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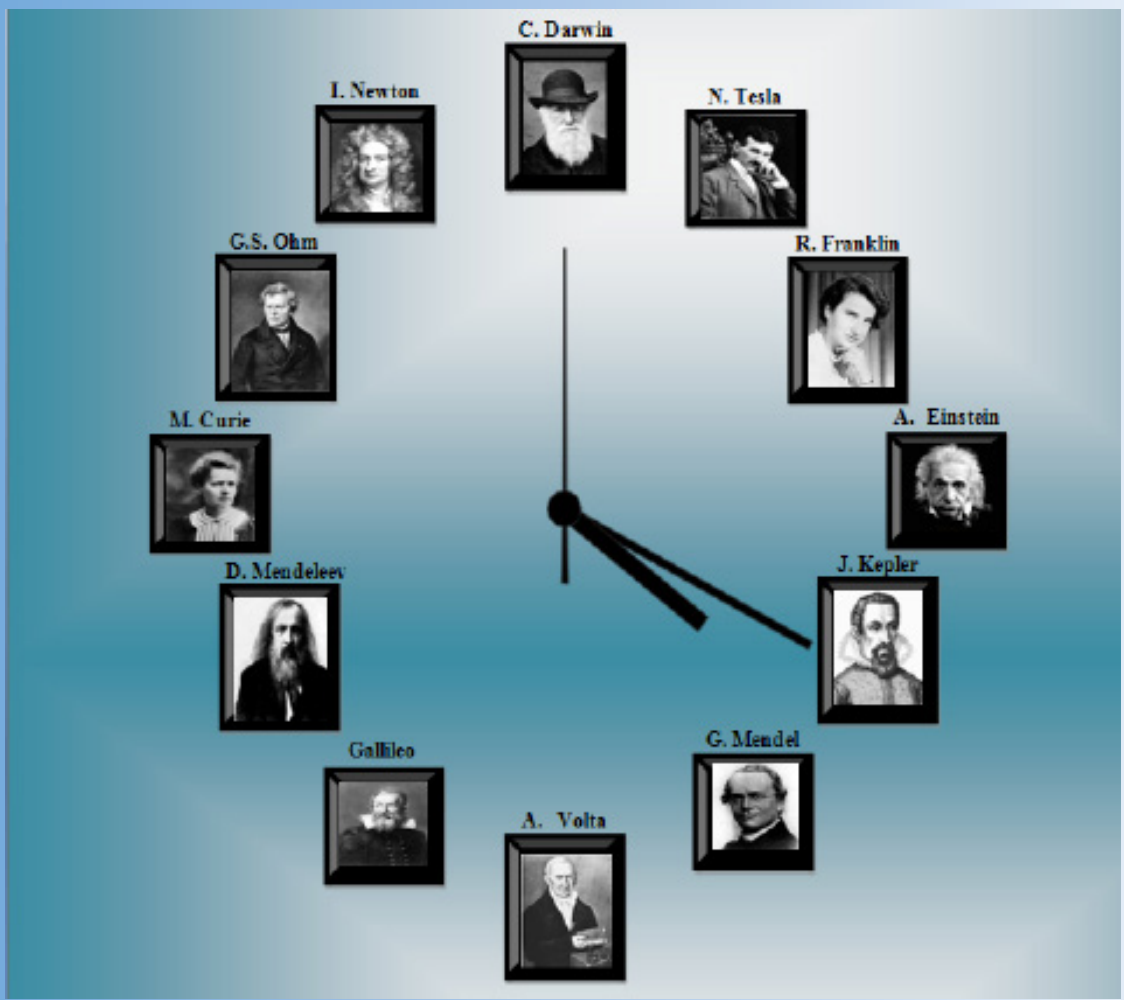
EUROPEAN PUPILS MAGAZINE



History of Science and Technology

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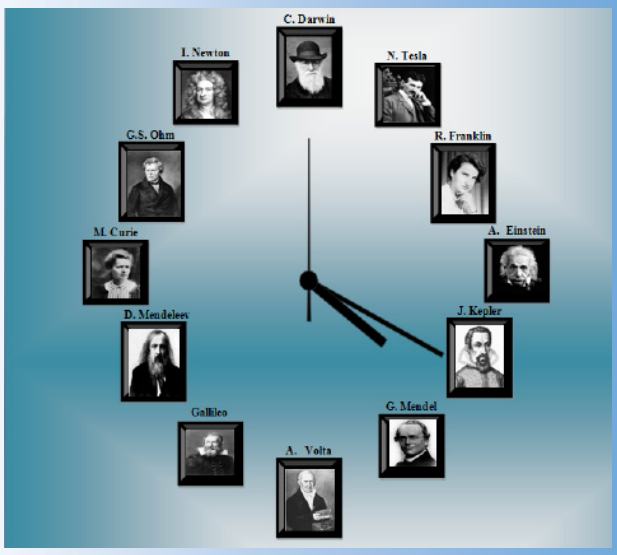

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History of Science and Technology

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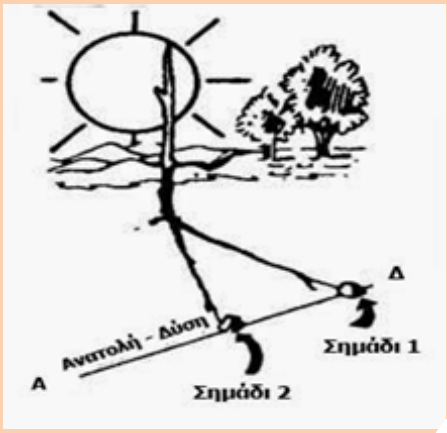
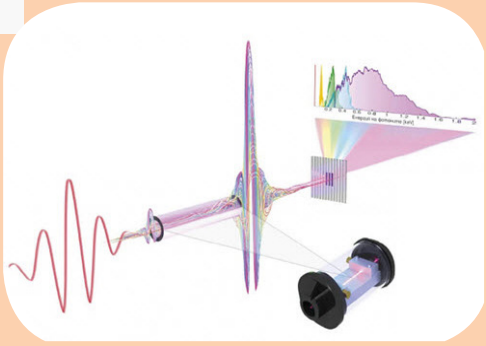
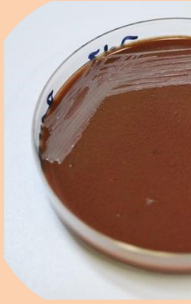
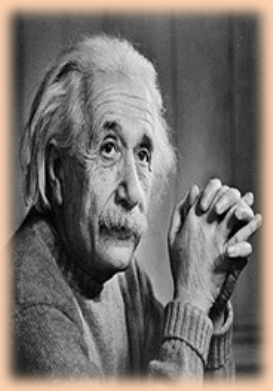






EDITORIAL

GENERAL



FUN PAGES

EDITORIAL

From the smallest to the biggest...

by Nikolaos Chatzarakis
Student of Physics Dept., Aristotle University of Thessaloniki

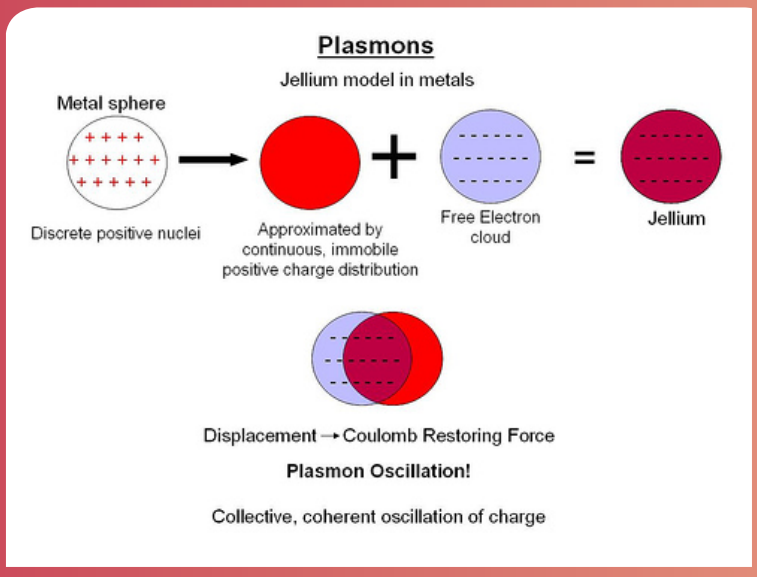
Dear Readers,

The summer is over for quite some time and thus your experience of waves must be really diminished. However, it is certain that this complex repeated motion of theirs could enchant everyone – even those who are not attracted or … to Physics or Mathematics.

As you have probably heard, it is the small every-day things that inspire the greatest ideas. Many scientists have conceived the solution to extremely difficult problems or developed radical new theories, just by looking around them while walking at the park. Besides, the urban legend that wants Isaac Newton forming the Law of Universal Attraction after he received a falling apple on his head, is very well-known. So, what kind of idea, that faces such a success in our days, could those little waves have given birth to?

Let us imagine that inside a metal, the atoms are standing still in certain positions, creating the so called Bravais lattice. They are bound together through metallic bonds. In order these bonds to be created, the atoms have been ionized "throwing away" one or more of their electrons. As a result, the electrons that leave the atoms are moving freely between the unmoved ions. It is this motion of free electrons that gives to metals their electric properties and identifies them as electrical conductors. In 1920's, P.A.M. Dirac, who had already studied the physical properties of en electron gas, according to the Fermi-Dirac statistical distribution, proposed that electrons could form a "sea" on the surfaces of the crystal – this sea was called "electron sea" or "Dirac sea".

It only needs a little imagination for someone in order to think that, as in a real sea, there are waves in this one too. To be specific, the waves are nothing more than oscillating electron states in the surface of the metal – states that can be predicted and explained by the quantum theory of matter. Those electron states where suggested in 1957 by Rufus Ritchie: Ritchie considered the collected oscillations quanta (solitons) of the oscillations of an ionized gas – in a complete analogy with phonons, that have been suggested by Einstein as the quanta of the mechanical oscillations in a Bravais lattice. Those quanta were later named plasmons and was one of the most interesting and exciting topics of research in theoretical physics during the last decades.

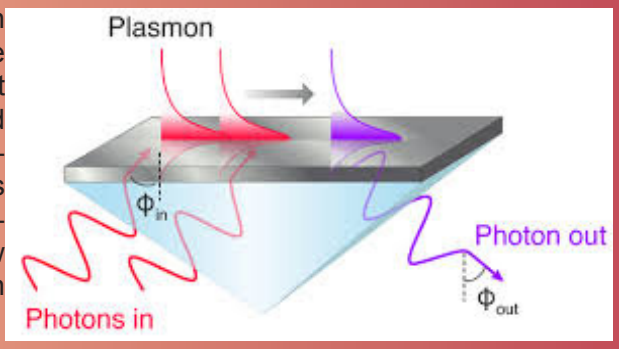


Jellium Model for Plasmons in Metals

Great interest was shown in the theory for synchronization of the surface plasmons. If we assume that an electron sea is given energy in the form of photons, then plasmons are created in the surface of the crystal, which are oscillating on exactly the same way mechanical means do; so we have some characteristic frequencies (we tend to call them "canonical vibration modes") in which the plasmons receive energy in the highest rate. If the photons that reach the crystal, "carrying" energy to the sea, oscillate with one of those frequencies, then we have the phenomenon of plasmons synchronization.

The mechanical analogue of this synchronization in classical physics is the breaking of crystal glasses with high frequency voices (like a soprano's voice) and the collapse of buildings during an earth-

quake – since both of them are forced to oscillate in such a frequency that allows them to receive the maximum rate of energy. In the case of plasmons, we cannot speak about breaking or collapse of the Dirac sea – a rather absurd thing; however, we can observe the appearance of other interesting phenomena. The most distinguishing of them all is the re-emission of photons from the crystal in the triple intensity of the incoming photons. In simple words, if we throw light of intensity on the one face of a thin metal lattice, then we will measure light of intensity from the other side.



