oggi si stanno sviluppando nuove tecnologie della telefonia mobile come il 4G, ancora in fase di sperimentazione.

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The story of *Flight-sapper* and the debut of astronautics

At first the fantastic factor prevailed but in 1874 the writer Jules Verne in his novel "From Earth to the Moon - direct route in 97 hours and 15 minutes", almost guessed the exact journey on which the first astronauts conquered Selene, in July 1969.

The attraction of the natural satellite of the Earth is as old as man.

In fact, history has shown that the initial enthusiasm has already fallen in the general indifference in the late '70s as a result of complex factors of interpretation: the routine trip from one planet to another, unfortunately, still belonged, almost half a century before Apollo 11, to the science fiction.

But following the crowd of early success, the boys of that time - *the legendary '60s* - lived immersed in a futuristic aura, where the conquest of space, interplanetary travel and the use of all resources of the solar system seemed to become a simple routine in a few decades time.

At that time, in fact, the Italian kids were traveling in the imaginary intergalactic space, fueling their fantasies thanks to TV dramas (ex. "A for Andromeda", "Space 1999") and being content to peer into the dark and mysterious sky. This is the background of the first moon-landing images, as they appeared on the screens of bulky television sets in the summer of 1969, contrasts of

GIULIO VERNE

DALLA TERRA ALLA LUNA

TRAGITTO DIRETTO

IN 97 ORE E 20 MINUTI

ILLUSTRATO CON 43 INC. ED UNA CARTA GEOGR.

Unica traduzione autorizzata dall'Autore.

QUARTA EDIZIONE.

MILANO

TIPOGRAFIA EDITRICE LOMBARDA

1874.

Jules Verne

From the Earth to the Moon

Giulio Verne-dalla terra alla luna

La storia dei *Volopionieri* e l'esordio

L'attrazione per il satellite naturale della Terra è nata insieme all'uomo. Inizialmente prevalse il fattore fantastico: ma già nel 1865 lo scrittore Giulio Verne, nel suo romanzo "*Dalla Terra alla Luna – tragitto diretto in 97 ore e 15 minuti*", quasi azzeccò l'esatta durata del viaggio che vide realisticamente protagonisti i primi astronauti alla "conquista" di *Selene,* nel luglio 1969.

In realtà, la storia ha dimostrato come l'entusiasmo iniziale sia decaduto nel disinteresse generale già al finire degli anni '70 in seguito a fattori di complessa interpretazione: i viaggi di routine da un pianeta all'altro appartengono purtroppo tuttora, quasi mezzo secolo dopo l'Apollo 11, al campo della fantascienza.

Ma sull'onda del successo iniziale, i ragazzini di allora - *i mitici anni '60 -,* vivevano immersi in un'aura avveniristica, dove, la conquista dello spazio, i viaggi interplanetari e l'utilizzazione di tutte le risorse del sistema solare sembravano, da lì a pochi decenni, potere diventare una semplice routine.

In quel periodo, infatti, i ragazzi italiani viaggiavano nell'immaginario spazio intergalattico, alimentando le loro fantasie grazie agli sceneggiati TV (ad esempio "A come Andromeda", "Spazio 1999"), accontentandosi momentaneamente di scrutare il cielo scuro e misterioso, delle stesse tinte fosche e nebulose che contraddistinguevano le prime immagini dell'allunaggio, così come apparivano sugli scherlight and shadow and intense emotions, in that sultry July.

The landing on the moon, or rather the American moon landing of Apollo 11 spacecraft, which deposited the first man on Earth's satellite, under the astonished eyes of 600 million people following the event live on TV, was, in fact, July 20 to be exact 43 years ago. In Italy it was nearly 4 am (3:56 ÷ 2:56 UTC), 6 hours after the landing of the spacecraft Eagle, when Neil Armstrong began the dangerous descent to the surface: anyone with a television set had been up to see the legendary moon-walk!

But who liked to believe the existence of large swarms of insects living inside the large lunar craters, as suggested by Desiderius Papp in 1942, was disappointed: only dark basaltic rocks covered with shiny round beads, the "*regolith*."

It was during the climax of enthusiasm aircraft which was kicked off the "mark" of coins commemorating the event, including, typically Italian phenomenon, the collection of medals of "flight-sapper" distributed by Shell, known petrochemical company. Twenty subjects chronologically retraced the evolutionary history of the "flight" from the beginning to 1969, the mythological Icarus & Daedalus, to 'space hero Neil Armstrong, first man to set foot on the moon. The gold medals were strictly jammed in the holes of a booklet of burgundy cardboard.

In that period of holiday everybody went overboard, and then the kids looked forward to the time of refueling at the gas station on the coast. After a painful struggle between brothers and cousins in the car, packet contention in tissue paper, was so frantically discarded by the winner: the brilliant medal, just unveiled, fueling the dreams of young aspiring cosmonauts. Win a binder filled with 4 complete with 20 medals was practically a utopia. We had to settle for a piece "one-off" and a lot of duplication! Only those who had the privilege of being an only

mi degli ingombranti apparecchi televisivi, nell'estate del 1969: contrasti di luce e ombra ed intense emozioni, in quell'afoso mese di luglio.

L'atterraggio sulla Luna o meglio l'*allunaggio* della navicella spaziale americana Apollo 11, che depositò il primo uomo sul satellite della Terra, sotto gli occhi attoniti di 600 milioni di persone che seguivano l'evento in diretta TV, risale, infatti, per l'esattezza al 20 Luglio di 43 anni fa. In Italia erano quasi le 4 del mattino (3:56 ÷ 2:56 UTC), 6 ore e mezza dopo l'allunaggio della navicella spaziale Eagle, quando Neil Armstrong iniziò la sua difficoltosa discesa sulla superficie: chiunque possedesse un apparecchio televisivo era rimasto alzato per assistere alla mitica passeggiata lunare!

Ma chi amava credere all'esistenza di grossi sciami di insetti viventi all'interno dei vasti crateri lunari, come ipotizzato da Desiderius Papp nel 1942, restò deluso: solo scure rocce basaltiche ricoperte da rotonde sferette lucenti, il "*regolite*".

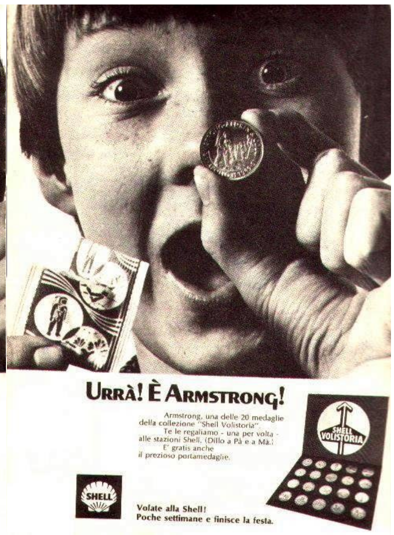
Fu proprio nel periodo *clou* di entusiamo aeronautico che fu dato il via al "conio" di numismatica commemorativa dedicata all'evento, tra cui, fenomeno prettamente italiano, la collezione di medaglie dei "Volopionieri" distribuite dalla Shell, nota società petrolchimica. Venti soggetti che ripercorrevano cronologicamente la storia evolutiva del "volo" dagli albori al 1969, dai mitologici Icaro & Dedalo, all' eroe spaziale Neil Armostrong, primo uomo a mettere piede sulla Luna. Le medaglie dorate andavano rigorosamente incastrate negli appositi fori di un libretto di cartone bordeaux.

In quel periodo di vacanza si andava a mare, ed i ragazzini di allora attendevano con ansia il momento del rifornimento al distributore di benzina sulla litoranea. Dopo una sofferta lotta in automobile tra fratelli e cugini, la contesa bustina in carta velina, veniva quindi freneticamente scartata dal vincitore: la brillante medaglia, appena svelata, alimentava i sogni dei piccoli aspiranti cosmonauti. Aggiudicarsi con 4 pieni un raccoglitore completo di 20 medaglie era praticamente un'utopia. Ci si doveva accontentare di un pezzo "una tantum" e di un mucchio di doppioni! Solo chi aveva il privilegio di child could realistically yearn to complete the collection!

Here is the advertisement which appeared on the competition "Flight-story" on "Mickey Mouse" comic.

The comics were busy to feed the general enthusiasm...

But go into detail, and retrace the steps of "Flight-story", just as there were proposals in 1969:



Icarus & Daedalus

The first "flight-sappers" belong to the mythology. Prisoners in the labyrinth of Minos, Daedalus and his son Icarus tried to escape with artificial wings. Only Daedalus survives.

Leonardo da Vinci (1452-1519)

One of the largest and most versatile figures of the Renaissance. Leonardo had many brilliant insights into the "flying machines": even on the helicopter and on the parachute.

The Montgolfier brothers (Paris - 1753)

With a balloon built by the brothers Joseph and Etienne Montgolfier, were lifted the first "flight-sappers" in history: Pilatre de Rozier and the Marquis of Arlandes.

The Wright Brothers (Kitty Hawk, USA Dec. 1903)

First flight with airplane engine. Constructors and drivers, Wilbur and Orville Wright.

essere figlio unico poteva realisticamente agognare al completamento della collezione!

I giornalini si davano da fare per alimentare l'entusiasmo generale...

Ecco la pubblicità del concorso Volistoria quale appariva su "Topolino".

Ma entriamo nel dettaglio, e ripercorriamo le tappe della "Volistoria", così come ci venivano proposte nel lontano 1969:

Icaro e Dedalo

I primi "Volopionieri" appartengono alla mitologia. Prigionieri nel labirinto di Minosse, Dedalo e suo figlio Icaro tentano la fuga con ali artificiali.

Solo Dedalo si salva.

Leonardo da Vinci (1452-1519)

Una delle più grandi e versatili figure del nostro Rinascimento. Leonardo ebbe molte geniali intuizioni sulle "macchine volanti": persino sull'elicottero ed il paracadute.

I fratelli Montgolfier (Parigi - 1753)

Grazie ai fratelli Etienne e Joseph Montgolfierre si alzarono in volo i primi volopionieri della storia grazie ad un'aerostato da loro costruito: Pilâtre de Rozier e il marchese d'Arlandes.

I fratelli Wright (Kitty Hawk, USA dicembre 1903)

Primo volo con aeroplano a motore. Costruttori e piloti, Wilbur e Orville Wright.

Louis Blériot (25 July 1909)

The French aviator Bleriot, with his monoplane, flying over the English Channel from Calais to Dover.

Louis Blériot (25 luglio 1909)

L'aviatore francese Blériot, col suo monoplano, sorvola La Manica da Calais a Dover.

Alcock & Brown (June 1919)

First Atlantic crossing by plane land. The British Alcock and Whitten Brown, Vickers-Vimy biplane with, from Newfoundland to Ireland, in about 16 hours and half.

Alcock e Brown (giugno 1919)

Prima traversata atlantica con aereo terrestre. Gli inglesi Alcock e Whitten Brown, con un biplano Vickers-Vimy, da Terranova all'Irlanda, in circa 16 ore e mezza.

Charles Lindembergh (1927)

From New York to Paris non-stop, the daring flight Lindembergh happily ends in 33 hours. Lindembergh piloting the "Spirit of St. Louis", a robust Ryan monoplane.

Charles Lindembergh (1927)

Da New York a Parigi, senza scali, l'audace volo di Lindembergh si conclude felicemente in 33 ore e mezza. Lindembergh pilotava lo "Spirit of St. Louis", un robusto monoplano Ryan.

Graf Zeppelin (1928)

The famous airship Graf Zeppelin (LZ-127) makes its first flight in 1928. In 9 years of service carries 13,110 passengers. In '29 goes around the world in 20 days, 4 hours and 14 minutes.

Graf Zeppelin (1928)

Il celebre dirigibile Graf Zeppelin (LZ-127) compie il suo primo volo nel 1928. In 9 anni di servizio trasporta 13.110 passeggeri. Nel '29 fa il giro del mondo in 20 giorni, 4 ore e 14 minuti.

Auguste Piccard (27 May 1931)

First flight in the stratosphere. The Swiss scientist Auguste Piccard, with Paul Kipfer, reached the record altitude of 15,781 meters with his balloon.

Auguste Piccard (27 Maggio 1931)

Primo volo nella stratosfera. Lo scienziato svizzero Auguste Piccard, insieme a Paul Kipfer, raggiunse l'altitudine-record di 15.781 metri con il suo aerostato.

Heinkel HE 178 (27 August 1939)

Flown by Erich Warsitz, the Heikel HE 178 (German) is the first jet device to soar.

Heinkel HE 178 (27 agosto1939)

Pilotato da Erich Warsitz, lo Heikel HE 178 (tedesco) è il primo apparecchio a reazione a librarsi in volo.

Sikorsky VS-300 (September 1939)

First flight by helicopter. It 'a VS-300, designed in the United States by Russian Igor Sikorsky.