Plasmons and Photons Interacting

Phenomena like this find a wide and fruitful ground for applications, predicting a true revolution in the science of materials. In fact, a whole area has been created in this science, under the name “Plasmonics” (like Photonics is focusing in the application of the photons synchronization), which works in order to find new applications for the outstanding properties of this phenomenon. Some of the most peculiar applications of the plasmons synchronization are the creation of holograms (which will probably conquer the telecommunication in the next decades), the creation of invisible materials –under certain conditions of lighting–, the increase of the spectroscopic counters’ sensitivity and the transformation of the incoming light into electric potential – a phenomenon known as “plasmoelectric”, exactly like the “photoelectric” which is widely used in solar collectors/photo-elements to produce electric current. In general solar collectors convert the light in thermal energy.

The way that science evolves through the ages is more or less with small but concrete steps: a simple and ordinary idea that forms in a person’s mind can lead to a solution to a tantalizing problem; a new theory is created; after many years, and thanks to developments in technology, other scientists manage to find new insight in this idea and turn it into a useful application that affects people around the world. This is probably the way that our every-day thinking should function – a small idea today, a brilliant new world tomorrow!

ΕΚΔΟΤΙΚΟ ΣΗΜΕΙΩΜΑ

Από τα μικρά στα μεγάλα...

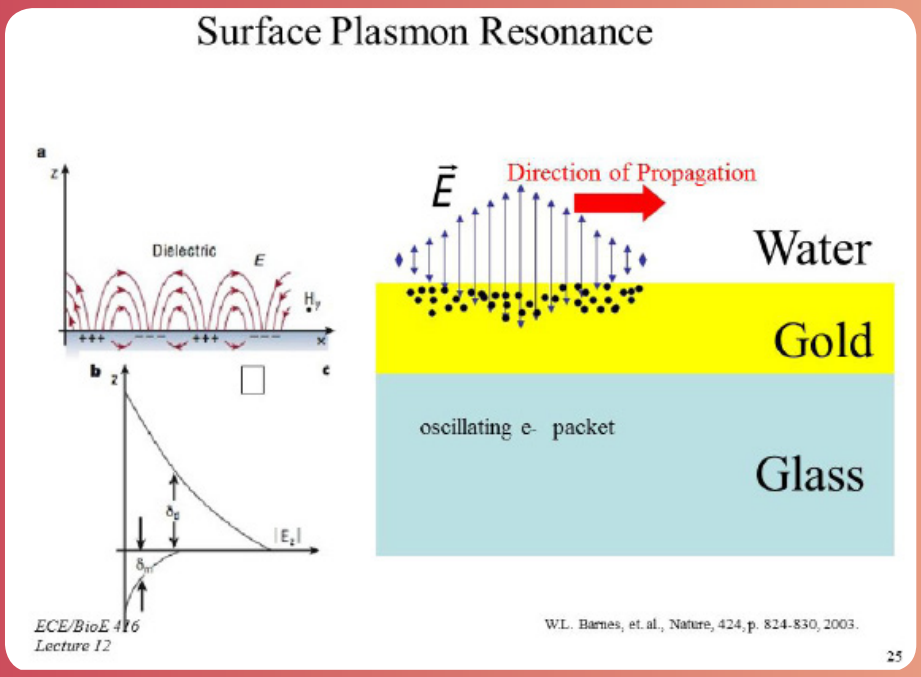
Αγαπητοί Αναγνώστες,

Το καλοκαίρι έχει εκπνεύσει προ πολλού κι έτσι η επαφή σας με τα κύματα μάλλον έχει περιοριστεί αισθητά. Σίγουρα, όμως, η περίπλοκη και επαναλαμβανόμενη κίνησή τους είναι κάτι που μπορεί να γοητεύσει τον καθένα – ακόμη κι αν δεν έχει κλίση στη Φυσική ή στα Μαθηματικά.

Όπως, ίσως, έχετε ακούσει πολλές φορές, είναι τα μικρά καθημερινά πράγματα που εμπνέουν τις μεγάλες ιδέες. Πολλοί επιστήμονες έχουν συλλάβει τη λύση δύσκολων προβλημάτων ή έχουν αναπτύξει ριζοσπαστικές θεωρίες απλά κοιτώντας γύρω τους ενώ κάνουν βόλτα στο πάρκο. Πασίγνωστος είναι, άλλωστε, ο αστικός θρύλος που θέλει τον Isaac Newton να σχηματοποιεί το Νόμο της Παγκόσμιας Έλξης δεχόμενος ένα ώριμο μήλο στο κεφάλι. Ποια, λοιπόν, ιδέα μπορεί να γέννησαν τα κύματα, που γνωρίζει τόσο μεγάλη επιτυχία στις μέρες μας;

Ας υποθέσουμε ότι σε ένα μέταλλο, τα άτομα είναι ακίνητα σε συγκεκριμένες θέσεις, δημιουργώντας το λεγόμενο κρυσταλλικό πλέγμα. Είναι ενωμένα μεταξύ τους με ιοντικούς δεσμούς. Για την επίτευξη αυτών των ιοντικών δεσμών, τα άτομα έχουν ιονιστεί “διώχνοντας” ένα ή περισσότερα από τα ηλεκτρόνιά τους. Τα ηλεκτρόνια που φεύγουν, οπότε, κινούνται ελεύθερα ανάμεσα στα ακίνητα ιόντα. Η ελεύθερη αυτή κίνηση των ηλεκτρονίων προσδίδει στα μέταλλα την ιδιότητα του ηλεκτρικού αγωγού. Τη δεκαετία του 1920, ο P.A.M. Dirac, που είχε ήδη μελετήσει τη συμπεριφορά ενός αερίου ηλεκτρονίων βάσει της στατιστικής κατανομής Fermi-Dirac, πρότεινε την ιδέα τα ηλεκτρόνια αυτά να σχηματίζουν μία “θάλασσα” στις επιφάνειες του κρυστάλλου – η θάλασσα αυτή ονομάστηκε “θάλασσα ηλεκτρονίων” ή “θάλασσα του Dirac”.

Με λίγη φαντασία θα μπορούσε κάποιος να σκεφτεί ότι, όπως σε μία κανονική θάλασσα, έτσι



και σε αυτή υπάρχουν επιφανειακά κύματα. Στην προκειμένη περίπτωση, τα κύματα δεν είναι τίποτα άλλο από ταλαντούμενες καταστάσεις ηλεκτρονίων στην επιφάνεια του κρυστάλλου, οι οποίες προβλέπονται από την κβαντική θεωρία της ύλης. Οι καταστάσεις αυτές προτάθηκαν το 1957 από τον Rufus Ritchie: ο Ritchie θεώρησε τις συλλογικές ταλαντώσεις των ελεύθερων ηλεκτρονίων ως κβάντα (σολιτόνια) των ταλαντώσεων ενός ιονισμένου αερίου – σε αναλογία με τα φωνόνια που είχε προτείνει ο Einstein (κβάντα των μηχανικών ταλαντώσεων που εφαρμόζονται σε ένα κρυσταλλικό πλέγμα). Τα κβάντα αυτά ονομάστηκαν πλασμόνια και ήταν ένα από τα πιο ενδιαφέροντα αντικείμενα έρευνας της θεωρητικής φυσικής εκείνες της δεκαετίες.

Ιδιαίτερο ενδιαφέρον φάνηκε, μάλιστα, να έχει η θεωρία για το συντονισμό των επιφανειακών πλασμονίων. Έστω ότι η θάλασσα των ηλεκτρονίων του υλικού δέχεται ενέργεια με τη μορφή φωτονίων. Σχηματίζονται στην επιφάνεια του κρυστάλλου ταλαντώνονται πλασμόνια τα οποία ταλαντώνονται με τον ίδιο ακριβώς τρόπο που ταλαντώνονται τα μηχανικά μέσα· εμφανίζουν, οπότε, χαρακτηριστικές συχνότητες (κανονικούς τρόπους δόνησης, όπως τους ονομάζουμε) στις οποίες προσλαμβάνουν μέγιστη ενέργεια. Αν τα φωτόνια που προσπίπτουν στον κρύσταλλο, μεταφέροντας ενέργεια στη θάλασσα ηλεκτρονίων, εξαναγκάζουν τα πλασμόνια σε ταλάντωση με μία τέτοια συχνότητα, τότε έχουμε το φαινόμενο του συντονισμού των πλασμονίων.

Το μηχανικό ανάλογο του συντονισμού στην κλασσική φυσική είναι η θραύση των κρυστάλλινων ποτηριών με τις υψηλής συχνότητας φωνές και η κατάρρευση των κτηρίων στο σεισμό (γιατί και τα δύο εξαναγκάζονται σε ταλάντωση κατά την οποία προσλαμβάνουν το μέγιστο δυνατό ποσό ενέργειας). Στην περίπτωση των πλασμονίων, δεν μπορούμε να μιλήσουμε για θραύση της θάλασσας του Dirac – πράγμα παράλογο, άλλωστε· παρατηρούμε, όμως, την εμφάνιση άλλων ενδιαφερόντων φαινομένων. Το χαρακτηριστικότερο, ίσως, αυτών των φαινομένων είναι η επανεκπομπή φωτονίων από τον κρύσταλλο σε τριπλάσια ένταση από αυτή των προσπιπτόντων φωτονίων – πράγμα που φαίνεται, εκ πρώτης, να παραβιάζει την αρχή διατήρησης της ενέργειας. Ουσιαστικά, αν ρίξουμε φως έντασης στην μία επιφάνεια ενός λεπτού φύλλου μετάλλου, φροντίζοντας πάντα να προκαλέσουμε συντονισμό των πλασμονίων στην επιφάνεια του φύλλου αυτού, τότε από την άλλη πλευρά μετρούμε εκπομπή φωτός έντασης .

Φαινόμενα όπως αυτό, τα τελευταία χρόνια, βρίσκουν ευρύ και προσοδοφόρο έδαφος για εφαρμογές, προοικονομώντας μία επανάσταση στην επιστήμη των υλικών. Έχει δημιουργηθεί, μάλιστα, ολόκληρος κλάδος στην επιστήμη αυτή, με την ονομασία Πλασμονική (κατά την ονομασία Φωτονική, για τον κλάδο που ασχολείται με τις εφαρμογές των φαινομένων συντονισμού των φωτονίων), που ασχολείται με την εύρεση νέων εφαρμογών για τις φοβερές ιδιότητες αυτού του φαινομένου. Κάποιες από τις χαρακτηριστικές εφαρμογές του φαινομένου συντονισμού των πλασμονίων είναι η χρήση του στη δημιουργία ολογραμμάτων (που αναμένεται να καταλάβουν τις τηλεπικοινωνίες στις επόμενες δεκαετίες), η προσπάθεια δημιουργίας αόρατων υλικών, υπό συγκεκριμένες συνθήκες φωτισμού, η αύξηση της ευαισθησίας των φασματοσκοπικών μετρητών και η μετατροπή του προσπίπτοντος φωτός σε ηλεκτρικό δυναμικό, ένα φαινόμενο που ονομάστηκε “πλασμοηλεκτρικό”, κατά το αντίστοιχο “φωτοηλεκτρικό”, που χρησιμοποιείται ευρέως για την παραγωγή ρεύματος από ηλιακούς συσσωρευτές.

Ο τρόπος που προχωράει η επιστήμη μέσα στα χρόνια είναι λίγο έως πολύ δεδομένος: μία ιδέα, συχνά απλή και καθημερινή, σχηματίζει στο μυαλό κάποιου τη λύση ενός μεγάλου προβλήματος· δημιουργείται μία νέα θεωρία· μετά από χρόνια, με την εξέλιξη της τεχνολογίας, κάποιοι άλλοι καταφέρνουν να δώσουν νέα πνοή στην ιδέα αυτή, φέρνοντας τις ιδιαιτερότητές της στην πράξη και αργότερα στην αγορά. Αυτός είναι, ίσως, ο τρόπος που θα έπρεπε να λειτουργεί και η καθημερινή μας σκέψη – μία απλή ιδέα τώρα, μία εκκωφαντική πρωτοπορία για αργότερα!

EDITORIALE

Dal più piccolo al più grande …

Cari Lettori,

L'estate è ormai passata, e l'esposizione ai raggi del Sole è notevolmente diminuita; è certo che questa alternanza può incantare chiunque – anche coloro che non sono attratti … dalla Fisica o dalla Matematica.

Come probabilmente sapete, spesso sono le piccole cose di ogni giorno che ispirano le più grandi idee. Molti scienziati hanno risolto problemi complicati o sviluppato teorie innovative proprio guardando attorno a loro; anche passeggiando nel parco. Pure la leggenda che vede Isaac Newton formulare la Legge Universale dell'Attrazione Gravitazionale dopo essere stato colpito alla testa da una mela è ben conosciuta; quindi, ci si chiede quali idee possano nascere dalle ricerche su queste *trascurabili* manifestazioni.

Riteniamo che, all'interno di un metallo, gli atomi (tenuti insieme da legami metallici) siano disposti in determinate posizioni, tali da creare il cosiddetto ***Reticolo di Bravais***, (*Bravais Lattice*). La formazione dei legami metallici presuppone che ogni atomo debba perdere i suoi elettroni di valenza, determinandone così la loro estrema libertà di movimento tra gli ioni, ingabbiati nelle loro posizioni. Proprio quest'ultima caratteristica determina le proprietà fisiche dei metalli, tra le quali la conducibilità elettrica. Negli anni 20'del Secolo scorso, Paul A.M. Dirac - che ha studiato le proprietà fisiche di una ***Nube Elettronica*** (*Electronic Gas*) secondo la distribuzione statistica Fermi-Dirac - ha teorizzato che sulla superficie di un cristallo gli elettroni formano un *mare*, denominato proprio ***Mare Elettronico*** (*Electron Sea*), conosciuto anche come ***Mare di Dirac*** (*Dirac Sea*).

Basta un minimo di immaginazione ad ognuno, per pensare che, come nel mare reale, vi si trovano onde. Nel nostro caso, le onde sono niente più che movimenti oscillatori degli elettroni sulla superficie del metallo – stati che possono essere facilmente previsti e spiegati dalla *Teoria dei Quanti* della materia. Questi Stati elettronici sono stati proposti nel 1957 da Rufus Ritchie considerando che le oscillazioni quantiche (***Solitoni***) osservate nella ionizzazione di un gas ionizzato – in perfetta analogia con i ***Fononi***, che erano stati suggeriti da Einstein come i quanti delle oscillazioni meccaniche nel ***Reticolo di Bravais***. Questi quanti sono stati denominati ***Plasmoni*** e costituivano uno degli argomenti più stimolanti nella ricerca in fisica teorica degli ultimi decenni.

In un ***Mare Elettronico***, che riceva energia sotto forma di ***Fotoni***, i ***Plasmoni*** sono creati sulla superficie del cristallo, oscillando esattamente con lo stesso modo meccanico che ci si può aspettare. In questo caso, osserviamo alcune frequenze caratteristiche (che tendiamo a chiamare Modi Vibrazionali Canonici) per le quali i ***Plasmoni*** ricevono energia ai valori più alti. Se i ***Fotoni*** che colpiscono il cristallo, portando energia al ***Mare***, oscillano con una di quelle frequenze, potremo osservare il fenomeno della ***Risonanza Plasmonica di Superficie*** (Oscillazioni coerenti).

Un'analogia meccanica di questa ***Risonanza*** nella Fisica classica è la rottura di un bicchiere di cristallo causato dalla voce ad alta frequenza (come quella di un soprano) e il collasso di un edificio durante un terremoto – entrambi i corpi sono forzati a oscillare con una frequenza tale da assorbire il massimo valore di energia. Nel caso dei ***Plasmoni*** non possiamo parlare di rottura o collasso del Mare di Dirac – una cosa assurda; possiamo, invece, osservare altri interessanti fenomeni. Il più notevole di tutti è ri-emissione di ***Fotoni*** dal cristallo con un'intensità tripla rispetto a quella delle radiazioni assorbite. In parole povere, se noi man-

diamo luce con un'intensità 1 sulla superficie di un reticolo metallico sottile, noi misureremo luce di intensità 3 emergere sull'altro lato.

Fenomeni come questi portano a un'ampia e fruttuosa serie di applicazioni di base, che fanno prevedere una vera rivoluzione nella ***Scienza dei Materiali***. Infatti, con il nome di ***Plasmonica*** (come ***Fotonica*** è focalizzata sulle applicazioni nelle oscillazioni coerenti dei ***Fotoni***), è stata creata un'intera area di ricerca per trovare nuove applicazioni che traggano spunto dalle proprietà emerse di questo fenomeno. Alcune delle più peculiari applicazioni della ***Risonanza Plasmonica di Superficie*** è la creazione degli ologrammi (che probabilmente, conquisteranno le telecomunicazioni nelle prossime decadi), la creazione di materiali invisibili – a certe condizioni di luce – l'incremento della sensibilità dei contatori spettroscopici e la trasformazione della luce incidente in potenziale elettrico – un fenomeno conosciuto come ***Plasmoelettronica***, esattamente come ***Fotoelettronica***, che è usata ampiamente nei collettori solari per produrre corrente elettrica.

La via dell'evoluzione della Scienza nel tempo, è più o meno definita: una idea, semplice e diffusa, forma, nella mente di qualcuno, la soluzione a un grande problema; viene formulata una nuova teoria; dopo anni, per lo sviluppo della tecnologia, qualcuno percepirà una nuova idea, che porterà a nuove applicazioni – e successivamente arriverà ad essere commercializzata. Questa è la via maestra affinché i nostri pensieri di ogni giorno possano funzionare – una piccola idea oggi, un brillante nuovo mondo domani!

РЕДАКЦИОННИ БЕЛЕЖКИ

От най-малкото към най-голямото ...

Скъпи читатели,

Лятото приключи отдавна и следователно вашият опит с вълните би трябвало да е силно намалял. Сигурно е, обаче, че това тяхно сложно повтарящо се движение може да очарова всеки – дори и тези, които не са привлечени или ... към физиката или математиката.

Както вероятно сте чували, малките ежедневни неща вдъхновяват най-великите идеи. Много учени са измислили решението на изключително сложни проблеми или са развили радикални нови теории просто като са гледали около себе си когато са се разхождали в парка. Освен това, градската легенда, която твърди, че Исак Нютон е създал закона за гравитацията след като една ябълка е паднала на главата му, е много добре известна. Така че, каква идея, която има подобен успех в наше време, би могла да се основава на вълните?

Нека си представим, че във вътрешността на метала атомите стоят неподвижни в определени позиции, създавайки така наречената решетка на Браве. Те са свързани чрез метални връзки. За да може да се създадат тези връзки, атомите са били йонизирани, „изхвърляйки" един или повече от електроните си. Като резултат, електроните, които напускат атомите се движат свободно между неподвижните йони. Това движение на свободни електрони дава на металите техните електрични свойства и ги определя като проводници на електричество. През 20те години на XX век П.А.М. Дирак , който вече бил изучил физичните свойства на електронния газ според статистическото разпределениен на Ферми-Дирак, предположил, че електоните могат да формират „море" на повърхностите на кристала – това море било наречено „електронно море" или „море на Дирак"

Трябва само малко въображение за да си представим, че както в истинското море и в това също има вълни. За да сме точни, вълните не са нищо повече от трептящи състояния на електроните на повърхността на метала – състояния, които могат да бъдат предсказани и обяснени от квантовата теория за материята. Тези електронни състояния са били предложени през 1957 от Руфус Ричи: той разгледал събраните трептящи квазичастици (солитони) на трептенията на йонизиран газ в пълна аналогия с фононите, които били предложени от Айнщайн като квазичастиците на механичните

трептения в решетката на Браве. Тези квазичастици били наречени по-късно плазмони и са една от най-интересните и вълнуващи теми на изследвания в теоретичната физика през последните десетилетия.

Голям интерес представлява теорията за синхронизация на повърхностните плазмони. Ако предположим, че електронното море получава енергия под формата на фотони, тогава на повърхността на кристала се създават плазмони, които трептят точно по същия начин като механичните средства; така, че имаме характерни честоти (наричаме ги „канонични вибрационни модове"), при които плазмоните получават енергия в най-висока степен. Ако фотоните, които достигат кристала „носейки" енергия за морето, трептят с една от тези честоти, тогава имаме явлението плазмонна синхронизация.

Механичният аналог на тази синхронизация в класическата физика е чупенето на кристални чаши чрез гласове с висока честота (като сопрано), както и разпадането на сгради по време на заметресение – тъй като и в двата случая теата са принудени да трептят с такава честота, която им позволява да получат максимална степен на енергия. В случая на плазмоните, не можем да говорим за счупване или разпадане на морето на Дирак – по скоро абсурдно нещо; обаче можем да наблюдаваме появата на други интересни явления. Най-отличителното от тях е излъчването на фотони от кристала с троен интензитет в сравнение с навлизащите фотони. С прости думи, ако осветим повърхността на тънка метална решетка със светлина с интензитет , ще измерим светлина с интензитет 3 от другата страна.

Явления като това намират широко и плодотворно поле за приложения, предсказвайки истинска революция в науката за материалите. Всъщност е създадена цяла област в тази наука, под името „плазмоника" (както фотониката се фокусира върху приложенията на фотонната синхронизация), която цели да открие нови приложения на изключителните качества на това явление. Едни от най-любопитните приложения на плазмонната синхронизация са създаването на холограмите (които вероятно ще завладеят телекомуникациите през следващите десетилетия), създаването на невидими материали – под определени условия на осветяване- увеличаване на чувствителността на спектроскопичните броячи и трансформацията на входящата светлина в електричен потенциал – явление, известно като „плазмоелектричен ефект", точно като „фотоелектричния ефект", който е чироко използван в соларните колектори, за производство на електричен ток.

Начинът, по който науката се развива през годините е сравнително специфичен: в главата на някого се формира една идея, обикновено проста и ежедневна, която е решение на голям проблем; създава се нова теория; след много години, чрез развитието на технологията, някой друг успява да даде ново виждане на тази идея, като използва нейната специфична природа на практика и в последствие я извежда на пазара. Това вероятно е начинът, по който нашето ежедневно мислене би трябвало да работи – една малка идея днес, блестящ нов свят утре!

EDITORIAL

De la cel mai mic la cel mai mare ...

Dragi cititori,

Vara a trecut de ceva vreme și, probabil, experiența valurilor e acum oarecum îndepărtată. Cu toate acestea, este cert că mișcarea lor repetată ne provoacă încă încântare - chiar și celor care nu sunt atrași... de fizică sau matematică.

După cum ați auzit, probabil, există mici lucruri de zi cu zi, care inspiră idei mărețe. Mulți oameni de știință au conceput soluția unor probleme extrem de dificile sau au dezvoltate noi teorii radicale, uitându-se în jurul lor în timp ce se plimbau pe jos în parc. În plus este foarte bine cunoscută legenda urbana conform căreia Isaac Newton formula legea atracției universale după ce îi căzuse un măr în cap. Deci, ce fel de idei, care se bucură de astfel de succes în zilele noastre, ar putea aceste valuri stimula?

Să ne imaginăm că în interiorul un metal, atomii sunt încă în picioare în anumite poziții, creând așa-numita latice Bravais. Ele sunt legate împreună prin legături metalice. Pentru aceste legături să fie create, atomii au fost ionizați "aruncând", unul sau mai mulți dintre electronii lor. Ca urmare, electronii care părăsesc atomii se mișcă liber între ionii stabili. Această mișcare de electroni liberi dă metalelor proprietățile lor electrice și îi clasifică drept conductori electrici. În 1920, P.A.M. Dirac, care studiase deja proprietățile fizice ale gazului de electroni, în funcție de distribuția statistică Fermi-Dirac, a stipulat că electronii ar putea forma o "mare" pe suprafețele de cristal - numită "mare de electroni" sau " mare Dirac ".