Sikorsky VS-300 (Settembre 1939)

Primo volo in elicottero. E' un VS-300 e lo ha progettato, negli Stati Uniti, il russo Igor Sikorsky.

Bell XS-1 (14 October1947)

First supersonic flight. The plane-Bell XS-1 rocket, the U.S. Air Force, has driven by Charles E. Yeager. Speed: 1078 km / h at an altitude of 12,800 m.

Bell XS-1 (14 ottobre 1947)

Primo volo supersonico. L'aereorazzo Bell XS-1, dell'aviazione statunitense, è pilotato da Charles E. Yeager. Velocità: 1078 Km/h; altitudine 12.800 m.

De Havilland Comet (2 May 1952)

Havilland Comet, the first jet passenger plane, joined service.

De Havilland Comet (2 maggio 1952)

Entra in servizio il De Havilland I, britannico. E' il primo aereo civile a reazione.

Sputnik 1 (4 October 1957)

Russia opens the space era by Sputnik 1, the first artificial Earth satellite. It weighs 83.6 pounds and remain in orbit until the 1958 beginning.

Sputnik 1 (4 ottobre 1957)

La Russia apre l'era dello spazio con lo Sputnik 1, il primo satellite artificiale della Terra. Pesa 83,6 Kg. e resta in orbita fino ai primi giorni del 1958.

Wernher Von Brown (31 January 1958)

A key figure of the entire U.S. space program The German scientist is particularly involved in the development of the Jupiter C rocket, which puts 31 January 1958 the first American satellite in orbit.

Wernher Von Brown (31 gennaio 1958)

Figura chiave di tutto il programma spaziale U.S.A. Lo scienziato tedesco è particolarmente coinvolto nello sviluppo del razzo Jupiter C, che il 31 Gennaio 1958 mette in orbita il primo satellite americano.

Yuri Gagarin (12 April 1961)

First manned flight into space. Yuri A. Gagarin makes an orbital flight around the Earth on the Soviet spacecraft Vostok 1. The flight lasted 108 minutes.

Yuri Gagarin (12 aprile 1961)

Primo volo umano nello spazio. Yuri A. Gagarin compie un volo orbitale intorno alla Terra sulla nave spaziale sovietica Vostok 1. Il volo dura 108 minuti.

Leonov & Belyaev (18 March 1965)

Human first walk in space. Cosmonaut Alexei Leonov "exit" from the Voskhod 2 space capsule, attached to a rope, and floats in space for over 10 minutes. The travel companion is Pavel Belyaev.

Leonov e Belyaev (18 marzo 1965)

Prima passeggiata umana nello spazio. Il cosmonauta Alexei Leonov "esce" dalla capsula spaziale Voskhod 2, legato a una corda, e fluttua nello spazio per oltre 10 minuti. Il compagno di viaggio è Pavel Belyaev.

Armstrong & Scott (16 March 1966)

First link between two spacecraft. The Gemini 8 with Neil Armstrong and David Scott on board, joined the Agena target rocket.

Armstrong e Scott (16 marzo 1966)

Primo collegamento tra due veicoli spaziali. La Gemini 8, con Neil Armstrong e David Scott a bordo, si unisce al razzo bersaglio Agena.

Apollo 8 (December 1968)

The first human flight around the moon. The Apollo 8 mission (starting December 21, six days after landing) has as its protagonists the astronauts: Borman, Lovell and Anders.

Apollo 8 (dicembre 1968)

Il primo volo umano intorno alla Luna. La missione Apollo 8 (partenza 21 dicembre, atterraggio 6 giorni dopo) ha come protagonisti gli astronauti Borman, Lovell e Anders.

Moon! (20 July 1969)

Neil Armstrong was the first man to set foot on the moon. The other men of Apollo 11 are Aldrin and Collins.

Luna! (20 luglio 1969)

Neil Armstrong è il primo uomo a mettere piede sulla Luna. Gli altri uomini della missione Apollo 11 sono Aldrin e Collins.

Shell was not the only one to commemorate the event; each nation is mobilized, venturing to the minting of coins "Space" from America to the Soviet Union, the latter defeated antagonist (perhaps wrongly?) from the United States, in countdown to the lunar landing, in the wake of the "Cold War".

Here, some examples of thematic souvenir medals and pins, from Italy and around the world:

La Shell non fu la sola a commemorare l'evento; ogni nazione si mobilitò, cimentandosi al conio di numismatica "spaziale": dall'America all'Unione Sovietica, quest'ultima antagonista sconfitta (forse a torto?) dagli Stati Uniti, nel conto alla rovescia per l'allunaggio, sulla scia di quella che fu definita la "guerra fredda".

Ecco alcuni esemplari di souvenir tematici: medaglie e spille, provenienti dall'Italia e da diverse parti del mondo:


Edwin Aldrin - Michael Collins – Neil Armstrong - Apollo 11

Edwin Aldrin - Michael Collins – Neil Armstrong - Apollo 11

Aldrin – Armstong – Collins 21 July1969

(A data error? Well... It depends on Italian time!) By Rizzoli Editor - Sciltian – SAN

Aldrin – Armstong – Collins 21 Luglio 1969

(un errore di data? Beh… dipende dal fuso orario italiano!) da Rizzoli Editore - Sciltian – S.A.N.


Edwin Aldrin - Michael Collins – Neil Armstrong

Panorama - 1969 Man on the Moon

Edwin Aldrin - Michael Collins – Neil Armstrong

Panorama - 1969 L'uomo sulla Luna

Landing on the Moon E. Aldrin - N. Armstrong – M. Collins

21.7.1969 – 3:56:20 mez MMA925

Landing on the Moon E. Aldrin - N. Armstrong – M. Collins

21.7.1969 – 3:56:20 mez MMA925

Apollo 12 – November 1969

With the Apollo program, an ideal cycle has closed. This cycle opened in July 1969 with Neil Armstrong, commander of Apollo 11, and concluded in December 1972, with Eugene Cernan, commander of Apollo 17, respectively the first and the last astronaut to “walk”, as it were, on the lunar surface.

After the Apollo landings, the Americans plunged into a limbo of neglect, while the Soviets, in the throes of “revenge” retroactive devoted themselves to “unleash” mechanical probes (including Lunakhod), for the collection of lunar soil - Automatic last mission: the Moon-24 1976.

In fact, the very high costs which would involve this type of exploration, not justified by real benefits and expectations alleged, dampened enthusiasm of the both superpowers.

At the silence of the 80s, followed, but weighted with renewed interest, not popular, but restricted to a limited scientific elite, a variety of orbital missions involving new emerging global powers: it was almost always reconnaissance probes for “remote sensing” (ex. X rays) of the lunar surface, which included a lunar landing impact “destructive”, as without “back-rockets” slowing down the descent:

- Probe Space-Hagoromo Hiten, launched January 24, 1990 from Japan; precipitated on the Moon - April 10, 1993.
- Space probe SMART-1 European Space

Publicity badges Soviet (80s)
Spillette propagandistiche sovietiche (anni ’80)

Apollo 12 – Novembre 1969

Con il programma Apollo, si chiuse un ciclo ideale inaugurato nel luglio 1969 da Neil Armstrong, comandante dell’Apollo 11, e concluso nel dicembre 1972, da Eugene Cernan, comandante dell’Apollo 17, rispettivamente il primo e l’ultimo astronauta a “passeggiare”, per così dire, sulla superficie lunare.

Dopo gli sbarchi del programma Apollo, gli Statunitensi piombarono in un limbo di disinteresse, mentre i Sovietici, in preda ad una “rivalsa” retroattiva, si sbizzarrirono a “sguinzagliare” sonde meccaniche (tra cui le Lunakhod), per il prelievo di suolo lunare – ultima missione automatica: la Luna 24 1976.

Di fatto, gli altissimi costi che presupponeva tale tipo di esplorazione, non giustificati da vantaggi reali ed aspettative presunte, tarparono l’entusiasmo delle due superpotenze.

Al silenzio degli anni ’80, seguì, con rinnovato ma ponderato interesse, non più popolare, bensì ristretto ad una limitata élite scientifica, tutta una serie di missioni automatiche coinvolgenti nuove potenze mondiali emergenti:

- Sonda spaziale Hiten-Hagoromo, lanciata il 24 gennaio 1990 dal Giappone; precipitata sul suolo lunare il 10 aprile 1993.
- Sonda spaziale SMART-1, dell'Agenzia Spaziale Europea (ESA), lanciata il 27 settembre 2003; precipitata sul suolo lunare il 3 settembre 2006.
- Sonda spaziale Chandrayaan-1 lanciata il 22 ottobre 2008 dalla base di Srihakot (India); modulo Aditya (Moon Impact Pro-

Agency (ESA), launched September 27, 2003, precipitated on the Moon - September 3, 2006.

- Chandrayaan-1 space probe launched 22 October 2008 from the base of Srihakot (India) Aditya form (Moon Impact Probe) dropped by the probe and sent down on the Moon - 14 November 2008.
- Space probe Chang'e 1's Republic of China, crashed on the Moon - March 1, 2009.

The absence of crew and its replacement by robotic equipment / computer has deprived these missions of that magical "pathos", involved "the masses" and characterized the legendary night of July 20, 1969, when the first man, in spite of the suspicion 'simulation', raised by so-called "conspiracy theories on lunar landings" [eg. "Theory of the fake Moon landing" by Bill Kaysing (1976) "Conspiracy Theory of the Moon" by Philippe Lheureux (2001)] - has left its "fingerprints" indelibly on the lunar surface.

And although NASA, headed by Michael Griffin, now already receives a stream of funding for the design and placement of a permanent base on the Moon, to be achieved by 2020, that enthusiasm of the "first time" of the year '60 is lacking.

Perhaps finally, albeit at a slow pace than expectations, the mythical dream materializes, after having been interplanetary placed in the drawer for 50 years? That this comes true form of "cosmos-reality" live satellite non-stop, or as a tour at the "5 moons" hotel for extravagant millionaires to search of excitement, it's unimportant.

What matters is that this project is realized, in accordance with the time limits provided (half a century is too much!); And since we can hardly afford to travel "low cost" on the Moon, at least we book

be) sganciato dalla sonda e fatto scendere sul suolo lunare il 14 novembre 2008.

- Sonda spaziale Chang'e 1 della Repubblica Popolare Cinese, schiantatasi sul suolo lunare il 1 marzo 2009.

Si è trattato quasi sempre di sonde ricognitive per il *"remote sensing" (es. raggi X)* della superficie lunare, che prevedevano un allunaggio da impatto "distruttivo", in quanto prive di retrorazzi rallentanti la "discesa".

L'assenza di equipaggio umano e relativa sostituzione con attrezzature robotiche/ computerizzate ha privato tali missioni di quel magico "pathos" che coinvolgeva le "masse" e che contraddistingueva la mitica notte del 20 luglio 1969, quando il primo uomo, a dispetto del sospetto di "simulazione", sollevato dalle cosiddette "Teorie della cospirazione sugli sbarchi lunari" [es. "*Teoria del falso allunaggio*" di Bill Kaysing (1976) *"Teoria del Complotto lunare"* di *Philippe Lheureux (2001)]* - ha lasciato le sue "impronte" indelebili sulla superficie lunare.

E benché la NASA, con a capo Michael Griffin, oggi riceva già un flusso di finanziamenti per la progettazione e collocazione di una base permanente sulla Luna, da realizzare entro il 2020, viene a mancare quell'entusiasmo della "prima volta" degli anni '60.

Che si stia finalmente concretizzando, seppure a rilento rispetto alle aspettative, il mitico sogno interplanetario riposto nel cassetto da 50 anni? Che questo si avveri sottoforma di "cosmo-reality" in diretta satellitare no-stop, o sottoforma di tour in hotel a "5 lune" per stravaganti milionari in cerca di emozioni, poco importa.

Quel che conta è che tale progetto si realizzi, nel rispetto dei tempi limite previsti (mezzo secolo è veramente troppo!); e poiché difficilmente potremo permetterci un on the web the future commemorative medals "Moon base 2020" limited edition! And who knows... maybe the Shell, for the occasion, will pursue a new collection "Flight-story".

viaggio "low cost" sulla Luna, prepariamoci almeno a prenotare sul web le future medaglie commemorative "Moon base 2020" a edizione limitata! E chissà... forse la Shell, per l'occasione, riproporrà una nuova collezione "Volistoria".

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Iconography

All pictures have been taken the author's personal collection

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Playing with radiations

The elements of the periodic table are many and each one of them has different characteristics (**from the other-deleted**). There are metals, semi-metals, non metals, transitions elements… the aspects of chemistry are various and most of them un-explored. We can either talk about the condition of the elements, solid, liquid or gas; or about the ebullition or the fusion temperatures, the electro negativity of the elements and radioactivity. Now we have to formulate a logical question:

What is the radioactivity?