Este nevoie de doar un pic de imaginație pentru a ne gândi că, asemenea unei mări reale, există valuri și în aceasta. Mai explicit, valurile nu sunt nimic altceva decât oscilări de stadii de electroni la suprafața metalului - stadii care pot fi prezise și explicate de teoria cuantică a materiei. Aceste stadii de electroni au fost descrise în 1957 de către Rufus Ritchie: Ritchie a considerat cuanta de oscilații acumulate (solitoni) al oscilațiilor unui gaz ionizat - într-o analogie completă cu fononii, care a fost sugerată de către Einstein ca cuanta oscilațiilor mecanice într-o latice Bravais. Aceste cuante au fost numite mai târziu plasmonii și au constituit unul dintre subiectele cele mai interesante și incitante de cercetare in fizica teoretică în ultimele decenii.

Un mare interes a fost demonstrat în teoria de sincronizare a plasmonului de suprafață. Dacă presupunem că unei mări de electroni îi este dată energie sub formă de fotoni, apoi plasmonii sunt creați în suprafața de cristal, care sunt oscilanți în exact același mod ca mijloace mecanice; așa că avem niște frecvențe caracteristice (avem tendința să le numim "moduri de vibrație canonice"), în care plasmonii primesc energie în cel mai mare ritm. În cazul în care fotonii care ajung cristalul, care "transportă" energie spre mare, oscilează cu una dintre aceste frecvențe, atunci avem fenomenul de sincronizare a plasmonilor.

Analogul mecanic al aceastei sincronizări din fizica clasică este spargerea paharelor de cristal cu sunete de înaltă frecvență (asemănătoare unei voci de soprană) și prăbușirea clădirilor în timpul unui cutremur - deoarece ambele dintre ele sunt forțate să oscileze într-o astfel de frecvență care le permite să primească rata maximă de energie. În cazul plasmonilor, nu putem vorbi despre ruperea sau colapsul mării Dirac - un lucru destul de absurd; cu toate acestea, se poate observa apariția altor fenomene interesante. Cel mai important dintre toate este re-emisia de fotoni din cristal în intensitatea triplă a fotonilor de intrare. Spus mai

simplu, dacă aruncăm lumină de intensitate pe suprafața unei părți dintr-o latice de metal subțire, atunci vom măsura lumina de intensitate din partea cealaltă.

Fenomene de acest gen găsesc un teren larg și fructuos pentru aplicații, prezicând o adevărată revoluție în știința materialelor. De fapt, o zonă întreagă a fost creată în această știință, sub numele de “Plasmonics” (ca de exemplu Fotonica axată pe aplicarea sincronizării fotonilor), care lucrează în scopul de a găsi noi aplicații pentru proprietățile remarcabile ale acestui fenomen. Unele dintre aplicațiile cele mai ciudate ale sincronizării plasmonilor este crearea de hologame (care, probabil, va cuceri telecomunicațiile în următoarele decenii), crearea de materiale invizibile – în anumite condiții de lighting-, creșterea sensibilității contoarelor spectroscopice și transformarea luminii de intrare în potențial electric - un fenomen cunoscut sub numele de “plasmoelectric”, exact ca cel “fotoelectric”, care este utilizat pe scară largă în colectoarele solare pentru a produce curent electric.

Modul în care știința evoluează de-a lungul anilor este mai mult sau mai puțin specific: o idee, de obicei, simplă și de zi cu zi, formulată în mintea cuiva, creează soluția unei mari probleme; este creată o nouă teorie; după mai mulți ani, prin evoluțiile tehnologiei, alții reușesc să dea o nouă percepție acestei idei prin aducerea naturii sale specifice în folosință și mai târziu spre piață. Acesta este, probabil, modul în care gândirea noastră de zi cu zi ar trebui să funcționeze - o idee mică astăzi, o minunată lume nouă mâine!

EDİTORİAL

EN KÜÇÜKTEN EN BÜYÜĞE...

Sevgili okuyucular,

Yaz mevsimi bir süre önce sona erdi ve dalgalarla deneyiminiz azalmış olmalı. Ancak, bu tekrarlanan karmaşık hareketin, herkesi, hatta fizik veya matematiğe ilgi duymayanları bile etkilediği kesindir.

Belki duymuşsunuzdur, büyük fikirler, basit küçük fikirlerden ilham alır. Pek çok bilim adamı, çok zor problemlerin çözümünü ve radikal yeni teorileri sadece parkta dolaşırken etrafa bakarken bulmuşlardır. Ayrıca, Isaac Newton’un kafasına düşen bir elmadan Evrensel Çekim Kanunu’nu bulduğu şehir efsanesini herkes bilir. Öyleyse, dalgalar günümüzde böyle başarılara yol açacak hangi fikirleri doğurmuştur?

Bir metalin içinde, atomların Bravais kafesi adı verilen belirli pozisyonlarda sabit olarak durduklarını düşünelim. Metalik bağlarla birbirlerine bağlıdırlar. Bu bağların yaratılması için atomlar bir veya birden fazla elektronları ‘atarak’ iyonize olmuşlardır. Sonuç olarak, atomdan ayrılan elektronlar, atomdan ayrılmayan iyonlar arasında serbestçe dolaşırlar. Serbest elektronların bu hareketi, metallere elektriksel özelliklerini kazandırır ve metallerin elektriksel iletkenliklerini belirler. 1920lerde, daha önceleri bir elektron gazının fiziksel özellikleri üzerine çalışma yapmış olan P.A. M. Dirac, Fermi- Dirac istatistiksel dağıtımına dayanarak, elektronların kristal yüzeyleri üzerinde ‘elektron denizi2 veya ‘Dirac denizi’ olarak adlandırılan bir ‘deniz’ oluşturabileceğini öne sürmüştür.

Gerçek denizdeki gibi, bu denizde de dalga olduğu biraz hayal gücü ile anlaşılabilir. Daha açık olmak gerekirse, bu dalgalar metalin yüzeyindeki– maddenin kuantum teorisi ile açıklanabilecek veya tahmin edilebilecek- titreşen elektron durumlarından başka bir şey değildir. Bu elektron durumları 1957’de Rufus Ritchie tarafından tanımlanmıştır: Ritchie, Einstein tarafından Bravais kafesinde mekanik salınımların kuantumu olarak ifade edilen fononların tamamlanmış analojisi içinde iyonize gazların salınımını, toplanan salınım kuantumu olarak değerlendirmiştir. Bu kuantumlar daha sonraları plasmonlar olarak adlandırılmıştır ve son dönemlerde teorik fizik araştırmalarının en ilgili çekici ve heyecan verici konularından olmuştur.

Yüzey plasmonlarının senkronizasyonu teorisine büyük ilgi gösterilmiştir. Elektron denizine fotonlar şeklinde enerji verildiğini varsayarsak, kristalin yüzeyinde tıpkı mekanik araçlardaki gibi salınan plasmonlar oluşur; böylece plasmonların en yüksek seviyede enerji aldıkları karakteristik frekanslar (biz buna 'standart titreşim modları' deriz) elde ederiz. Denize enerji 'taşıyarak' kristale ulaşan fotonlar bu frekansların biri ile titreşirse, plasmon senkronizasyonu olgusunu elde ederiz.

Klasik fizikteki bu senkronizasyonun mekanik analoğu, yüksek frekanslı seslerle (bir sopranonun sesi gibi) kristal camların kırılmasıdır ya da depremde binaların yıkılmasıdır- çünkü her ikisi de maksimum oranda enerji almalarına sebep olan bir frekansta titreşmeye zorlanır. Plasmonların durumunda, Dirac denizinin kırılması veya yıkılmasından bahsedemeyiz, ancak başka ilginç olguların ortaya çıktığını gözlemleyebiliriz. Bunların en ayırt edici olanı, gelen fotonların üç katı yoğunluğundaki kristalde fotonların yeniden yayılmasıdır. Daha basit bir ifade ile, ince metal bir kafesin yüzeyine bir yoğunluk ışığını Ī atarsak, diğer yüzeyde bunu 3 Ī olarak ölçeriz.

Bunu gibi olgular, madde biliminde gerçek bir devrimi öngörerek geniş ve verimli uygulama alanları bulur. Aslında bu bilimde bu olgunun önemli özelliklerine yeni uygulama alanları bulmak için çalışan tam bir alan yaratılmıştır. Plasmon senkronizasyonunun garip uygulama alanlarından bazıları, (önümüzdeki yıllarda telekomünikasyonun yerini alacak olan) hologramların yaratılması, - belli ışık koşulları altında- görünmez maddelerin yaratılması, spektroskopik sayaçların duyarlılığının arttırılması ve tıpkı elektrik akımı üretmek için güneş kollektörlerinde / fotoelementlerde yaygın olarak kullanılan 'fotoelektrik' gibi 'plasmoelektrik' olarak biline olguyani elektrik gerilimine gelen ışığın transformasyonudur. Genel olarak güneş kollektörleri, ışığı termal enerjiye dönüştürürler.

Bilimin yıllar boyunca gelişmesi küçük ama somut adımlarla olmuştur: bir kişinin zihninde şekil bulan basit ve sıradan fikirler, çok zor problemlerin çözümüne götürebilir; yeni bir teori ortaya atılır, pek çok yıl sonra ve teknolojik gelişmelerin sayesinde başka bilim adamları bu fikirde yeni bir yön görürler ve bunu tüm dünyadaki insanları etkileyecek kullanışlı uygulamalara dönüştürürler. Bu muhtemelen günlük düşünmemizin çalışma şeklidir- bugün küçük bir fikir, yarın parlak yeni bir dünya!

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The Ten Plagues of Egypt

Δέκα πληγές του Φαραώ

by Ananiadou Sofia, Doni Ariadni, Eminidou Persephone

The Ten plagues of Egypt – The Myth / The religious approximation

The story of Moses and the ten plagues of Pharaoh is the stage of the Christian, Hebrew and Muslim religion and is written in the Old Testament book of Exodus. According to the myth, the Egyptians had enslaved the Israelites. Then, the God of Israel sent Moses to set them free. When the Pharaoh denied, the God bored the Egyptians with the so-called ten plagues of Egypt. In this way he enforced him to set the people of Israel free.

The ten plagues according to the Bible are:

1. The water of the river Nile turned into blood and, as a consequence, the fish of the Nile died and left Egypt without drinkable water.
2. Frogs covered the entire dominion.
3. The air of Egypt got filled with gnats.
4. Swarms of horseflies raided on the Egyptians' houses.
5. A serious epidemic inflicted all the herds of Egyptians.
6. Men and animals got foul of hives, large spots and sores.
7. A heavy hailstorm destroyed everything.

Δέκα πληγές του Φαραώ - Ο μύθος / Η θρησκευτική προσέγγιση

Η ιστορία με τον Μωυσή και τις 10 πληγές του Φαραώ βρίσκεται στη βάση της χριστιανικής, της εβραϊκής και της μουσουλμανικής πίστης και καταγράφεται στο βιβλίο της Εξόδου στην Παλαιά Διαθήκη. Σύμφωνα με τον θρύλο, οι Ισραηλίτες είχαν υποδουλωθεί στους Αιγυπτίους. Τότε ο Θεός του Ισραήλ έστειλε τον Μωυσή για να τους ελευθερώσει από τα δεσμά τους. Όταν όμως ο Φαραώ αρνήθηκε, ο Θεός έπληξε τους Αιγυπτίους με τις λεγόμενες 10 πληγές του Φαραώ. Με αυτόν τον τρόπο τον ανάγκασε να ελευθερώσει το λαό του Ισραήλ.
Οι 10 πληγές σύμφωνα με τη Βίβλο είναι:
Τα νερά του ποταμού Νείλου μετατράπηκαν σε αίμα με συνέπεια να πεθάνουν τα πλάσματα του νερού και να μην υπάρχει πόσιμο νερό.
Βάτραχοι κάλυψαν όλη την επικράτεια.
Ο αέρας της Αιγύπτου γέμισε με σκνίπες.
Σμήνη από αλογόμυγες εισέβαλαν σε κάθε κατοικία των Αιγυπτίων.
Βαριά επι δημία έπληξε όλα τα κοπάδια των Αιγυπτ ίων

Άνθρωποι και ζώα γέμισαν εξανθήματα, μεγάλα σπυριά και πληγές.
Έπεσε βροχή από βαρύ χαλάζι τσακίζοντας τα πάντα
Σκοτείνιασε η γη της Αιγύπτου από τα σμήνη των ακριδών
Για τρεις ημέρες πυκνό σκοτάδι σκέπασε την Αίγυπτο
Πέθαναν όλοι οι πρωτότοκοι γιοι των Αιγυπτίων καθώς και τα πρωτότοκα των ζώων τους

Δέκα πληγές του Φαραώ- Η αλήθεια πίσω από το μύθο/ Η επιστημονική προσέγγιση

Με αφορμή αυτήν την ιστορία επιστήμονες και αρχαιολόγοι άρχισαν να μελετούν τα φαινόμενα που περιγράφονται στην Παλαιά Διαθήκη προσπαθώντας να τα ερμηνεύσουν βιολογικά. Έτσι, κατάφεραν να βρουν την αρχαία πόλη της Πι-Ραμές στην οποία, σύμφωνα με τις έρευνες, συνέβησαν τα γεγονότα της που περιγράφονται στην Π.Δ.. Τα ευρήματα που βρέθηκαν στην πόλη

8. The whole Egypt fell into darkness due to the swarms of locust.
9. For three days, Egypt was completely covered in darkness.
10. The firstborn sons of Egyptians died, as well as the firstborn animals.