Pierre curie

The radioactivity is the capacity of the atoms to emit different kinds of radiation, a radiation, b radiation and g radiation (the most dangerous). Depending on the stability of the nucleon of the atom, the higher the number of protons is, the more unstable the atom becomes. Protons are the positive particles, electrons the negative ones and neutrons are neutron particles, with the function of stabilization, because positive charges always repel other positive charges. Almost each atom of the periodic table has isotopes (atoms with the same atomic number but different mass number), and part of them are radioactive. There are also natural elements like uranium, or as we are going to talk about, radium and polonium, that have as natural property the radioactivity. During the centuries radioactive atoms lost part of their particles in order to reach more stability in the nucleon. Some disciplines use the decay of the atoms to date the existence of a particular organism, or even the dating of the life of a particular animal species.

The radiation emitted by the radioactive atoms

Giocando con le radiazioni

Gli elementi della Tavola Periodica sono tanti ed ognuno di essi ha diverse caratteristiche.

Ci sono i metalli, i semi-metalli, i non metalli e gli elementi di transizione.

Gli aspetti della chimica sono vari e molti di essi sono ancora sconosciuti.

Si può parlare degli stati fisici degli elementi, solido, liquido o aeriforme; o si può parlare del punto d'ebollizione e di fusione, dell'elettronegatività degli elementi e della radiattività.

Detto questo è logico porsi una domanda:

Cos'è la Radiattività?

La radiattività è la capacità degli atomi di emettere diversi tipi di radiazioni, α, β e g (le più pericolose). Il tipo di radiazione dipende dalla stabilità dell'atomo, più alto è il numero di protoni, più l'atomo è instabile. I protoni sono le particelle subatomiche positive, gli elettroni sono negativi mentre i neutroni posseggono una carica neutra e hanno la funzione di stabilizzare l'atomo, perché la carica positiva respinge quella negativa.

Quasi tutti gli atomi della tavola periodica hanno degli isotopi (atomi con lo stesso numero atomico ma differente numero di massa) e molti di essi sono radiattivi.

Ci sono anche elementi naturali come l'uranio, il radio o il polonio che hanno naturali proprietà radioattive.

Nel corso dei secoli gli atomi perdono parte delle loro particelle per rendere più stabile il nucleo.

Alcune scienze studiano il decadimento radioattivo per calcolare le date d'esistenza di particolari organismi o datare la vita di particolari specie animali.

Le radiazioni emesse da gli atomi radiattinormally isn't very dangerous, a and b radiation are constituted by positive and negatives particles, protons and electrons, and could penetrate slight layers of metals like Aluminum. g radiations could penetrate thick layers of Lead or other metals, and are constituted by photons. In our presentation we now pass to the second question:

A fragment of pitchblende
Un frammento di penchblenda

Who discovered radioactivity as a feature of some elements?

We owe the discovery of radioactivity to a brave and intelligent woman, Marie Curie.

Marie Sklodowska-Curie was born in Warsaw, the 7th November 1867, in Poland. Fifth daughter of a Mathematics and Physics teacher, she studied for some years as self-taught, because girls couldn't attend university in Poland. Her passions were Mathematics and Physics, and at first her family didn't approve her choice. On 1891 Marie's older sister went to Paris to attend the famous Sorbonne university, to (take degrees as and) become a doctor. In order to pay the expenses of the University, Marie started to work as a governess, and she had been working for six years, when her sister Bronya graduated. During those six years, Bronya had already got married and found a house where she and her husband lived. Bronya repaid the favor to her sister, paying her university expenses and giving her hospitality for some time.

Marie studied Physics at the university in the morning, and Mathematics and Chemistry in the evening as self-taught. Here, in Paris, she met a brilliant scientist, Pierre Curie, and they married on the 26th of July 1895. Pierre was a Physics teacher at the Sorbonne University, and he had made research about the magnetic properties and quartz piezo-electric properties with his brother Jacques. Thanks to his studies, Marie could start her research about the radioactivity, and soon they became also laboratory mates.

After two years of marriage, they have their first daughter Irène, and on 1904 their second daughter, Eve, is born.

vi normalmente non sono molto pericolose, le radiazioni α e β sono costituite da particelle positive e negative, protoni ed elettroni e possono penetrare sottili metalli come alluminio.

Le radiazioni g possono penetrare pesanti strati di metalli e sono costituiti da fotoni. Passiamo adesso alla seconda domanda:

Chi scoprì la radiattività come caratteristica di alcuni elementi?

Dobbiamo la scoperta della radiattività a un'intelligentissima donna, Marie Curie.

Marie Sklodowska-Curie nacque il 7 Novembre del 1867 a Warsaw, in Polonia. Ebbe cinque figlie da un professore di matematica e fisica, studiò per alcuni anni per conto suo, perché le donne non potevano frequentare l'università in Polonia. La sua passione era la matematica e la fisica che in principio non fu approvata dai genitori. Nel 1891 la sorella maggiore di Marie andò a Parigi per frequentare la famosa università Sorbonne e diventare dottore. Per poter pagare gli studi all'università, marie cominciò a lavorare come governante per sei anni, fino a quando la sorella Bronya si laureò. Durante questi sei anni, Bronya si sposò e comprò una casa dove viveva con suo marito, alla fine la sorella maggiore per ripagare il favore fatto da Marie le pagò gli studi e la ospitò per un po' di tempo.

Marie studiava fisica la mattina e matematica e chimica nel pomeriggio come autodidatta. A Parigi incontrò un bravo scienziato, Pierre Curie e si sposarono il 26 Luglio del 1895. Pierre era un professore di fisica all'università di Sorbonne e faceva degli studi sulle proprietà magnetiche della materia e le proprietà piezoelettriche del quarzo con suo fratello Jaques.

Grazie ai suoi studi, Marie cominciò le ricerche sulla radiattività e divenne presto un assistente di

Marie wanted to study a particular characteristic of some elements, what now we call radioactivity and started to study this phenomena in a little house in Rue Lohmond, where the couple created a laboratory. Their research studied at first the radioactivity of Uranium's salt (discovered many years before by Henry Becquerel) in different kind of substances, pure or not. They measured the radioactivity with a particular piezo-electric electrode made-up of quartz, reporting different measures depending on the concentration of Uranium. The properties of those piezo-electric electrodes had been studied by Pierre several years before, but Pierre's old studies were concentrated only on magnetic properties (in 1882 Pierre with his brother Jacques registered their discovery about the properties of the quartz). Thanks to Pierre's knowledge they continued their research for many years, examining, reporting data and formulating theories and more others. Then they tried to measure the radioactivity in other elements, observing their reactions and properties.

Marie and Pierre formulated a definition of the radioactivity, and said that the radioactivity is a characteristic of the atom, not a feature of the substance as all the scientists thought at that time.

After months of study they tried to measure the radioactivity of a substance named "pitchblende", a radioactive material coming from mines in the south of the France. At that time the scientists thought that this substance was constituted by Uranium. They discovered that the radioactivity of this substance was much more intense than the normal radioactivity of Uranium, in consequence they understood that the substance wasn't pure Uranium, but a mixture of more substances, possibly more radioactive than Uranium. They tried to divide this substance with more and more experiments, extracting Uranium and dividing the remnants in order to finally obtain a new element with characteristics different from any other in the periodic table.

An example of alpha radiation
Un esempio di radiazioni alfa

laboratorio. Dopo due anni dal matrimonio, loro ebbero Irene e nel 1904 nacque Eve.

Marie voleva studiare una particolare caratteristica di alcuni elementi, le diede il nome di radiattività e cdomincio a studiare questo fenomeno in una piccola casa in via Lohmond, dove la giovane coppia aveva creato un laboratorio.

Per prima cosa studiarono la radiattività dell'uranio (scoperto tempo prima da Henry Becquerel) in diverse sostanze, pure e no.

Per misurare la radiattività utilizzarono un particolare elettrodo piezoelettrico di quarzo che dava diverse misure in base alla concentrazione d'uranio. Le proprietà di questo elettrodo di quarzo erano state studiate da Pierre molti anni prima, ma lo scienziato si era concentrato solo sulle proprietà magnetiche (nel 1882 Pierri con suo fratello Jacques registrarono le loro scoperte sulle proprietà piezoelettriche del quarzo). Grazie alle conoscenze di Pierre i due scienziati continuarono le loro ricerche per anni, esaminando, riportando dati, registrando i processi e formulando varie teorie. Dopo provarono a misurare la radiattività in altri elementi, osservando le reazioni e le proprietà.

Marie e Pierre formularono una definizione di radiattività dicendo che era una proprietà degli atomi e non una proprietà della sostanza come alcuni scienziati pensavano in quel periodo.

Dopo mesi di studi provarono a misurare la radiattività di una sostanza chiamata "pitchblende", un materiale radiattivo proveniente dalle miniere del sud della Francia. In quel periodo gli scienziati pensavano che quella sostanza non fosse costituita da uranio, ma da un insieme di sostanze anche più radiattive dell'uranio. Provarono a dividere questa sostanza con tanti esperimenti, estraendo uranio e dividendo il resto in mo-

Marie and Pierre called this element "Polonium".

They published their discoveries in a journal named "Swatlo" and named the new element for the first time.

The Polonium had a radioactivity more intense than Uranium and this justified a certain level of radioactivity, but it wasn't so high to justify the level of radioactivity of the pitchblende, so they tried for the second time to divide the elements, and discover a little quantitative of a new substance, much more radioactive than the Polonium, the Radium.

Marie Curie in her laboratory
Marie Curie nel suo laboratorio

In order to reach their goal, Marie and Pierre analyzed tons of pitchblende, absorbing a huge quantitative of radiation that eventually took Marie to death after many years and risking her life for the research.

Marie and Pierre could have earned millions and become very reach if only they had registered their discovery, but they didn't, in order to make possible for everyone to study this particular topic and take the science to another level, developing the technology of that period.

Officially they announced their discoveries the 26th December 1898, and in 1903, Marie and Pierre with a scientist named Henry Becquerel, received the Nobel Prize for Physics.

The couple Curie-Sklodowska working together in the laboratory
La coppia Curie-sklodowska lavora insieme in laboratorio

In 1906 Pierre died in a car accident and Marie took his place as a teacher at the Sorbonne University, becoming the first woman to teach here.

Even after Pierre's death, Marie continued her research, trying to create pure Polonium and pure Radium; after many years she isolated

do da ottenere nuovi elementi con diverse caratteristiche dagli altri elementi della tavola periodica. Marie e Perrie chiamarono questo elemento Polonio.

Pubblicarono un articolo "Swatlo" dove spiegarono la loro scoperta e il nome del nuovo elemento.

Il Polonio aveva una radiattività più intenza dell'Uranio ma non così intenza da giustificare la radiattività dell pitchblende così i due scienziati continuarono a dividere gli elementi e scoprirono tantissime nuove sostanza anche più radiattive del Polonio, come il Radio.

Per scoprire questi nuovi elementi che causavano una così alta radiattività del pitchblende, i due scienziati assorbirono una grandissima quantità di radiazioni che portò Marie a morire alcuni anni dopo.

Marie e Pierre non guadagnarono milioni e non divennero famosi ma aiutarono gli altri scienziati a concentrarsi su questo particolare studio e permisero alla tecnologia del periodo di progredire.

Ufficialmente I due scienziati annunciarono la loro scoperta il 26 Dicembre del 1898 e nel 1903 Marie, Pierre e uno scienziato di nome Henry Becquerel, ricevettero il Premio Nobel per la fisica.

Nel 1906 Pierre mori in un incidente automobilistico e Marie prese il suo posto all'università di Sorbonne, diventando la prima donna ad insegnare all'università.

Anche dopo la morte di Pierre, Marie continuò le sue ricerche, cercando di creare il Polonio puro e il Radio; dopo alcuni anni riuscì ad isolarli en-pure metallic Radium and Polonium, and won in 1911 the second Nobel Prize, this time for Chemistry.

Marie Curie published different papers about her research the most popular being: *"Researches sur les substances Radioactives"* (1904); *"L'isotopie et les elements Isotopes"; "Traité de la radioactivité"* (1910). She also wrote different papers that explained how to extract pure Polonium and pure Radium.

Marie Curie driving one of the radiology cars
Marie Curie alla guida di una delle auto attrezzate per la radiologia

She has founded a particular institute, at first named "Istitute du radium", which is still known nowadays as "Istitute Curie". Irène, Marie's first daughter, had the same attitude as her mother and soon she started to study Physics and Chemistry with her mother's encouragement.

Marie's and Pierre's research wasn't applied only in Physics and Chemistry, it made a several progress about the fight against the cancer and most of the congenital illnesses, and also they had an important role in the development of X-Rays. During the World War I Marie worked as radiologist with her daughter Irène saving millions of lives. They worked with the Red Cross Association and with them they invented the first car with X-Rays equipment, and with this Marie and Irène went personally near the lines of fight.

In 1920 Marie became very fragile, and fourteen years later she died of pernicious anemia in the sanatorium of Sancellemoz, an illness caused from the huge amount of radiation absorbed during her research.

Personally I admire this woman, She fought against the prejudice and studied at the university, even if her parents didn't approve. She persisted in her research,

trambi e nel 1911 vince il secondo Premio Nobel, questa volta per la chimica.

Marie Curie pubblicò diversi articoli sulle sue ricerche, I più famosi sono: "ricerche sulle sostanze radiattive" (1904), "l'isotopia e gli elementi isotopi"; "trattato sulla radiattività" (1910). Inoltre scrisse diversi articoli per spiegare come estrarre il Polonio e il Radio puro.

Marie fondò un istituto particolare, inizialmente chiamato "istituto del Radio", adesso conosciuto come "istituto Curie". Irene, la prima figlia, aveva le stesse passioni della madre e presto cominciò a studiare fisica e chimica con l'incoraggiamento della madre.

Le ricerche di Marie e Pierre non furono solo utilizzate in chimica e fisica, ma aiutarono la ricerca per la sconfitta del cancro e di altre malattie genetiche ed ebbero un importante ruolo per l'uso dei raggi X. Durante la Prima Guerra Mondiale, Marie lavorò come radiologa con sua figlia Irene e salvò milioni di vite. Lavorarono con la Croce Rossa e con loro fu inventata la prima macchina munita di raggi X e con questo Marie e Irene furono mandate in prima linea durante la guerra.

Nel 1920 Marie divenne molto fragile e quattordici anni dopo morì di anemia perniciosa nel'ospedale di Sancellemoz, la sua malattia fu causata dall'enorme quantità di radiazioni assorbite durante le sue ricerche.

Personalmente ammiro questa donna, lei ha lottato contro I pregiudizi studiando all'Università anche se la sua famiglia non approvava. Ha continuato le sue ricerche, lavorando e ottenendo importanti risultati e ha continuato anche dopo aver perso il marito, lavorando sola, allevando le figlie, Irene e Eve, che dopo la sua morte divennero donne importanti, Irene vinworking hard and obtaining very important results and she continued even after the loss of her husband, working alone and at the same time raising her daughters, Irène and Eve, that became after her death very important people- Irène won a Nobel prize for Chemistry as her mother had done, and Eve worked as ambassador for UNICEF. During her last year of life Marie worked as a radiologist, near the conflict of the World War I, saving lots of lives and risking hers. She died because of her research, the radiation caused that illness and even now she rests in her final and last sleep in a lead coffin, near her husband, because her body continues to emit radiation. Her original scripts are preserved in a special place, because of the radiation, and most of her objects are preserved in the same way.

I think that everyone should know what Marie Curie has done in her incredible life, because for me she represents an ideal of what all the scientists should be, altruist and brave.

We can easily say that Marie Curie's case is one when pure intellect meets bravery.

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From left, Marie Malone (Missy), Irène, Marie and Eve Curie.
Da sinistra, Marie Malone (Missy), Irène, Marie e Eve Curie.

se il Premio Nobel per la chimica come la madre e Eve lavorò come Ambasciatore per l'UNICEF. Durante gli ultimi anni di vita, Marie lavorò come radiologa, vicino al periodo della Prima Guerra Mondiale, salvando tante vite e rischiando la sua. Questa grandissima donna è morta a causa delle sue ricerche, le radiazioni le causarono la malattia e adesso riposa in pace, vicino al marito, in una bara di piombo, perché il suo corpo emette radiazioni. I suoi articoli originali sono conservati in un posto speciale a causa delle radiazioni e molti dei suoi oggetti sono conservati allo stesso modo.

Io penso che tutti dovrebbero conoscere l'incredibile vita di Marie Curie, perché secondo me rappresenta l'ideale di scienziato che tutti dovrebbero essere, altruista e capace.

Possiamo affermare che Marie Curie è il caso in cui l'intelletto puro e il coraggio si incontrano.

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Sudoku

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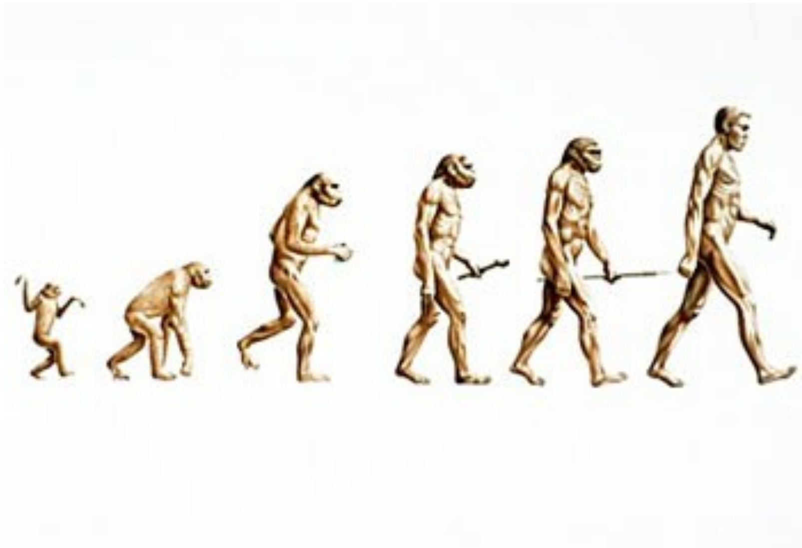
Is evolution the process that created the diversity of life on Earth?

The theory of evolution, this is an extremely popular and widely renowned theory, proposed by two people, Alfred Wallace, and more notably, Charles Darwin. These two men had extensive knowledge of nature and how it progressed, and these observations were a vital key to how an idea evolved into a brilliantly devised theory [1]

The image to the right is very commonly used to portray the evolution of man, as it shows a monkey (Left) slowly evolving over time to become what we are today as humans (Right) [13]



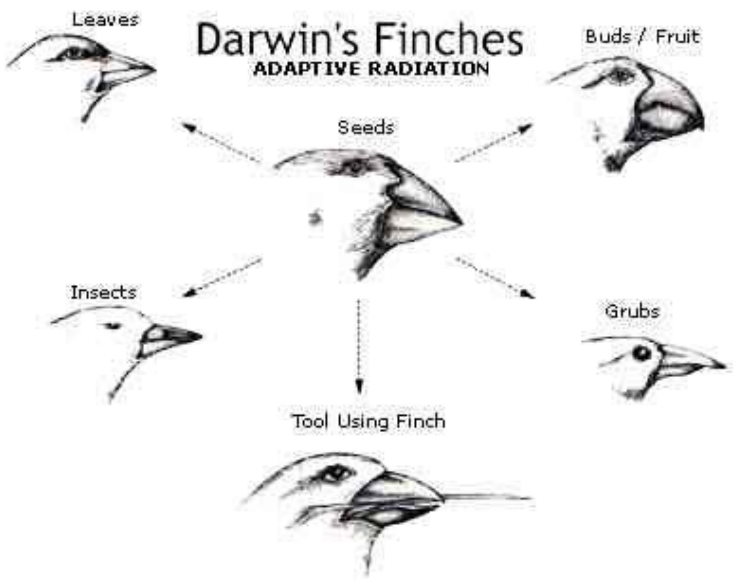
Evolution is how a species becomes more complex, and better suited (or adapted) to their environment, through the process of 'Natural Selection'. This means that a pair of a species, with superior genetics, are likely to reproduce (as they are more capable in surviving the conditions they live in), combining their genes resulting in a slight change in offspring. Over numerous generations, these changes become more apparent and this is evolution. As generations go on, the genetic material within DNA changes, mutates, (sometimes enough to allow a generation to branch off into a completely new species!) and realistically improves from the last generation (as an inferior set of genes is less likely to be passed through numerous generations successfully) this results in the species becoming better suited to their environment, through the process of evolution [1]

<u>What is Natural Selection?</u>

To ensure survival of a species, a member of that species must be capable of surviving long enough to find a mate, allowing them to successfully reproduce, by avoiding being killed, and finding sufficient nutrition. Commonly this must the fought for, as there will be competition from many other members of that species looking for a mate, and even more other species hunting for food, and food may even be the species in question!

Not only must the creature survive, but it must protect its offspring during their early years to avoid them being killed. Some organisms manage all of these successfully; others may have a smaller number of offspring, while some may die before they can reproduce. The members of the species who do manage to reproduce, are superior to those who don't, meaning those individuals are more 'fit' for survival (this may also be known as survival of the fittest) than the others. The genetics, adaptations and mental and physical traits of the individual, all resulted in the 'fitness' that was superior to that of other members of the species. These characteristics are then likely to be 'inherited' by its offspring, making them more likely to survive and reproduce and this continues over many generations to result in the evolution of the species. This process is called 'Natural Selection' [1]

A good example of how genetic mutations and natural selection occur is by looking at how finches adapted to make use of their mutations. Charles Darwin studied this, and how finches evolved and mutated to have different types of beaks, and how the resulting characteristics benefited them in survival. Through surviving the process of natural selection, and evolving over generations to allow their mutations to develop, the species of the finch was provided a great advantage over others [1]



Different beaks allowed the finch to feed differently, not only does this benefit the individual to survive, as they are better adapted to where they live, but also helps the species as a whole, as it means there is reduced competition for food against other members of the same species [1]

This is a brilliant display of how evolution occurs through the process of natural selection, and how this helps benefit the species further to allow new mutations to improve the species to a greater extent [1]

Survival of the Fittest

Survival of the fittest is the reason natural selection exists, put very simply, it is the idea that those better suited, or 'Adapted' to their environment, are much more likely to survive and pass down their genetics through reproduction, in contrast to those that are not as well developed [9]

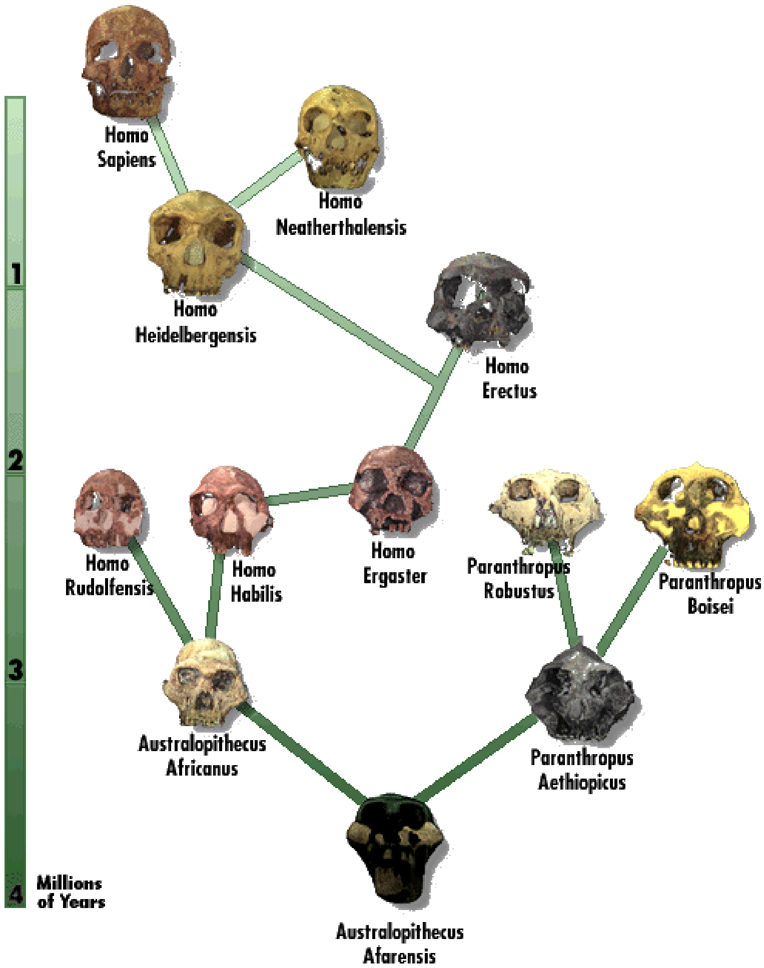
As these superior genetics are passed down upon generations, some will mutate, sometimes benefiting the species, sometimes hindering them. Survival of the fittest means that those who mutate in a positive way, will have a benefit when competing for food, shelter, and a mate, and will therefore be more likely to survive, allowing these genetics to be passed on. Those who mutate in a negative way, will not be able to perform the before mentioned tasks as efficiently, and are then more likely to be killed, or starve. (Image left [16])

These mutations and adaptations don't happen overnight, through a single generation, or even ten! For genetic mutations to have a noticeable impact, a particular set of genes will have to be copied and passed down thousands of generations, slowly changing that particular family tree of a species, either for the better or for the worse. This also means that sometimes a single species will branch off into many others. Looking at Darwin's finches (above) shows how a single species can have different sets of mutations, some that are less beneficial than others, will eventually die due to natural selection (survival of the fittest). An example of this is shown by the diagram on the left; it shows how the human species has evolved over millions of years, and how it has branched off into others over time.