Ten plagues of Egypt: the truth behind the myth/ the scientific approach

The myth in question appeared to be the triggering factor for scientists and archeologists to start studying the phenomena which are described in the Old Testament, in order to explain them from a biological point of view. In this way, they managed to discover the ancient city of Pi-Ramesh, where, according to research, the events of the Old Testament took place. The findings that were discovered in the city inform us that it was at its prime until the period when Ramses B' was the Pharaoh (3000 BC.). From then on, there are no findings, so we conclude that the town was evacuated for an inexplicable reason. After that, scientists tried to establish a connection between The Ten Plagues of Egypt and several natural phenomena.

1. The water of the river Nile turned into blood and, as a consequence, the fish of the Nile died and left Egypt without drinkable water.
According to the scientific approach, the Nile didn't turn red because of blood, but it got this reddish color from toxic algae, which are a type of aerobic toxic Cyanobacteria (Oscillatoria rubescens). These bacteria multiply under specific favorable conditions (temperature, vitriolic and phosphoric salt) and when they die, they produce this red color. Based on this specific characteristic, the researchers discovered that at the time the ten plagues happened, there was a sudden rise in temperature, which caused the river waters to become stagnant. That is the main reason for the first plague. The bacteria reduced the oxygen and resulted in the death of the fish and the pollution of the river water, which was no longer drinkable.

2. Frogs covered the entire dominion.

μάς πληροφορούν ότι βρισκόταν σε μεγάλη ακμή μέχρι την περίοδο που ήταν Φαραώ ο Ραμσής ο Β΄(3000 π.Χ.). Από εκείνη την στιγμή σταματούν να υπάρχουν ευρήματα και συμπεραίνουμε ότι η πόλη εκκενώθηκε για κάποιο ανεξήγητο λόγο. Επιστήμονες στη συνέχεια προσπάθησαν να αποδείξουν τις 10 πληγές του Φαραώ με βάση κάποια φυσικά φαινόμενα.
Τα νερά του ποταμού Νείλου μετατράπηκαν σε αίμα με συνέπεια να πεθάνουν τα πλάσματα του νερού και να μην υπάρχει πόσιμο νερό.
Σύμφωνα με την επιστημονική προσέγγιση, τα νερά του ποταμού Νείλου δεν βάφτηκαν κόκκινα από το αίμα αλλά από τις τοξικές άλγες , οι οποίες είναι ένα είδος αερόβιου τοξικού κυανοβακτηριδίου (Oscillatoria rubescens) που πολλαπλασιάζετε λόγω συγκεκριμένων ευνοϊκών συνθηκών (θερμοκρασία, νιτρικό και φωσφορικό άλας) και όταν πεθαίνει αποκτά κόκκινο χρώμα. Με αφορμή το συγκεκριμένο χαρακτηριστικό οι ερευνητές βρήκαν πως την εποχή που χρονολογούνται οι 10 πληγές υπήρξε απότομη άνοδος της θερμοκρασίας που είχε ως αποτέλεσμα να γίνουν τα νερά του Νείλου σε λιμνάζοντα. Αυτή είναι και η βασική αιτία που προκάλεσε την πρώτη πληγή. Το βακτήριο μείωσε το οξυγόνο, με αποτέλεσμα να πεθάνουν τα ψάρια και το νερό του ποταμού να μην είναι πια πόσιμο.

2. Βάτραχοι κάλυψαν όλη την επικράτεια.
Στη συνέχεια αυξήθηκε ραγδαία ο αριθμός των βατράχων, επειδή οι γυρίνοι αναπτύσσονται με διπλάσια ταχύτητα όταν βρίσκονται σε

Then, the number of the frogs rose rapidly, because tadpoles tend to grow much faster under environmental pressure (lack of oxygen). According to the Bible, the frogs surfaced and died.

3. The air of Egypt got filled with gnats.
Gnats multiplied, because the fish and the frogs, which were their predators, were dead.

4. Swarms of horseflies raided on the Egyptians' houses.
The dead fish and frogs attracted swarms of horseflies. Also, since the frogs, the predators of the horseflies, had died, their number got out of control.

5. A serious epidemic inflicted all the herds of Egyptians.
The gnats proliferated and spread the virus 'Blue Tongue'. This virus is responsible for a contagious disease which is an ailment of ruminants that spreads through the insect's saliva.

6. Men and animals got foul of hives, large spots and sores.
The horseflies, in their turn, became the carrier of the virus 'Glanders', which causes an infection that is manifested with blisters and abscesses on the skin.

7. A heavy hailstorm destroyed everything.
The researchers tried to relate the three following plagues with the eruption of the Santorini volcano. The seventh plague describes very heavy hailstorms which takes place when clouds and solid particles meet. So, when the Santorini volcano erupted, tons of ash were blasted off and reached Egypt; scientists can tell this by the pieces of pumice stones coming from the Santorini volcano which were discovered near the area of Pi-Ramesses. Therefore, the tons of ash could be responsible for the strong hailstorm described in the seventh plague.

8. The whole Egypt fell into dark due to the swarms of locust.
After that, the eruption of ash caused weather abnormalities, which led to heavy rainfalls and increased humidity. This climate in particular attracts swarms

περιβαλλοντική πίεση (έλλειψη οξυγόνου). Οι βάτραχοι, όπως λέει και η Βίβλος, βγήκαν στη στεριά και πέθαναν.

3. Ο αέρας της Αιγύπτου γέμισε με σκνίπες.
Οι σκνίπες πολλαπλασιάστηκαν, επειδή τα ψάρια και τα βατράχια που τις έτρωγαν είχαν πεθάνει.

4. Σμήνη από αλογόμυγες εισέβαλαν σε κάθε κατοικία των Αιγυπτίων.
Τα πτώματα των ψαριών και των βατράχων προσέλκυσαν σμήνη από αλογόμυγες. Επίσης εφόσον οι βάτραχοι είχαν πεθάνει οι οποίοι ήταν οι θηρευτές των αλογόμυγων, ο αριθμός τους δεν μπορούσε να ελεγχεί.

5. Βαριά επιδημία έπληξε όλα τα κοπάδια των Αιγυ πτίων
Οι σκνίπες που είχαν πολλαπλασιαστεί μετέδωσαν τον ιό Blue Tongue (Κυανή γλώσσα) η ασθένεια αυτή είναι λοιμώδες νόσημα που οφείλεται σε ιό είναι νόσος των μηρυκαστικών ο οποίος μεταδόθηκε μέσω του σάλιου του εντόμου.

6. Άνθρωποι και ζώα γέμισαν εξανθήματα, μεγάλα σπυριά και πληγές.
Οι αλογόμυγες με την σειρά τους έγιναν φορείς του ιού Glanders, μιας μόλυνσης που προκαλεί φουσκάλες και αποστήματα στο δέρμα.

7. Έπεσε βροχή από βαρύ χαλάζι τσακίζοντας τα πάντα
Οι ερευνητές προσπάθησαν να συνδέσουν τις τρεις επόμενες πληγές με την έκρηξη του ηφαιστείου τις Σαντορίνης. Η έβδομη πληγή περιγραφεί πολύ δυνατό χαλάζι που δημιουργείται όταν τα σύννεφα έρχονται σε επαφή με στερεά σωματίδια. Όταν λοιπόν έγινε η έκρηξη εκτοξεύτηκαν δισεκατομμύρια τόνοι σποδό(ηφαιστειακή σκόνη), οι οποίοι έφτασαν μέχρι την Αίγυπτο καθώς βρέθηκαν σε περιοχή κοντά στην Πι-Ραμές κομμάτια ελαφρόπετρας από το ηφαίστειο της Σαντορίνης. Έτσι οι τόνοι από σποδό θα μπορούσαν να θεωρηθούν υπεύθυνοι για το δυνατό χαλάζι.

of locusts, which move through gas streams from the coldest areas to the warmest and more humid ones.

9. For three days Egypt was completely into darkness.
The tons of ash led to the ninth plague, as all this ash covered the entire Egypt and even blocked the sun. However, some scientists disagree with this interpretation, because it is estimated that the Exodus and the eruption of the Santorini volcano do not coincide historically, but the former happened 200 years earlier than the latter.

10. The firstborn sons of Egyptians died, so did the firstborn animals.
As for the tenth plague, there are two different explanations. According to the first one, the death of the Egyptians' firstborn boys and animals is due to a type of fungus which was detected in grains and contaminated them. The firstborn boys used to work at the grain plantations, so they were probably the first victims. The second explanation, however, is more religious-oriented, because, according to the Egyptian tradition, the firstborn boys represented the future of the people and their death symbolized that there was no future for Egypt from then on. In this way, the Hebrew god Jehovah is shown as superior to the Pharaoh.

Nevertheless, despite the research, no one can be completely sure as to whether the ten plagues of Egypt have ever happened. Others believe that it is just a myth that aims to convince people about the existence of God, something that was extremely important at that time, considering that people were encouraged to go on living by believing in a superior deity, which was supposed to look after them and help them. Moreover, there are certain people who believe that the plagues did happen and were caused by natural phenomena, whereas there are others who are convinced that the plagues are in fact catastrophes having taken place through the entire Egyptian history and were simply related and made into one myth by oral tradition. Finally, there are those that need no evidence in order to believe in the plagues, but are content with their faith in God's power. We can surely say that scientists will

8. Σκοτείνιασε η γη της Αιγύπτου από τα σμήνη των ακριδών.
Στη συνέχεια η εκτόξευση της σκόνης δημιούργησε καιρικές ανωμαλίες που προκάλεσαν ισχυρές βροχοπτώσεις και περισσότερη υγρασία. Το συγκεκριμένο κλίμα προσελκύει τα σμήνη των ακριδών καθώς μετακινούνται μέσω των αέριων ρευμάτων από τις ψυχρότερες στις θερμότερες και πιο υγρές περιοχές.

9. Για τρεις ημέρες πυκνό σκοτάδι σκέπασε την Αίγυπτο.
Οι τόνοι σποδό δημιούργησαν και την ένατη πληγή καθώς όλη αυτή η στάχτη κάλυψε την Αίγυπτο και έκρυψε μέχρι και τον ήλιο. Αν και αυτό το ενδεχόμενο θα μπορούσε να ισχύει κάποιοι επιστήμονες έχουν ενστάσεις επειδή υπολογίζεται ότι η Έξοδος με την έκρηξη του ηφαιστείου έχουν περίπου 200 χρόνια διαφορά μεταξύ τους αν όχι και παραπάνω.