All of this concludes that survival of the fittest, allows superior genetics to survive, and inferior ones to meet their demise, this is what allows natural selection to exist [9]

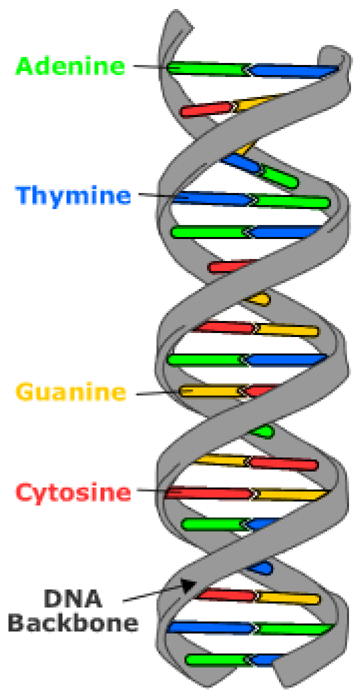
DNA and how it has evolved

It is theorised that DNA once began as 'a simple self replicating peptide', of which would contain 32 amino acids, that were supposed to form in the Earth's oceans. Once this self-replication had completed, the theory of natural selection would take over, so those that had evolved to protect themselves from danger, and that were able to adapt to their surroundings through evolution, were capable of surviving longer than others. An extended survival then resulted in more reproduction, thus spreading, allowing the molecule to travel throughout generations. Some molecules would have evolved to be contained within a lipid bubble, would have a better chance of survival, passing itself down the generations, leaving itself open to further evolution. After this process has prolonged, the lipid bubbles eventually turned into cell membranes, forming DNA molecules [8]



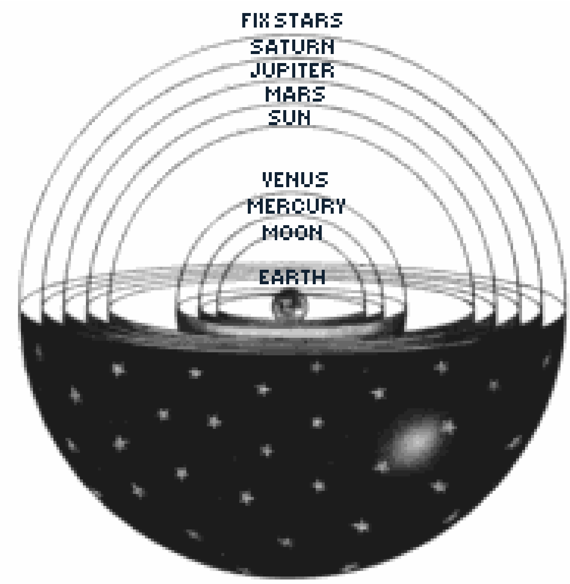
These DNA molecules are how they are as we know them now, a collection of complex molecules possessed by every living creature, the DNA containing genetic information about its host. After DNA itself evolved, over longer periods of time it also caused their hosts to evolve, through the form of natural selection, and through mutations within the DNA itself. This can be shown by looking at humans and chimps, the fact that we are very similar suggests (using the theory of evolution) that we share a common ancestor, which if true, would mean that we humans and chimps both branched off from our common ancestor due to different accumulations of mutations within the DNA [5]

Here is an example of a double-helix DNA molecule (left). It consists of amino acids, 4 of them, labelled: Adenine, Thymine, Guanine and Cytosine, and these 4 amino acids are responsible for the diversity of life on earth that we see today. All individuals possess these same four amino acids in their DNA, what makes us all different is due to the variation in how these amino acids are arranged and linked together by hydrogen bonds. The DNA backbone is made up of phosphates and sugars, its job is to simply hold up the molecules structure, its substance is also very flexible, which is necessary to allow the molecule to spiral into the double helix [17]



Creationism

There are numerous types of creationism, and lots of other beliefs that are used in conjunction with these, it is a very widespread and popular belief, heavily renowned by Christians. Different forms of creationism can include: Raelian, Panspermia, Catastrophic Evolution, Islamic, Vedic, American Indian, and many other beliefs from other cultures, however the most common form of creationism is Christian creationism, which branches off into many different groups, and I will talk of a few of these briefly.



Christian creationism as largely followed in the US, due to Christianity being such a prevalent religion in that country, not all Christian creationists follow the exact same beliefs, and can be split into different groups. These groups of Christian creationists consist of the following: 'Flat Earthers' – this is the belief that the earth is indeed flat, this is taken from the Bible; suggesting that the earth is also covered by a dome, surrounded by water, this water being what is believed by these flat earthers, as to what created Noah's flood. The bible reading from where the belief originated is from a literal point of view of "The four corners of the earth".

'Geocentrists' – As opposed the flat earthers, geocentrists accept the fact that the earth is spherical, however they do not accept the idea that the sun is in the centre of our solar system, or that the earth even moves at all. Alike flat earthers, this is reason for geocentrists to state what they caused Noah's flood, this being a solid firmant containing water above the still earth. The basis for their belief is again a literal reading of the Bible. "It is not an interpretation at all; it is what the words say." An example of the geocentric model is shown to the left [18], the diagram shows how geocentrists believe that planets orbit the earth.

'Young Earth Creationists' –Or YEC, is probably the most common kind of creationism to date, which is again based upon a literal reading from the Bible. These beliefs are that the earth is 6000 -10000 years old, and that earth and life was created by God in 6 days, that death was resulted from Adam and Eve, and lastly that geology must be in the terms of Noah's Flood. The idea of the earth being spherical and that we are in a heliocentric solar system is accepted.

Those few examples of creationism theories consist of either the most extreme views, or the most common views, basically contrasting each other, giving both ends of the spectrum. This shows that the belief of creationism, ironically alike evolution, has branched off into many different forms of creationism [3]

Other major religions also share views on their concept of creationism too, these religions being Muslims, Jews, and Hindus. The Islamic view on creationism is slightly different to that of other religions, in that they believe creation not to have been the 'Big Bang' as such, but rather, "the heavens and earth" joining together. Whilst the literal readings of the Koran do not promote the idea of the big bang, they do not dismiss it either. Further readings from the Koran also state that 'Allah' created everything, the planets and the sun, and even their orbital paths… it also suggests that he created 'laws'. All of this, much alike the more widely accepted view on creationism, was done within 6 days according to the Koran [19]

As for Jewish views on creation, they believe once again in the 6 days of creation, and a 7th of rest by God. However these 'days' are not viewed as literal days, but instead viewed as 'a specific stage of creation', each 'stage' being the creation of something different. More specifically: Day 1, gasses; Day 2, water; Day 3, dry land and plants; Day 4, fish and birds; Day 5, animals; Day 6, humans. This is also accepted due to being similar to scientific evolution, and some even believe that the evolutionary process is based on this view! [20]

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Sudoku

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2	9	1	8	4	3	5	6	7
5	6	7	1	2	9	8	4	3
9	1	4	6	8	2	3	7	5
7	8	5	3	9	4	1	2	6
6	3	2	5	7	1	9	8	4
3	2	8	4	5	6	7	9	1
1	7	6	9	3	8	4	5	2
4	5	6	2	1	7	9	3	8

Fun Page

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Chaos: Clouse Encounters With Disorder

Chaos! A word we hear so often and scares us so much. Something reasonable enough if one considers that we live in a universe where everything works perfectly and everything can be predicted by certain laws (no matter if they are understandable or not) or at least that is what we think.

Scientifically, Chaos is defined as **endmost sensitiveness in initial conditions**. In Mathematics and Physics (as well as many other sciences), Chaos Theory, which appeared all of a sudden before forty years, has brought radical changes in the researchers' way of thought and offered us progress that the classical research methods would never imagine. The present article is attempting an approach of what is Chaos in Physics Sciences, how the necessity for research in chaotic systems was born and in what scientific fields it has applications.

The First Steps into Chaos: "The n Body Problem"

Since his beginning, the Man wanted to explain the phenomena taking place all around him. In this attempt of his he began to create models based either on some metaphysical powers or in some natural order that, he suspected, existed in the universe. These models often led to laws that explained, or even predicted, Nature. This was the technique that created "Science". However, the research results were not always that good.

The first scientist who ever faced a problem not able to be solved was, possibly, the English mathematician and theoretical physicist sir Isaac Newton (1642-1727).

Χάος: Στενές Επαφές με την Αταξία

Χάος! Μια λέξη που ακούμε συχνά και που μας τρομάζει τόσο πολύ. Πράγμα άλλωστε που φαίνεται να έχει λογική, αν σκεφτεί κανείς πως ζούμε σε ένα σύμπαν που τα πάντα δουλεύουν στην εντέλεια και μπορούν να προβλεφθούν από συγκεκριμένους νόμους (ασχέτως αν τους καταλαβαίνουμε ή όχι)... ή τουλάχιστον, έτσι νομίζουμε.

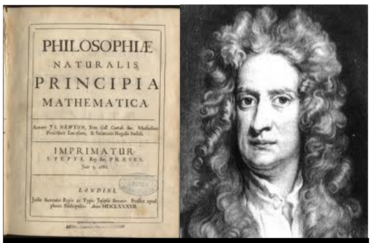
Επιστημονικά το Χάος ορίζεται ως η **ακραία ευαισθησία στις αρχικές συνθήκες**. Στα Μαθηματικά και τη Φυσική (και σε πολλές άλλες επιστήμες), η Θεωρία του Χάους, που εμφανίστηκε ως δια μαγείας πριν από σαράντα χρόνια, έχει φέρει ριζικές αλλαγές στον τρόπο σκέψης των ερευνητών και έχει επιφέρει πρόοδο που οι κλασσικές μέθοδοι έρευνας ούτε θα φαντάζονταν. Το παρόν άρθρο επιχειρεί μία προσέγγιση του τι είναι Χάος στις θετικές επιστήμες, πώς γεννήθηκε η ανάγκη για την έρευνα των χαοτικών συστημάτων και σε ποια σημεία έχει εφαρμογές.

Τα Πρώτα Βήματα στο Χάος: "Το Πρόβλημα των n Σωμάτων"

Από την αρχή της πορείας του, ο Άνθρωπος ήθελε να εξηγήσει τα φαινόμενα που συνέβαιναν γύρω του. Στην προσπάθεια του αυτή άρχισε να δημιουργεί μοντέλα βασισμένα είτε σε κάποια μεταφυσική δύναμη είτε σε κάποια φυσική τάξη που υπέθετε ότι υπάρχει στο σύμπαν. Τα μοντέλα αυτά, συχνά, οδηγούσαν σε νόμους που ερμήνευαν, ή ακόμη, προέβλεπαν τη Φύση. Αυτή η τεχνική ήταν που δημιούργησε την "Επιστήμη". Ωστόσο, τα αποτελέσματα των ερευνών δεν ήταν πάντα ρόδινα.

Κατά πάσα πιθανότητα, ο πρώτος που ήρθε

As known, Newton created the Law of Universal Gravitation. According to it, any object is falling towards Earth as well as the Earth is moving around the Sun because of a force, known as gravitational. The mathematic description of the force is:



Sir Isaac Newton and his book, "Philosophiae Naturalis Principia Mathematica"

$$\vec{F_g} = -G\frac{m_1 m_2}{r^2}\hat{r}$$

This law manages to explain (mathematically too) why the planets are moving around the Sun in elliptic orbits. However, in comparison to what we believe in school when we are taught this law, Newton didn't manage to find the motion equation of a body moving under gravity. Meaning, he didn't manage to find a law that predicts the position and the velocity of a body moving under the gravitational attraction of one or more others in any moment given its mass and the initial position and velocity.

The reason of this gap in the Law of Universal Gravitation is exactly the existence of Chaos. Newton, after solving approximately the system of two bodies moving under gravitation (e.g. the Earth motion around the Sun), considered easy the addition of more bodies. But, with the addition of one more body (for example the Moon in the Sun-Earth system) the system was not solvable. Newton quitted quite early without mentioning anything about this problem in his book "Philosophiae Naturalis Principia Mathematica" (Mathematical Principles of Physics Philosophy) where he expresses his opinions no Mechanics and Gravitation.

During the centuries, many scientists worked on the **"three body problem"** or, in its general name, the **"n body problem"**. Everyone thought that with a lot of imagination and a great lot of work, the problem would be

αντιμέτωπος με ένα πρόβλημα αδύνατο να λυθεί ήταν ο Άγγλος μαθηματικός και θεωρητικός φυσικός sir Isaac Newton (1642-1727). Ως γνωστόν, ο Newton ήταν αυτός που διατύπωσε το Νόμο της Παγκόσμιας Έλξης. Σύμφωνα με αυτόν, η πτώση των σωμάτων στη Γη αλλά και η κίνηση της Γης γύρω από τον Ήλιο οφείλονται σε μία δύναμη, γνωστή ως βαρυτική. Η μαθηματική περιγραφή αυτής της δύναμης είναι:

$$\vec{F_g} = -G\frac{m_1 m_2}{r^2}\hat{r}$$

Ο νόμος αυτός καταφέρνει να εξηγήσει (και μαθηματικά) γιατί οι πλανήτες κινούνται γύρω από τον Ήλιο σε ελλειπτικές τροχιές. Ωστόσο, σε αντίθεση με αυτό που νομίζουμε μαθαίνοντας το νόμο αυτό στο σχολείο, ο Newton δεν κατάφερε να βρει την εξίσωση κίνησης ενός σώματος που κινείται ως προς ένα ή περισσότερα άλλα υπό την επίδραση της βαρύτητας. Δηλαδή, δεν μπόρεσε να βρει ένα νόμο που να προβλέπει τη θέση και την ταχύτητα οποιουδήποτε σώματος κινούμενου υπό την έλξη άλλων σωμάτων κάθε χρονική στιγμή, αν είναι γνωστές η μάζα, η αρχική θέση και η αρχική ταχύτητα του.

Η αιτία αυτού του κενού στο Νόμο της Παγκόσμιας Έλξης είναι ακριβώς η ύπαρξη του Χάους. Ο Newton, λύνοντας προσεγγιστικά το σύστημα δύο σωμάτων που κινούνται υπό την επίδραση της βαρύτητας (π.χ. η κίνηση της Γης γύρω από τον Ήλιο), θεώρησε ότι το να προσθέσει οποιοδήποτε επιπλέον σώμα στο σύστημα θα ήταν απλό. Ωστόσο, με την προσθήκη ενός ακόμη σώματος (π.χ. της Σελήνης στο σύστημα Ήλιου-Γης) το σύστημα ήταν αδύνατο να λυθεί. Ο Newton άφησε σχετικά γρήγορα το πρόβλημα χωρίς να κάνει καμία αναφορά γι' αυτό στο βιβλίο του "Philosophiae Naturalis Principia Mathematica" (Μαθηματικές Αρχές της Φυσικής Φιλοσοφίας), στο οποίο διατυπώνει τις απόψεις για τη Μηχανική και τη Βαρύτητα.

Κατά το πέρασμα των αιώνων, πολλοί επιστήμονες ασχολήθηκαν με το **"πρόβλημα των τριών σωμάτων"** ή, solved, as the "two body problem" was. No one was ready to admit that the world we live is not working like a well-tuned clock, as Newton's laws were ordering. But, Nature is far more complex than we think.

In the late 1980's, king Oscar II of Sweden (1829-1907) put to scientists from all over the world four problems suggested by German mathematician Karl Weierstrass (1815-1897). Anyone who would manage to solve one of them until the 21st January 1889 (60th birthday of the king) would not only win a great monetary prize (2,500 crowns) but also a golden medal, the publication of his solution and (of course) glory. One of the four problems was the following:

"*Given a system of arbitrarily many mass points that attract each according to Newton's law, under the assumption that no two points ever collide, try to find a representation of the coordinates of each point as a series in a variable that is some known function of time and for all of whose values the series converges uniformly.*"

Actually, the scientists are asked to solve an n body system: to find the motion equations of n bodies in the three-dimension space under the attraction of gravity and prove that this system is stable (it is not changing despite any disorders). This was the problem the French mathematician, theoretical physicist and science philosopher Henri Poincaré (1854-1912) decided to solve.


Henri Poincaré

Poincaré immediately understood that the problem had to be limited, ending in the three body problem Newton was not able to solve. After that, he studied the orbits of the (three now) planets in the phase space, a space where the coordinates are not given by the position and the time, but by the moment (mass multiplied by velocity) and the posi-

όπως ονομάστηκε στη γενική του περιγραφή, με "το πρόβλημα των n σωμάτων". Όλοι υπέθεταν ότι με πολλή επινοητικότητα και μετά από αρκετή δουλειά, το πρόβλημα αυτό θα λυνόταν όπως και το προγονικό του "πρόβλημα των δύο σωμάτων". Κανένας δεν μπορούσε να δεχτεί ότι το σύμπαν δε λειτουργούσε όπως καλοκουρδισμένο ρολόι, όπως προέβλεπαν οι Νόμοι του Newton. Όμως, η Φύση είναι συχνά πιο πολύπλοκη απ' ότι τη φανταζόμαστε.

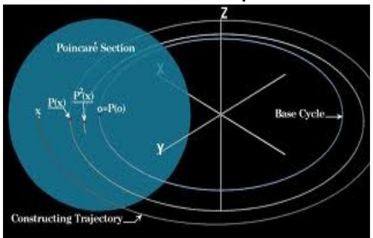
Στα τέλη της δεκαετίας του 1890, ο Βασιλιάς Oscar II της Σουηδίας (1829-1907) αναθέτει στους επιστήμονες ολόκληρου του κόσμου τέσσερα προβλήματα που του προτείνει ο Γερμανός μαθηματικός Karl Weierstrass (1815 -1897). Όποιος κατάφερνε να λύσει ένα από αυτά μέχρι την 21η Ιανουαρίου του 1889 (ημέρα των εξηκοστών γενεθλίων του βασιλιά) θα κέρδιζε εκτός του χρηματικού επάθλου (2.500 σουηδικές κορόνες), ένα χρυσό μετάλλιο, την έκδοση της λύσης και (φυσικά) δόξα. Ένα από τα τέσσερα προβλήματα είχε την παρακάτω εκφώνηση:

"*Δοσμένου ενός συστήματος αυθαίρετα πολλών υλικών σημείων που έλκονται σύμφωνα με τους νόμους του Newton, και υποθέτοντας ότι κανένα δε συγκρούεται με τα υπόλοιπα, προσπαθήστε να βρείτε μία αναπαράσταση των συντεταγμένων κάθε σημείου ως σειρά μεταβλητών που είναι γνωστές συναρτήσεις του χρόνου και για όλες αυτές το σύστημα να συγκλίνει ομοιόμορφα.*"

Ουσιαστικά, ζητείται από τους επιστήμονες να λύσουν ένα σύστημα n σωμάτων: να βρουν τις εξισώσεις κίνησης n σωμάτων στον τρισδιάστατο χώρο υπό την επίδραση της βαρύτητας και να αποδείξουν ότι το σύστημα αυτό είναι ευσταθές (δε μεταβάλλεται παρά τις τυχόν διαταραχές ή μετατοπίσεις ενός σώματος σε αυτό). Αυτό το πρόβλημα ήταν που αποφάσισε να λύσει ο Γάλλος μαθηματικός, θεωρητικός φυσικός και φιλόσοφος Henri Poincaré (1854-1912).

Ο Poincaré κατάλαβε αμέσως ότι το πρόβλημα έπρεπε να περιοριστεί, καταλήγοντας στο πρόβλημα των τριών tion. In this study, Poincaré showed his genius by setting one of the bodies' mass much less than the others' (limitation of the problem) and then by studying only a small part of the phase space each time instead of the full orbit.

The second step was abolishing. Poincaré was using a plane right to the orbits of the three bodies (known as Poincaré map) and was noting on it the spot of a body crossing the plane there. In a plane like this is easy to find the periodic and the non-periodic orbits, depending on whether the spots are repeated after some time or not.



Representation of "Poincaré Map" for material points moving on circular orbits.

Αναπαράσταση της "Τομής Poincaré" για υλικά σημεία που κινούνται σε κυκλικές τροχιές

With this tool, Poincaré believed he would manage to prove the stability of such a system. And, indeed, after many efforts he did it, deposing to the scientific committee the king Oscar II had chosen a 200-pages solution. The paper had such an impact towards the committee members, that Poincaré was awarded the prize immediately and many thought of suggesting him for the Nobel prize.

However, Swedish mathematician Edvard Phragmén (1863-1937) found a mistake in the solution. Its print in Acta Mathematica journal stopped immediately and Poincaré turned again to the problem. This time the result was the opposite: not only the n body system was not stable but it gave the most paradox solutions the French mathematician had ever seen.

Chaos had made his first timid appear on the scientific stage.

σωμάτων, το οποίο δεν είχε καταφέρει να λύσει ο Newton. Στη συνέχεια, μελέτησε τις τροχιές των (τριών πλέον) πλανητών στο χώρο των φάσεων, ένα χώρο όπου οι συντεταγμένες δε δίνονται από τη θέση και το χρόνο αλλά από την ορμή (γινόμενο ταχύτητας και μάζας) και τη θέση. Στη μελέτη του αυτή ο Poincaré απέδειξε τη μεγαλοφυΐα του, αρχικά θέτοντας τη μάζα του ενός σώματος μικρότερη από τη μάζα των άλλων δύο (περιορισμός του προβλήματος) και στη συνέχεια μελετώντας μόνο ένα μικρό τμήμα του χώρου των φάσεων κάθε φορά αντί για ολόκληρη την τροχιά.

Το δεύτερο αυτό βήμα ήταν και καταλυτικό. Ο Poincaré χρησιμοποιούσε ένα επίπεδο κάθετο στην τροχιά των σωμάτων (γνωστό ως "Τομή Poincaré") και σημείωνε πάνω σ' αυτό το στίγμα ενός σώματος όταν αυτό διερχόταν από εκεί. Σε ένα τέτοιο επίπεδο είναι εύκολο να εντοπίσεις τις περιοδικές ή τις μη περιοδικές τροχιές, ανάλογα με το αν επαναλαμβάνονταν ή όχι τα στίγματα.

Με αυτό το εργαλείο ο Poincaré πίστεψε ότι θα κατάφερνε να αποδείξει την ευστάθεια ενός τέτοιου συστήματος. Κι όντως, μετά από αρκετές προσπάθειες τα κατάφερε, καταθέτοντας στην επιτροπή που όρισε ο βασιλιάς Oscar II μια εργασία 200 σελίδων. Η εργασία έκανε τέτοια εντύπωση που ο Poincaré κέρδισε αμέσως το βραβείο και πολλοί θέλησαν να τον προτείνουν για Nobel.

Όμως, ο Σουηδός μαθηματικός Edvard Phragmén (1863-1937) ανακάλυψε ένα σφάλμα στην εργασία. Η τύπωση της λύσης στο περιοδικό Acta Mathematica σταμάτησε αμέσως και ο Poincaré ξαναστράφηκε στο πρόβλημα. Το αποτέλεσμα αυτή τη φορά ήταν το εντελώς ανάποδο: το σύστημα των n σωμάτων όχι μόνον δεν ήταν ευσταθές αλλά παρουσίαζε τις πιο παράδοξες λύσεις που είχε δει ποτέ ο Γάλλος μαθηματικός.

Το Χάος είχε κάνει την πρώτη δειλή εμφάνισή του στη σκηνή της επιστήμης.

Σύννεφα και Στροβιλισμοί: Το Χάος ξαναχτυπά!

Χρειάστηκε να περάσουν εβδομήντα

Clouds and Turbulence: Chaos strikes back!

Almost seventy years were needed to pass until the scientific research would turn again to Chaos. One of the pioneers on the matter was the American mathematician and meteorologist Edward Lorenz (1917-2008). Lorentz had created on his computer a "game" about the weather he had built a digital universe whose laws he was able to control and which was simulating (quite realistically) the atmosphere of Earth. Every minute the computer was typing on a page a series of numbers that were describing the weather of one day. The worthy of noticing in all this "game" was that no one of the phenomena was repeated.

Edward Lorenz

In fact, Lorenz set a universe whose weather was evolving according to time. He was using Newton's laws so that everything works perfectly. But, actually, Lorenz himself was using a form of "ordered disorder" to give his weather the changeable form of the real weather. That way every phenomenon of the weather could be compared with circles repeated again and again without, though, being the same.

The computer, as mentioned, printed on a page a series of numbers describing the weather. Those numbers, for space saving, had three decimals (e.g. 0,506), while the computer made calculations using numbers with six decimals (0,506127). Once, Lorenz wanted to reexamine a long attendance of weather phenomena. Instead of starting the same proceeding from the beginning (insuring he would have all the previous steps with accuracy), he inserted to the computer the numbers he had from the previous time (losing the accuracy of the last three decimals) and began the proceeding from the middle.