10. Πέθαναν όλοι οι πρωτότοκοι γιοι των Αιγυπτίων καθώς και τα πρωτότοκα των ζώων τους.
Για την δέκατη πληγή υπάρχουν δύο εντελώς διαφορετικές εξηγήσεις. Σύμφωνα με την πρώτη ο θάνατος των πρωτότοκων αγοριών και ζώων των

αιγυπτίων οφείλεται σε έναν μύκητα και μούχλα που δηλητηρίασε τα σιτηρά και επειδή τα πρωτότοκα αγόρια συνηθιζόταν να εργάζονται στις φυτείες των σιτηρών ήταν πιθανόν τα πρώτα θύματα. Η δεύτερη εξήγηση όμως υποστηρίζει πως η δέκατη πληγή είναι θεολογική, γιατί σύμφωνα με την Αιγυπτιακή παράδοση τα πρωτότοκα αγόρια συμβόλιζαν το μέλλον ενός λάου και πως με το θάνατο τους υπονοούνταν πως η Αίγυπτος μετά όλα όσα της είχαν συμβεί δεν είχε πλέον μέλλον. Με αυτόν τον τρόπο φαίνεται η ανωτερότητα του Εβραίου θεού Ιεχωβά σε σχέση με τον Φαραώ.

Παρά τις έρευνες όμως κάνεις δεν μπορεί να είναι απολύτως βέβαιος ότι οι 10 πληγές συνέβησαν στα αλήθεια. Άλλοι πιστεύουν ότι είναι απλά ένας μύθος που είχε στόχο να πείσει τους ανθρώπους για την ύπαρξη του θεού, πράγμα που είχε τεράστια σημασία για εκείνη την εποχή γιατί οι άνθρωποι αντλούσαν τη δύναμη να συνεχίσουν πιστεύοντας σε κάποια ανώτερη θεότητα που τους έβλεπε και τους βοηθούσε. Κάποιοι επίσης πιστεύουν ότι οι πληγές

keep looking for answers until they manage to decode even the smallest detail of this mystery.

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όντως συνέβησαν με αφορμή φυσικά φαινόμενα και άλλοι πως είναι καταστροφές που έγιναν σε όλη την ιστορία της Αιγύπτου και απλά τις ένωσαν μέσα από τις προφορικές παραδόσεις. Τέλος, δεν είναι λίγοι αυτοί που δεν χρειάζονται τις αποδείξεις για να πιστέψουν στις πληγές αλλά αρκούνται στην πίστη τους και στη δύναμη του θεού. Σίγουρο είναι πως οι επιστήμονες θα συνεχίσουν να ψάχνουν απαντήσεις μέχρι να καταφέρουν να αποκρυπτογραφήσουν και την τελευταία λεπτομέρεια αυτού του μυστηρίου.

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Lighthouses of Greece

Οι φάροι της Ελλάδας

by Fotis Platanos

Introduction

For each sailor, “lighthouse” means hope, optimism and security for his route. For the rest of the world is a matter nilly, touching always some subtle strings of our soul. It is no coincidence that the beacons themselves is a topic that attracts all kinds of art, not just painting and literature, poetry and film, because behind the imposing stone walls, eroded from the saltiness, hide power, mystery, solitude, adventure and simultaneously immense serenity. The first lighthouses all over the world appeared about 2000 years ago. It was the Colossus of Rhodes in Greece and the Lighthouse of Alexandria in Egypt.

The History of the Greek lighthouses

Φάρος στον Αρμενιστή της Μυκόνου

The lighthouses’ network of the country is considered the largest and most organized in the world. This consists of 1309 beacons, lights and light buoys of which 57 are supervised, while 6 are permanently manned. The exact construction date of the first Greek lighthouse is not known. Oral tradition says that the first lighthouse was built in 1827, on Aegina, the capital

Εισαγωγή

Για κάθε ναυτικό, “φάρος” σημαίνει ελπίδα, αισιοδοξία και ασφάλεια της ρότας του. Για τον υπόλοιπο κόσμο είναι ένα θέμα που θέλοντας και μη, αγγίζει πάντα κάποιες λεπτές χορδές της ψυχής μας. Δεν είναι καθόλου τυχαίο ότι οι Φάροι από μόνοι τους είναι ένα θέμα που ελκύει το ενδιαφέρον όλων των ειδών τέχνης , όχι μόνο της ζωγραφικής αλλά και της λογοτεχνίας , της ποίησης και του κινηματογράφου, γιατί πίσω από τους επιβλητικούς πέτρινους τοίχους τους , τους διαβρωμένους από την αλμύρα , κρύβουν δύναμη , μυστήριο , μοναξιά , περιπέτεια και συγχρόνως απέραντη γαλήνη. Οι πρώτοι φάροι σ’ όλο τον κόσμο έκαναν την εμφάνισή τους περίπου 2000 χρόνια πριν…. Ήταν ο Κολοσσός της Ρόδου στην Ελλάδα και ο Φάρος της Αλεξάνδρειας στην Αίγυπτο.

Το Φαρικό δίκτυο της Ελλάδας

Το φαρικό δίκτυο της χώρας μας θεωρείται από τα μεγαλύτερα και πιο οργανωμένα στον κόσμο. Αυτό αποτελείται από 1309 φάρους, φανούς και φωτοσημαντήρες εκ των οποίων οι 57 είναι επιτηρούμενοι, ενώ οι 6 είναι μόνιμα επανδρωμένοι. Η ακριβής χρονολογία κατασκευής του πρώτου Ελληνικού φάρου δεν μας είναι γνωστή. Η προφορική παράδοση αναφέρει ότι ο πρώτος φάρος κτίστηκε στην Αίγινα το 1827 όταν ο Καποδίστριας την όρισε πρωτεύουσα του νεοσύστατου Ελληνικού κράτους. Το 1831 τοποθετήθηκαν ακόμη δύο φανοί στα λιμάνια των Σπετσών και της Κέας αντίστοιχα και το 1934 κατασκευάστηκε ο φάρος στο Γαϊδουρονήσι της Σύρου που είναι ο ψηλότερος του Ελληνικού δικτύου με ύψος 29 μέτρων περίπου, ενώ ακολούθησε και η κατασκευή και πολλών άλλων. Έτσι το 1863 το φαρικό δίκτυο στην Ελλάδα αριθμούσε 29 φάρους και φανούς, ενώ τον επόμενο χρόνο με την απελευθέρωση των Ιονίων νήσων προστέθηκαν άλλοι 15 που είχαν κατασκευαστεί ήδη από το 1822 από τη Μεγάλη Βρετανία στην οποία ανήκαν μέχρι τότε τα Επτάνησα. Έως το 1887, χρονολογία σταθμό για την ιστορία των Ελληνικών φάρων, προστέθηκαν άλλοι 25 φάροι και φανοί (σύνολο 49) ανάμεσά τους και δύο στη Μαγνησία (ένας στο Τρίκερι και ένας στο Βόλο), πρώην Τούρκικοι, που αποκτήθηκαν με την προσάρτηση της Θεσσαλίας το 1881. Το 1887 επί Χαριλάου Τρικούπη θα ψηφιστεί ο νόμος «περί συστάσεως ταμείου φάρων» ο οποίος θα λύσει οριστικά όλα τα μέχρι τότε προβλήματα και θα δώσει νέα ώθηση στην ανάπτυξή τους. Μετά τους Βαλκανικούς πολέμους 1912-13 θα προστεθούν και άλλοι 35 φάροι και φανοί που είχαν κατασκευαστεί από τους Γάλλους για λογαριασμό της Οθωμανικής Αυτοκρατορίας με την ενσωμάτωση των «νέων Χωρών» στο Ελληνικό Κράτος και ο συνολικός αριθμός θα ανέλθει στους

of the newly appointed Greek state by Kapodistrias. In 1831 two more lamps placed at ports of Spetses and Kea, respectively, in 1934 the lighthouse in Gaidouronisi of Syros was built, which is the tallest in the Greek network with a height of about 29 meters, followed by the construction of many others. So in 1863 the lighthouse network in Greece numbered 29 lighthouses and lights, while next year with the liberation of the Ionian islands 15 others were added. The latest were built as early as 1822 by Great Britain which occupied the Ionian Islands. By 1887, chronology station on the history of Greek lighthouses, another 25 lighthouses and lights (total 49) were added, among them two at Magnesia (one in Volos and the other in Trikeri isle), former Turkish territory, acquired with the annexation of Thessaly 1881. In 1887 Trikoupis voted a law "establishing a fund beacons" that will finally solve all the problems by then and will give new impetus to their development. After the Balkan wars of 1912-13 another 35 lighthouses and lamps were added, with the incorporation of the "new lands" in Greek State and the total rose to 193, manufactured by the French on behalf of the Ottoman Empire.

Φάρος σε βραχονησίδα 193.

Important role in the development and operation of the lighthouse network played Stylianos Lykoudis, who was born in Syros in 1878 and served in the lighthouse network for more than 50 years, until his retirement in 1939. So during the 25 years 1913-1936 with the reorganization of the Lighthouse Service under the authority and guidance of Stylianos Lykoudis were added 191 other flares, number of great importance to the completion of the lighthouse network. During the Second World War, the beacons suffered significant damage, since they were easy and obvious target both from air and during naval raids. After the end of the Second World War only 28 lighthouses and lights out of the 400, which were in operation in the Greek seas found to operate.

In 1945 a systematic effort began to repair the damages, and in 1946 there were already 374 lighthouses, lights and light buoys.

The lighthouses network today

The Lighthouse network now has 120 traditional lighthouses aged about 2 centuries. Only 20 are in good condition and other 30 in medium condition. In the others signs of wear are visible with naked eye.

Σημαντικό ρόλο στην ανάπτυξη και λειτουργία του φαρικού δικτύου θα παίξει ο Στυλιανός Λυκούδης ο οποίος γεννήθηκε στη Σύρο το 1878 και υπηρέτησε στην υπηρεσία φάρων για περισσότερο από 50 χρόνια μέχρι και την αποστρατεία του το 1939. Έτσι κατά την 25ετία 1913-1936 με την αναδιοργάνωση της υπηρεσίας φάρων υπό την ευθύνη και την καθοδήγηση του Στυλιανού Λυκούδη θα προστεθούν άλλοι 191 πυρσοί, αριθμός αρκετά σημαντικός στην ολοκλήρωση του φαρικού δικτύου. Στα χρόνια του Β΄ παγκοσμίου πολέμου οι φάροι θα υποστούν σημαντικές φθορές, αφού αποτελούσαν εύκολο και εμφανή στόχο τόσο στις αεροπορικές, όσο και στις ναυτικές επιδρομές. Μετά την απελευθέρωση, από τους 400 φάρους και φανούς που υπήρχαν σε λειτουργία στις Ελληνικές θάλασσες βρέθηκαν να λειτουργούν μόνον 28.

Το 1945 άρχισε μία συστηματική προσπάθεια για την αποκατάσταση των ζημιών και το 1946 λειτουργούσαν ήδη 374 φάροι, φανοί και φωτοσημαντήρες.

Το Ελληνικό Φαρικό δίκτυο αριθμεί σήμερα 120 παραδοσιακούς φάρους μέσης ηλικίας περίπου 2 αιώνων. Μόνο οι 20 βρίσκονται σε καλή κατάσταση ενώ μέτρια χαρακτηρίζεται η κατάσταση άλλων 30. Στους υπόλοιπους τα σημάδια φθοράς είναι ορατά και με γυμνό μάτι. Το 1998 η Υπηρεσία Φάρων του Γενικού Επιτελείου Ναυτικού (ΓΕΝ), στην οποία ανήκει η ευθύνη για την διαχείριση του δικτύου, εκπόνησε ένα συνολικό πρόγραμμα συντήρησης και αποκατάστασης όλων των κτισμάτων και προώθησε το σχέδιο αυτό προς ένταξη στο Β΄ Κοινοτικό πλαίσιο στήριξης. Το Υπουργείο Πολιτισμού και οι Εφορείες Νεωτέρων Μνημείων ανέλαβαν να αξιολογήσουν έναν προς έναν όλους τους φάρους. Στο διάστημα

In 1998, the Lighthouse Department of the Navy General Staff, which owns the responsibility for managing the network, prepared a comprehensive program of restoration and maintenance of all buildings and promoted the project in the Second Community Support Framework. However, the plan had not been funded, so the Ministry of Culture and the Curators of Contemporary Monuments undertook to evaluate one by one all the lighthouses. The inspectors visited 20, which they considered as historical monuments to be preserved. The Lighthouse Service with its available funds has the ability to repair 3 to 4 towers annually. At this rate, the completion of the project extends in 40 years. Nevertheless, the third Community Support Framework revived the hopes of the people involved in the preservation of these monuments. Their persistence was paid off with the approval of funds -approximately EUR 4.5 million - to develop a pilot program of renovation and restoration of the network. With these funds the Departments of the Navy can repair about 40 lighthouses and yet in an extremely short period of time because they have knowledge, skilled engineers and architects.