The result was a weather that, after some time, had nothing in common with

περίπου χρόνια για να ξαναστραφεί η επιστημονική έρευνα προς το Χάος. Ένας από τους πρωτοπόρους του είδους ήταν ο Αμερικανός μαθηματικός και μετεωρολόγος Edward Lorenz (1917-2008). Ο Lorenz είχε κατασκευάσει στον υπολογιστή του ένα "παιχνίδι" με τον καιρό: είχε δημιουργήσει ένα ψηφιακό σύμπαν του οποίου τους νόμους μπορούσε να ρυθμίζει ο ίδιος και το οποίο προσομοίωνε (αρκετά ρεαλιστικά) τη γήινη ατμόσφαιρα. Κάθε λεπτό ο υπολογιστής τύπωνε σε μια σελίδα μία σειρά αριθμούς που περιέγραφαν τον καιρό μίας ημέρας. Το αξιοπερίεργο σε όλο αυτό το "παιχνίδι" ήταν ότι κανένα φαινόμενο δεν επαναλαμβανόταν.

Στην ουσία, ο Lorenz είχε σκηνοθετήσει ένα σύμπαν του οποίου ο καιρός μεταβαλλόταν συναρτήσει του χρόνου. Χρησιμοποιούσε τους νόμους του Newton ώστε τα πάντα να δουλεύουν στην εντέλεια. Στην πραγματικότητα, όμως, ο ίδιος ο Lorenz χρησιμοποιούσε μία μορφή "τακτικής αταξίας" για να δώσει στον καιρό του την ευμετάβλητη μορφή του πραγματικού καιρού. Έτσι, κάθε καιρικό φαινόμενο μπορούσε να παρομοιαστεί με κύκλους οι οποίοι επαναλαμβάνονταν χωρίς όμως να είναι απολύτως ίδιοι.

Ο υπολογιστής, όπως αναφέρθηκε, τύπωνε σε μία σελίδα μία σειρά αριθμών που περιέγραφαν τον καιρό. Οι αριθμοί αυτοί είχαν, για οικονομία χώρου, τρία δεκαδικά ψηφία (π.χ. 0,506) ενώ στην πραγματικότητα ο υπολογιστής έκανε υπολογισμούς με αριθμούς που είχαν έως έξι δεκαδικά (π.χ. 0,506127). Κάποια στιγμή, ο Lorenz θέλησε να επανεξετάσει μία ακολουθία μεγάλου μήκους. Αντί, λοιπόν, να ξεκινήσει την προηγούμενη διαδικασία από την αρχή (εξασφαλίζοντας με ακρίβεια όλα τα προηγούμενα βήματα) πέρασε στον υπολογιστή τους αριθμούς που είχαν προκύψει την προηγούμενη φορά (χάνοντας την ακρίβεια των τριών τελευταίων δεκαδικών) και ξεκίνησε τη διαδικασία από τη μέση. Το αποτέλεσμα ήταν ένας καιρός που με το πέρασμα του χρόνου δεν είχε καμία the weather he examined before. The difference in the three last decimals (infinitely small for our approaches) caused with the passing of time a great change in the weather and made Lorenz shout: **"A butterfly flying in Brazil can cause a typhoon in Texas!"**

After the first shock, Lorenz continued his work in such systems with non-linear equations (equations that express relations with non-severe proportion). He noticed behaviors similar to these in the liquid turbulence. He also studied a certain waterwheel, a system composed by a wheel and small pots hanging on its perimeter. Each pot has a small hole in its bottom and from above the wheel drips water on a stable order. When the water drips slowly the pot that is above all does not fill because of the hole

If the water drips a little quicklier, the weight of the pots is dragging it down making the wheel to turn. In the water drips very quickly, the heaviest pots go down before the empty and the wheel is turning once to one trend and once to the other

Lorenz discovered that things were infinitely more complex.

Using those three equations (with three variables), Lorenz was able to describe fully the motion of the system.

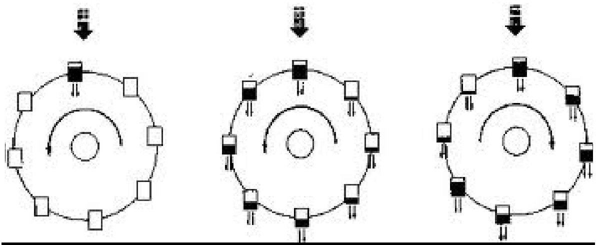
$$\frac{dx}{dt} = \sigma(y - x)$$

$$\frac{dy}{dt} = x(\rho - z) - y$$

$$\frac{dz}{dt} = xy - \beta z$$

Using the triad of numbers resulting from these three equations for a certain moment as coordinates in a three-dimension phase space, Lorenz attempted to make a diagram of the motion he was working on. The result made him famous: a figure infinity complex that looked like a butterfly wings or an owl eyes, the Lorenz Attractor.

Lorenz's job was continued by the American theoretical biologist Robert May. In the early



Lorenz's Waterwheel: on the left and on the center, when the water runs with stable and low velocity, and on the right, when the water runs with high velocity

Ο Υδροτροχός του Lorenz: στα αριστερά και το κέντρο, όταν το νερό τρέχει με σταθερή και χαμηλή ταχύτητα, και στα δεξιά, όταν το νερό τρέχει με υψηλή ταχύτητα

σχέση με τον καιρό που προέκυψε την προηγούμενη φορά. Η διαφορά στα τρία τελευταία ψηφία (απειροελάχιστα μικρή στις προσεγγίσεις μας) προκάλεσε με την πάροδο του χρόνου τεράστια αλλαγή και έκανε το Lorenz να αναφωνήσει:

"Το πέταγμα μιας πεταλούδας στη Βραζιλία μπορεί να προκαλέσει έναν τυφώνα στο Τέξας."

Μετά το πρώτο σοκ, ο Lorenz συνέχισε να δουλεύει σε αντίστοιχα συστήματα με μη γραμμικές εξισώσεις (εξισώσεις που εκφράζουν σχέσεις μη αυστηρής αναλογίας). Παρατήρησε αντίστοιχες συμπεριφορές με τον καιρό στο στροβιλισμό των ρευστών. Επίσης, μελέτησε ένα είδος υδροτροχού, ενός συστήματος που αποτελείται από έναν τροχό με δοχεία κρεμασμένα κατά μήκος της περιμέτρου του. Τα δοχεία έχουν μια μικρή τρύπα και από πάνω στάζει με σταθερό ρυθμό νερό. Καθώς το νερό στάζει, το δοχείο που βρίσκεται πιο ψηλά δε γεμίζει καθώς αδειάζει αμέσως λόγο της τρύπας. Αν το νερό στάζει λίγο πιο γρήγορα, το βάρος των δοχείων τα παρασέρνει προς τα κάτω κι ο τροχός γυρνάει. Αν δε το νερό στάζει πολύ γρήγορα, τα πιο βαριά δοχεία πάνε κάτω με αποτέλεσμα ο τροχός να γυρνάει πότε προς τη μία πλευρά και πότε προς την άλλη. Όμως, ο Lorenz ανακάλυψε πως τα πράγματα ήταν απείρως πολυπλοκότερα.

Χρησιμοποιώντας αυτές τις τρεις

1970's May studied the increase of populations in an ecosystem as a result of the food granting by the area. He noticed that the equation he created showed a certain periodicity that after some time was became unpredictable.

May continued his work on ecosystems and this way came to the result that every system tracing regular periods has the possibility to end up in a disordered (chaotic in other words) evolution. Thanks to his research, the point where a dynamical system is passing to Chaos was accurately determined.

Since then, Chaos Theory has found applications in many sciences. Most characteristic examples are Economy and Astronomy.

In Economy, and mostly in Microeconomics (that studies isolated economic subjects or businesses), Chaos has made a very dynamic entrance. Since 1970's, many economists and mathematicians are reexamining a lot of economic theories under the prism of the new science. The result was the creation of new econometric techniques able to explain and predict the falling or rising of shares in the markets. For example, the dramatic changes in the Chinese markets the last year are explained through the butterfly effect.

In Astronomy, and specifically in Celestial Mechanics, whose place of studies are the orbits of the celestial bodies (e.g. comets), and in Dynamic Astrophysics, which is interested on the motion and the forces between celestial objects in great body clusters (e.g. planetary systems, galaxies, nebulae), Chaos is the basic research field. It is notable that there is now a new and more probable destruction-of-the-world theory. Because the solar system is, as mentioned, unstable, the planets, especially the small ones (Mercury, Venus, Earth, Mars), are in orbits we cannot predict for more than 100.000.000 years (approximately). Some are suggesting that they will leave their orbit destroying the sensitive balance of the solar system far before the collapse of the Sun (the second most probable destruction scenario).

εξισώσεις (με τρεις μεταβλητές), ο Lorenz μπορούσε να περιγράψει πλήρων την κίνηση ενός τέτοιου συστήματος.

$$\frac{dx}{dt} = \sigma(y - x)$$

$$\frac{dy}{dt} = x(\rho - z) - y$$

$$\frac{dz}{dt} = xy - \beta z$$

Χρησιμοποιώντας την τριάδα των αριθμών που προέκυπταν σε μια συγκεκριμένη χρονική στιγμή από τις τρεις εξισώσεις ως τριάδα συντεταγμένων στον τρισδιάστατο χώρο των φάσεων, ο Lorenz αποπειράθηκε να φτιάξει ένα διάγραμμα την κίνησης που μελετούσε. Το αποτέλεσμα τον έκανε πασίγνωστο: ένα σχήμα απείρως πολύπλοκο που θύμιζε φτερά πεταλούδας ή μάτια κουκουβάγιας, ο Ελκυστής Lorenz.Τη δουλειά του συνέχισε ο Αμερικανός θεωρητικός βιολόγος Robert May. O May στις αρχές τις δεκαετίας του 1970 μελετούσε την αύξηση των πληθυσμών ενός είδους σε ένα οικοσύστημα συναρτήσει της παροχής φαγητού. Παρατήρησε ότι η εξίσωση που είχε κατασκευάσει για τη μελέτη του παρουσίαζε μία συγκεκριμένη περιοδικότητα η οποία όμως μετά από κάποιο χρόνο γινόταν απρόβλεπτη.

Ο May συνεχίζοντας να δουλεύει πάνω σε οικοσυστήματα με αντίστοιχο τρόπο αντιλήφθηκε ότι κάθε σύστημα που διαγράφει κανονικές περιόδους έχει την πιθανότητα να καταλήξει σε απρόβλεπτη (δηλαδή χαοτική) εξέλιξη. Χάρη στις έρευνές του, μάλιστα, προσδιορίστηκε με ακρίβεια το σημείο στο οποίο ένα δυναμικό σύστημα περνάει στο Χάος.

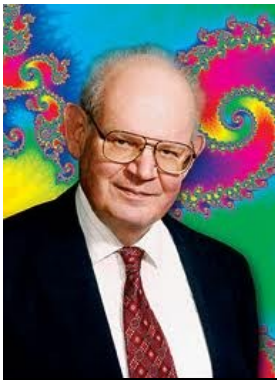
Από τότε, η Θεωρία του Χάους έχει βρει εφαρμογές σε πολλές επιστήμες. Χαρακτηριστικότερα παραδείγματα η Οικονομία και η Αστρονομία.

Στην Οικονομία, και ειδικότερα στη Μικροοικονομία (που έχει σημείο εφαρμογής μεμονωμένα οικονομικά υποκείμενα ή επιχειρήσεις), το Χάος έχει κάνει δυναμικά

Maps, Computers and Shares: Fractals everywhere!

Almost the same period, French-American mathematician Benoit Mandelbrot (1924-2010) began to discover a certain proportion by studying accidental and unpredictable alterations (similar to those studied by Lorenz).

Mandelbrot's interest in Chaos began when he was studying the changes in the price of cotton in several markets (London, New York, etc.). According to the then prevalent theories, the small and temporary changes in the prices had no affection on the big alterations. Everybody's belief was that small changes happen accidentally, without affecting the total. Mandelbrot, although, dove deeper in the matter studying not only the prices, but the scale they were moving.



Benoit Mandelbrot

After careful research, he realized that, although the changes of the prices were accidental (as all economists were suggesting), the curves of these changes respective to the time were following certain proportions: the curves representing the daily alteration of prices were the same as those representing the monthly or the annual. Mandelbrot had found a sort of order among irregular series of numbers.

That was only the beginning of the revolution that followed. More and more researches lead to the conclusion that Nature is not as regular or Euclidian we think it is, neither is it described by fully logic laws, like those of Newton. Small changes can alter fully a situation that appeared static and immutable. Every system, natural (e.g. the population of a species in an ecosystem) or human-born (e.g. the fluctuation of shares in the markets), shows great complexity. The material itself, in great enlargement, shows abnormalities that have nothing to do with
την εμφάνισή του. Από το 1970, πολλοί οικονομολόγοι και μαθηματικοί έχουν αρχίσει να εξετάζουν πολλές οικονομικές θεωρίες υπό το πρίσμα της νέας επιστήμης. Αποτέλεσμα ήταν η δημιουργία νέων τεχνικών οικονομετρία που μπορούν να εξηγήσουν και να προβλέψουν την κίνηση των μετοχών στις αγορές. Για παράδειγμα, οι δραματικές αυξομειώσεις στις αγορές της Κίνας τα τελευταία χρόνια εξηγούνται μέσω του φαινομένου της πεταλούδας.