Φάρος στο πέλαγος

The importance of the lighthouses in Greece today

The utility of the lighthouses in Greece becomes obvious if we take into account: a) the large coastal development in our country (mainland & island = 18.400 km), b) the number of islands, islets and rocks are 9835, c) the utility of flares that despite the modernization of navigation instruments, remain important navigational aids, as shown by the continuous submission of requests for the installation of new torches and light buoys and for connection with the existing network.

The latest news for Greek lighthouses is that three stone built lighthouses in Paxos and Antipaxos (March2012) were identified as monuments after a unanimous decision of the Central Council of Modern Monuments. These lighthouses are remarkable architectural structures and contributed for long to the development and security of navigation.

αυτό επισκέφθηκαν 20, τους οποίους και έκριναν ως νεώτερα μνημεία τα οποία πρέπει να διατηρηθούν. Ωστόσο το σχέδιο δεν χρηματοδοτήθηκε και η αποκατάσταση έμεινε στα χαρτιά. Η Υπηρεσία Φάρων με τα κονδύλια που διαθέτει έχει την δυνατότητα επισκευής 3 - 4 πύργων ετησίως. Με τον ρυθμό αυτό η αποπεράτωση του έργου τοποθετείται σε 40 χρόνια. Το Γ΄ Κοινοτικό Πλαίσιο Στήριξης αναπτέρωσε τις ελπίδες των ανθρώπων που ασχολούνται με την διατήρηση αυτών των μνημείων. Η επιμονή τους απέδωσε σε πρώτη φάση την έγκριση κονδυλίων ύψους 1,5 δισεκατομμυρίων δραχμών (περίπου 4,5 εκατομμύρια ΕΥΡΩ) για την εκπόνηση ενός πιλοτικού προγράμματος αναπαλαίωσης και αποκατάστασης του δικτύου. Με τα χρήματα αυτά οι υπηρεσίες του ΓΕΝ μπορούν να επισκευάσουν περίπου 40 φάρους και μάλιστα σε εξαιρετικά σύντομο χρονικό διάστημα γιατί διαθέτουν γνώση, ειδικευμένους μηχανικούς και αρχιτέκτονες.

Τα τελευταία νέα για τους ελληνικούς φάρους (Μάρτιος 2012) είναι ότι τρεις λιθόκτιστοι φάροι στους Παξούς και Αντίπαξους, που αποτελούν αξιόλογες αρχιτεκτονικές κατασκευές και συνέβαλαν στην ανάπτυξη και ασφάλεια της ναυσιπλοΐας, χαρακτηρίστηκαν μνημεία, έπειτα από ομόφωνη απόφαση του Κεντρικού Συμβουλίου Νεωτέρων Μνημείων.

Η σημασία των φάρων για την Ελλάδα σήμερα:

Η χρησιμότητα των φάρων στη ναυσιπλοΐα στις Ελληνικές θάλασσες γίνεται φανερή αν λάβουμε υπόψη:

α) την μεγάλη ανάπτυξη των ακτών στη χώρα μας (Ηπειρωτικό & νησιωτικό = 18.400χλμ),

β) το πλήθος των νήσων, νησίδων και βραχονησίδων που είναι 9.835,

γ) την σπουδαιότητα των πυρσών που παρά τον εκσυγχρονισμό των μέσων ναυσιπλοΐας παραμένουν σημαντικά ναυτιλιακά βοηθήματα, όπως φαίνεται από τη συνεχή υποβολή αιτημάτων

Φάρος Αγ. Σώστη, Λιμνοθάλασσα Μεσολογγίου

Fig. 1 Town lighthouse at Armenistis, Mykonos island.
Fig. 2 Lighthouse in islet
Fig. 3 Lighthouse at sea
Fig. 4 Lighthouse at Agios Sostis-Messologi lagoon
Fig. 5 Buoy

για την εγκατάσταση νέων πυρσών και φωτοσημαντήρων και την δικτύωση του υφιστάμενου φαρικού δικτύου.

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Castaway on a desert island

Ναυαγός σε ερημονήσι

by Margarita Deligiannidou & Iordana Apatsidou

Translation by Kakos Anastasios (student) supervised by Vassilou Kyriaki (english language teacher) (Model Experimental High School of University of Macedonia)

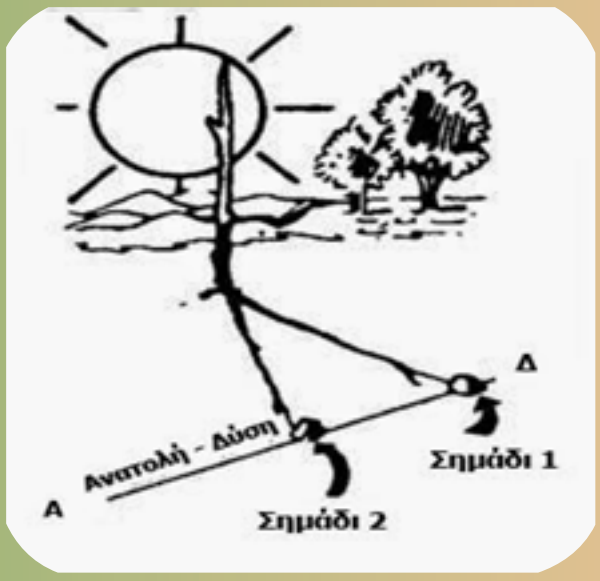
Castaway on a desert island

Have you ever thought about how you could survive in case you came to be a castaway n a desert island? While at 1st grade of Senior High School and in the context of our project, we decided to conduct some research concerning the question mentioned above, aiming not only at the acquisition of some basic knowledge around the subject, but also at the acquisition of some practical knowledge coming straight from the field of Physics. In order to make our study easier, we set the following sub-questions:

1. Weapon construction and ways of surviving
2. Orientation and castaway's psychological state
3. Food, clothing, accommodation
4. Castaway's communication

However, for the sake of saving time and space, we decided to present some indicative experiments of the previously mentioned sub-questions =>

1. **Castaway's orientation**
2. **Food ensurance**
3. **Water purification**



Orientation with the help of the sun

Έχετε σκεφτεί ποτέ πώς θα καταφέρνατε να επιβιώσετε σε περίπτωση που βρεθείτε ναυαγοί σε ένα ερημονήσι; Στη διάρκεια της πρώτης Λυκείου και στα πλαίσια του μαθήματος των ερευνητικών εργασιών ασχοληθήκαμε με το παραπάνω ερώτημα, επιδιώκοντας όχι μόνο να αποκτήσουμε ορισμένες βασικές γνώσεις επιβίωσης αλλά ακόμα να εμβαθύνουμε και σε πρακτικό επίπεδο στον κλάδο της φυσικής. Προκειμένου, όμως, να γίνει πιο εύκολη η μελέτη του ερωτήματος μας θέσαμε ορισμένα υποερωτήματα , τα οποία απορρέουν από αυτό. Έτσι, τα υποερωτήματα είναι τα εξής:

1. **Προσανατολισμός του ναυαγού.**
2. **Εξασφάλιση τροφής.**
3. **Καθαρισμός του νερού.**

Α) Εφόσον στόχος της μελέτης μας ήταν η επιβίωση του ναυαγού θεωρήσαμε ότι ο προσανατολισμός αποτελεί ένα ιδιαίτερα σημαντικό κομμάτι ,διότι γνωρίζοντας τα σημεία του ορίζοντα ο ναυαγός έχει τη δυνατότητα να εξασφαλίσει την δραπέτευσή του από το νησί. Έτσι στην αναζήτησή μας εντοπίσαμε αρκετά ενδιαφέρουσες προτάσεις για σωστό προσανατολισμό με τη βοήθεια τόσο του ήλιου όσο και του αστερισμού. Όσον αφορά τον προσανατολισμό του ναυαγού με τη βοήθεια του ήλιου, αυτός θα πρέπει πρώτα να βρει τον άξονα ανατολή – δύση. Για να γίνει, όμως αυτό αναγκαίο είναι να θέσει μία σταθερά με σκοπό να παρατηρήσει προς τα που γίνετε η κίνηση του ήλιου. Αυτό μπορεί να γίνει με την τοποθέτηση ενός ίσιου κλαδιού ή πασσάλου κάθετα σε ένα επίπεδο έδαφος. Πρέπει να σημειωθεί ότι το αντικείμενο που θα χρησιμοποιηθεί καλό θα είναι να έχει μέγεθος που να δημιουργεί μια ικανοποιητική σκιά. Επομένως τα βήματα που θα πρέπει να ακολουθήσει για να εντοπίσει την κίνηση του ήλιου, συνεπώς και τον αντίστοιχο άξονα είναι τα 2 παρακάτω :

- Σημείο 1, σημειώνουμε το σημείο που βρίσκεται η **σκιά**
- Περιμένουμε να περάσουν κάποια λεπτά ώστε η σκιά να μετατοπιστεί για μερικά εκατοστά (30-40)
- Σημείο 2, σημειώνουμε το νέο σημείο που βρίσκεται η **σκιά**,
- Ενώνουμε τα δύο αυτά σημεία με μία ευθεία γραμμή και έχουμε τον άξονα ανατολής-δύσης

A) Having in mind the goal of our research, which is the castaway's survival, we thought that their orientation would play a very important role, because by knowing the points of the horizon, the castaway has the ability to ensure their escape from the island. So, in our search we managed to gather quite a few interesting tips for proper orientation using the help of the sun and the different constellations scattered around our galaxy. As regards the castaway's orientation using the sun, they will first need to find the East-West axis. However, in order to do this, they will need to set a fixed position so they can observe the movement of the sun. This can happen by placing a straight tree branch or peg vertically on flat ground. Note, though, that the object which is intended for use is advisable to have a size that can create a satisfying shadow. So, the steps the castaway will have to follow, in order to spot the movement of the sun and with that the corresponding axis, are the following two:

- Point 1, we mark the spot where the **shadow** is found
- We wait for some minutes so that the **shadow** moves for some centimeters (30-40cm)
- Point 2, we mark the new spot where the **shadow** is found
- We link the two spots with a straight line and we have the East-West axis
- Point 2 is the East and Point 1 is the West

In addition, in order to find where approximately the North is:

- We place our right foot at Point 2 (east)
- And our left foot at Point 1 (west)

As far as the moon is concerned, it follows the same course as the sun does, but it has a different orbit. So, by using the same logic, we can spot East and West and, after that North and South, making it equally useful for orientation. The sun and the moon differ at the point of the horizon where they appear according to each season, so the moon:

- is found lower at the horizon during full-moon

- Η ανατολή είναι το σημείο 2, η δύση το σημείο 1

Επίσης για να βρούμε κατά προσέγγιση το βορρά,

- Το δεξί μας πόδι το τοποθετούμε στο σημείο 2 (ανατολικά)
- Το αριστερό μας πόδι στο σημείο 1 (δυτικά),

Όσον αφορά τώρα την **σελήνη**, αυτή ακολουθεί την ίδια πορεία που ακολουθεί ο **ήλιος** αλλά έχει διαφορετική τροχιά γωνίας, οπότε με την ίδια λογική μπορούμε να εντοπίσουμε την ανατολή και τη δύση και εν συνεχεία το βορρά και το νότο, συνεπώς είναι το ίδιο χρήσιμο στο προσανατολισμό. Ο ήλιος και το φεγγάρι έχουν μία διαφορά ως προς το σημείο του ορίζοντα που εμφανίζονται σε συνάρτηση με την εποχή, έτσι το φεγγάρι:

- Το καλοκαίρι όταν έχει πανσέληνο το φεγγάρι βρίσκετε πιο χαμηλά στον ορίζοντα
- Το χειμώνα όταν έχει πανσέληνο το φεγγάρι βρίσκετε πιο ψηλά στον ορίζοντα

Επίσης μπορούμε να διαπιστώσουμε σε ποια φάση του κύκλου της βρίσκεται η σελήνη ως εξής:

- Γεμίζει, αν η φωτεινή πλευρά είναι δεξιά του σκοτεινού της σημείου. Δηλαδή η φωτεινή μεριά της είναι προς την πλευρά που κατευθύνετε για να δύσει. Επίσης αυτό συμβαίνει όταν η ανατολή της σελήνης γίνει πριν τη δύση του ήλιου (p)
- Αδειάζει, αν η φωτεινή πλευρά είναι αριστερά του σκοτεινού της σημείου. Δηλαδή η φωτεινή μεριά είναι από την πλευρά από όπου ανέτειλε. Επίσης αυτό συμβαίνει όταν η ανατολή της σελήνης γίνει μετά τα μεσάνυχτα (d)

Αυτό προκύπτει αν τραβήξουμε μία νοητή γραμμή που να περνάει από τα νοητά άκρα της **σελήνης**, δηλαδή ανάλογα από ποια μεριά βρίσκετε το εμφανές κομμάτι ισχύει το παραπάνω, αν σχηματίζει το d αδειάζει και αν σχηματίζει το p γεμίζει.