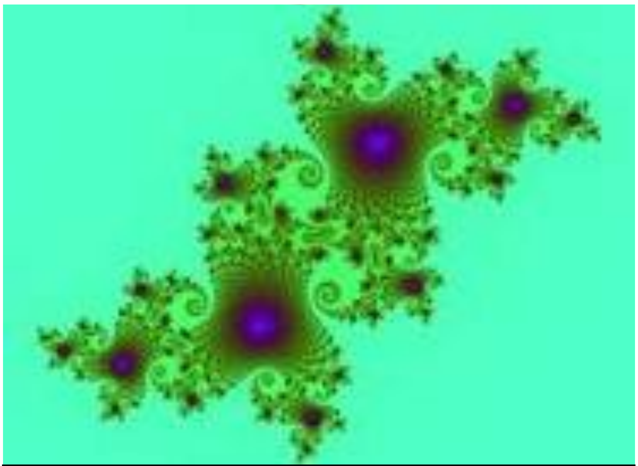
Στη δε Αστρονομία, και συγκεκριμένα στην Ουράνια Μηχανική, που ασχολείται με τις τροχιές των ουράνιων σωμάτων (π.χ. κομητών) οι οποίες συχνά δίνουν "άστατες" λύσεις, και στη Δυναμική Αστροφυσική, που ασχολείται με την κινηματική και τη δυναμική των συστημάτων των ουράνιων σωμάτων (π.χ. πλανητικών συστημάτων, γαλαξιών, νεφελωμάτων), το Χάος είναι ο βασικός τόπος ερευνών. Αξιοσημείωτο είναι ότι έχει εμφανιστεί μία νέα και πιθανότερη εκδοχή της συντέλειας του (δικού μας) κόσμου. Καθώς το ηλιακό μας σύστημα είναι ασταθές, όπως προαναφέρθηκε, οι πλανήτες, και ειδικότερα οι μικροί (Ερμής, Αφροδίτη, Γη, Άρης) εκτελούν τροχιές τις οποίες δεν μπορούμε να προβλέψουμε για πάνω από 100.000.000 χρόνια. Κάποιοι υποστηρίζουν ότι θα φύγουν από την τροχιά τους καταστρέφοντας τη λεπτή ισορροπία του ηλιακού συστήματος πολύ πριν καταρρεύσει ο Ήλιος (το δεύτερο πιθανότερο σενάριο καταστροφής).

Χάρτες, Υπολογιστές και Μετοχές: Fractals παντού!

Την ίδια περίπου περίοδο, ο Γάλλο-Αμερικάνος μαθηματικός Benoit Mandelbrot (1924-2010) άρχισε να ανακαλύπτει μία συγκεκριμένη αναλογία μελετώντας τυχαίες και απρόβλεπτες μεταβολές (αντίστοιχες αυτών που μελετούσε ο Lorenz).

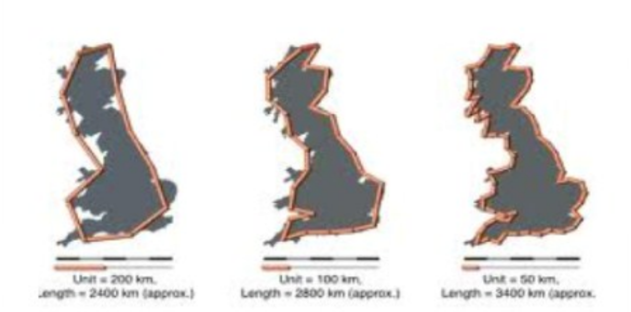
Ο Mandelbrot ξεκίνησε να ενδιαφέρεται για το Χάος μελετώντας τις μεταβολές των τιμών του ing in common with the geometry we know but follow completely Mandelbrot's ideas.

A new geometry began to take form. Its name: Fractal Geometry. Its figures (Fractals)



Two Fractals: on the right the Julia Set and on the left a natural fractal resulting from the mutual reflection of three balls

Δύο Fractals: στα δεξιά το Σύνολο Julia και στα αριστερά ένα φυσικό fractal που προκύπτει από την αμοιβαία αντανάκλαση τριών σφαιρών



Fractals use for cartography of the coastline of Great Britain

Χρήση Fractals για τη χαρτογράφηση της ακτογραμμής της Μεγάλης Βρετανίας

occupied with their colours and their beauty, the majority of the papers of the corresponding publications. Their main characteristics are the complexity and the self-similarity (stable proportions appeared under enlargement). The most interesting, however, is that the scientists working on this field started to see it everywhere. The Fractal Geometry, they said, is the geometry of Nature.

μπαμπακιού σε διάφορες αγορές (του Λονδίνου, της Ν. Υόρκης, κτλ). Σύμφωνα με τις μέχρι τότε επικρατούσες θεωρίες, οι μικρές και προσωρινές μεταβολές των τιμών δεν σχετίζονταν με τις μεγάλες. Η πεποίθηση όλων ήταν ότι οι μικρές αλλαγές γίνονται τυχαία, χωρίς να επηρεάζουν το σύνολο. Ωστόσο, ο Mandelbrot εμβάθυνε στο θέμα μελετώντας όχι μόνον τις τιμές αλλά και τις κλίμακες στις οποίες αυτές κινούνταν.

Έπειτα από προσεκτική έρευνα, αντιλήφθηκε πως, παρότι οι μεταβολές των τιμών ήταν τυχαίες (όπως υποστήριζαν και οι οικονομολόγοι), οι καμπύλες των μεταβολών ως προς το χρόνο ακολουθούσαν συγκεκριμένες αναλογίες: οι καμπύλες της ημερήσιας μεταβολής των τιμών συνέπιπταν με καμπύλες της μηνιαίας ή της ετήσιας μεταβολής. Ο Mandelbrot είχε βρει ένα είδος τάξης μέσα στις τυχαίες σειρές των τιμών.

Αυτή ήταν μόνον η αρχή της επανάστασης που επακολούθησε. Όλο και περισσότερες έρευνες οδηγούσαν στο εξής συμπέρασμα ότι η Φύση δεν είναι ομαλή ή ευκλείδεια, όπως τη φανταζόμαστε, ούτε περιγράφεται με πλήρως λογικούς νόμους, όπως αυτοί του Newton. Οι μικρές μεταβολές μπορούν να αλλάξουν τελείως μία κατάσταση που φάνταζε στατική και αμετάβλητη. Κάθε σύστημα, φυσικό (π.χ. ο πληθυσμός ενός είδους σε ένα οικοσύστημα) ή ανθρωπογενές (π.χ. η διακύμανση των τιμών στις αγορές), παρουσιάζει μεγάλη πολυπλοκότητα. Η ύλη, σε μεγάλη μεγέθυνση, παρουσιάζει ανωμαλίες που ουδεμία σχέση έχουν με τη γνωστή μας γεωμετρία αλλά υπακούουν απόλυτα στη λογική του Mandelbrot.

Μια νέα γεωμετρία άρχισε να παίρνει μορφή. Το όνομα αυτής: Fractal (Μορφοκλασματική). Τα σχήματά της (μορφοκλασματικά σύνολα ή Fractals) καταλάμβαναν, με τα χρώματα και την ιδιαίτερη ομορφιά τους, τις περισσότερες σελίδες των αντίστοιχων δημοσιεύσεων.

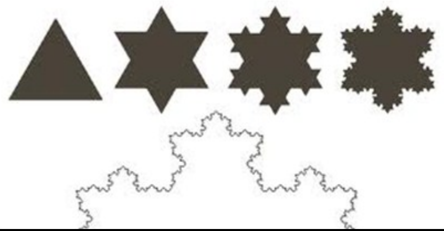
The Chaos was now the leading star on the stage.

One of the most characteristic examples of the Fractals use is the cartography.

A map (like the map of Great Britain) presents several points (like the coastlines) which do not follow the usual methods of counting lengths and surfaces.

They have infinitely great complexity and the only way of counting the precisely is the continuing division of our measure units: from kilometres to metres, from metres to millimetres. But, if we use a specific Fractal, that has the ability to repeat its figure in every enlargement, the problem becomes clearly easier.

The realistic representation of natural formations, like the three-dimension shape of a mountain, also demands figures not belonging to our familiar (Euclidian) geometry. So, the computers are using certain Fractals (that era dividing to smaller, similar to the original, figures) in order to give images similar to the real.



Koch Curve, one of the most characteristic fractals, that presents, under constant division, figures similar to the primitive

Η Καμπύλη Koch, ένα από τα πιο χαρακτηριστικά fractals, το οποίο εμφανίζει, μέσω συνεχών διαιρέσεων, εικόνες ίδιες με την αρχική

Even the nature of matter itself presents great complexity. Enlarging to a smooth surface, we will find out it is not smooth at all. On the contrary, it is rough and possesses a Fractal form, as the molecules are put together disorderly but with a stable scale proportion. The same happens with the snowflakes and the branching out of the nerves.

Today, the Fractals are used even in therapies for the Parkinson disease.

Χαρακτηριστικά τους η περιπλοκότητα και η αυτό-ομοιότητα (σταθερές αναλογίες που εμφανίζονται υπό μεγέθυνση).

Το πιο ενδιαφέρον, όμως, ήταν ότι οι επιστήμονες που ασχολούνταν με αυτά άρχισαν να τα βλέπουν παντού. Η Μορφοκλασματική Γεωμετρία, είπαν, είναι η γεωμετρία της Φύσης.

Το Χάος ήταν επιτέλους ο πρωταγωνιστής της παράστασης.

Από τα χαρακτηριστικότερα παραδείγματα εφαρμογής των Fractals είναι η χαρτογράφηση. Ένας χάρτης (όπως ο χάρτης της Μ. Βρετανίας) παρουσιάζει στοιχεία (π.χ. οι ακτογραμμές) τα οποία δε μοιάζουν να υπακούουν στους κανόνες της μέτρησης μηκών (ή εμβαδών) που χρησιμοποιούμε. Εμφανίζουν άπειρη πολυπλοκότητα και ο μόνος τρόπος ακριβούς μέτρησής τους είναι η συνεχής διαίρεση των μονάδων μέτρησής μας: από χιλιόμετρα σε μέτρα, από μέτρα σε χιλιοστά, κτλ. Αν, όμως, χρησιμοποιήσουμε ένα κατάλληλο Fractal, το οποίο έχει την ιδιότητα να επαναλαμβάνεται με κάθε διαίρεση, το πρόβλημα σαφώς γίνεται πιο απλό.

Η ρεαλιστική απεικόνιση περίπλοκων φυσικών σχηματισμών, όπως η τρισδιάστατη δομή ενός βουνού, απαιτεί επίσης σχήματα που δεν εμπίπτουν στη γνωστή μας (ευκλείδεια) γεωμετρία. Έτσι, οι υπολογιστές χρησιμοποιούν κατάλληλα Fractals (που διαιρούνται σε μικρότερα, όμοια με το αρχικό, σχήματα) για να δώσουν εικόνες όμοιες των πραγματικών.

Η φύση της ίδιας της ύλης παρουσιάζει άπειρη πολυπλοκότητα. Καθώς εμβαθύνουμε σε μία λεία επιφάνεια θα δούμε ότι δεν είναι καθόλου λεία. Απεναντίας, είναι τραχιά και εμφανίζει μία fractal δομή, καθώς τα μόρια της διατάσσονται άτακτα αλλά υπό σταθερή αναλογία κλίμακας. Το ίδιο συμβαίνει και με τις νιφάδες του χιονιού και με τις διακλαδώσεις των νεύρων.

Σήμερα τα Fractals χρησιμοποιούνται ακόμη και σε θεραπείες για τη νόσο του Parkinson.

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My Venus

Dear passengers, welcome on board of our spacecraft Venus! Please fasten your seat belts and enjoy your flight.

When I saw you in the sky,
all the people passing by
fell In love with you,
my Venus

When I'm riding my bike,
When I'm going to my school,
I will think about you,
my Venus

When I'm riding my bike,
When I'm going to my school,
I will dream about you,
my Venus

When I'm riding my bike,
When I'm going to my school,
I will sing about you,
my Venus
Na, na, na, ...

All the children of the world
And the people all around,
They will sing about you,
my Venus
All the children of the world
And the people all around,
They will dream about you,
my Venus!

<u>Chorus:</u>
We will sing,
We will cry,
We will dream,
We will fly
To Venus

We will dream, We will fly
Like a bird In the sky
To Venus,
Oh, Venus!

Dear passengers, we have just landed Venus. The temperature outside is 480 degrees centigrade. Welcome to our planet!

Na na na…ya

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Include in your mail:

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- **article in your mother tongue;**
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