Β) Ο ναυαγός για να εξασφαλίσει την τροφή του, η οποία αποτελεί και το πρωταρχικό στοιχείο

Indications of the Lunar phases

time in summer
- is found higher at the horizon during full-moon time in winter

We can also make out in which state of its circle the moon currently is, this way:

- It fills, if its enlightened side is on the right of its dark one, meaning that the enlightened side faces the one from which it is supposed to set. This also happens when the moon sets earlier than the sun (p)
- It empties, if its enlightened side is on the left of its dark one, meaning that the enlightened side faces the one from which it is supposed to rise. This also happens when the rise of the moon happens after midnight (d)
- This happens if we draw a conceivable line which passes from the conceivable edges of the moon, meaning that depending on which side each time the visible side is, the previously mentioned phenomenon is valid accordingly (if “d” is formed, it gets empty, however, if “p” is formed it gets filled).

B) In order to ensure their food, which is the key element for a person’s survival, the castaway will have to resort to fishing, since he is in a place which can

Natural cleaning water

mainly offer him food sourcing from the sea. The castaway will probably have to use a pointed stick, which will help him catch a fish by throwing it. However, sometimes the castaway throws the stick, but realizes that he didn’t manage to catch anything. In this case, the science of Physics comes to the rescue by indicating to us the refraction of light. Physicians claim that when a thin beam of light falls onto the surface, on which two transparent and isotropic forms of different visual density are divided, at a certain angle, a part of this light is reflected, however, most of the light passes through the second form. The course of the beam on the second form is not a continuation of the original falling beam. It looks like

Refracting light

επιβίωσης ενός ατόμου χρειάζεται να καταφύγει στο ψάρεμα, μιας και βρίσκεται σε έναν τόπο , ο οποίος κατά βάση μπορεί να του προσφέρει τροφή από την θάλασσα. Ο ναυαγός για να πιάσει ένα ψάρι λογικά θα χρησιμοποιήσει ένα μυτερό ξύλο, το οποίο θα χρησιμεύσει στο να το πετύχει. Ρίχνει και συνειδητοποιεί ότι δεν κατάφερε τίποτα. Στην συγκεκριμένη περίπτωση έρχεται η επιστήμη της Φυσικής για να επισημάνει την διάθλαση του φωτός. Έτσι η Φυσική αναφέρει ότι Όταν μια λεπτή φωτεινή δέσμη πέσει με κάποια γωνία στην επιφάνεια διαχωρισμού δυο διαφανών και ισότροπων μέσων διαφορετικής οπτικής πυκνότητας, ένα μέρος του φωτός ανακλάται, το πιο πολύ όμως περνά μέσα στο δεύτερο σώμα. Η πορεία της δέσμης στο δεύτερο σώμα δεν είναι συνέχεια της προσπίπτουσας. Φαίνεται να σπάει στην επιφάνεια διαχωρισμού και να πλησιάζει ή να απομακρύνεται από την κάθετο που θεωρούμε στο σημείο προσπτώσεως. Το φαινόμενο αυτό το λέμε **Δ ι ά θ λ α σ η.**

Αποτέλεσμα της διάθλασης

Φαινομενική ανύψωση αντικειμένων. Είναι γνωστό πως τα σώματα που βρίσκονται μέσα σε δοχεία που περιέχουν κάποιο διαφανές υγρό φαίνονται πιο ψηλά απ’ ότι στην πραγματικότητα. Το ίδιο συμβαίνει και στην περίπτωση του ψαριού για αυτό και ήταν αδύνατη η απόκτησή του.

C) Επιπλέον για τον ναυαγό απαραίτητη θεωρείται και η απόκτηση πόσιμου νερού. Αν και περιβάλλεται από νερό ,το οποίο μάλιστα βρίσκεται και σε αρκετή ποσότητα, δυστυχώς αυτό είναι θαλασσινό γεγονός που δεν το καθιστά κατάλληλο για να εισέλθει στον οργανισμό. Και αυτό συμβαίνει εξαιτίας του ιωδίου και των διάφορων μικροοργανισμών που περιέχει. Συνεπώς είναι αναγκαίος ο καθαρισμός του ,διότι διαφορετικά ο ναυαγός δεν θα καταφέρει να επιζήσει για μεγάλο χρονικό διάστημα. Μετά από αναζήτηση καταλήξαμε ότι ο πιο σίγουρος και βέβαιος τρόπος καθαρισμού του νερού είναι το βράσιμο για δέκα περίπου λεπτά. Το πιο ιδανικό μάλιστα είναι να βράσει σε χαμηλή φωτιά όσο το δυνατόν περισσότερο χρόνο γίνεται. Πάντως μπορεί

that it gets broken upon the surface of the division and approaches or fends off from the conceivable vertical line that we set at the point on which the fall happened. This phenomenon is called **R e f r a c t l o n.**

Result of refraction

Ostensible elevation of objects. It is well known that objects which are placed inside pots including transparent liquid tend to look like they are on a higher level than they are in reality. The same happens also in the fish case explaining the reason why its catching was impossible.

C) In addition, the acquisition of drinkable water is considered to be necessary for the castaway's survival. Even though the castaway is surrounded by water, which is also on a very large quantity, unfortunately, it is sea water, something which automatically makes it unsuitable for consumption. This is due to the fact that it contains iodine and a lot of different microorganisms. Consequently, its purification is necessary, otherwise the castaway will not manage to survive for a long period of time. After extensive research, we concluded that the most certain and guaranteed way for water purification is boiling it for approximately ten minutes. The ideal way of doing it so is by putting it over low burning fire for the longest possible time. One way or another, though, it is definitely a very time-consuming process, as the time needed to start the fire, boil the water and finally let it cool so the castaway can drink it is quite a lot. Eventually though, it is worth the effort.

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να είναι χρονοβόρο καθώς απαιτείται χρόνος για να αναφτεί η φωτιά, να βράσει το νερό και να κρυώσει ώστε ο ναυαγός να μπορεί να το πιεί ,ωστόσο αξίζει τον κόπο!

ΒΙΒΛΙΟΓΡΑΦΙΑ

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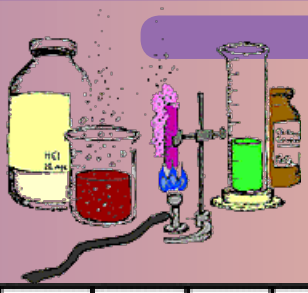
FUN PAGE

Find the words!

by Athina Stergiannidou & Spyros Terzis



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J	E	M	E	K	F	R	S	D	E
H	R	P	R	A	D	A	R	S	C
O	G	E	M	P	E	T	U	W	T
G	Y	R	O	S	C	O	P	E	R
L	A	A	D	O	M	M	O	C	O
K	E	T	Y	L	D	R	W	M	M
G	G	U	N	H	F	W	E	N	A
D	F	R	A	F	U	A	R	C	G
F	D	E	M	N	L	S	V	I	N
P	G	D	I	O	K	R	V	T	E
E	F	H	C	W	E	I	G	H	T
M	E	G	S	P	T	S	F	O	I
G	R	A	V	I	T	Y	Y	L	C

ANSWERS

Energy
Temperature
Thermodynamics
Gyroscope
Weight
Gravity
Atom
Power
Electromagnetic
Radar

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FUN PAGE

Write the numbers in the right persons!

by Athina Stergiannidou & Spyros Terzis

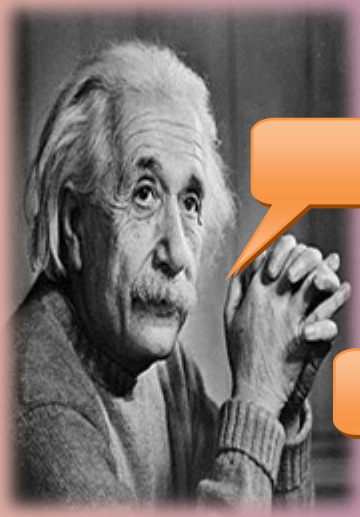
1)ALBERT EINSTEIN

2) JAMES WATT

3) ISAAK NEWTON

4) GALILEO GALILEI

5) CELCIUS



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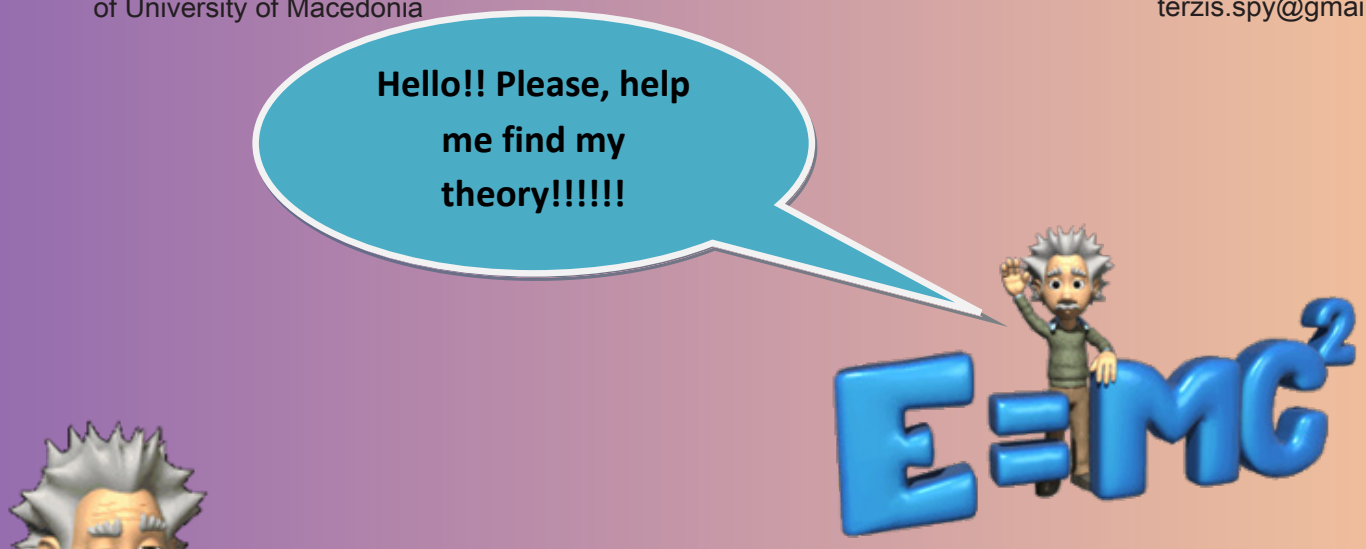

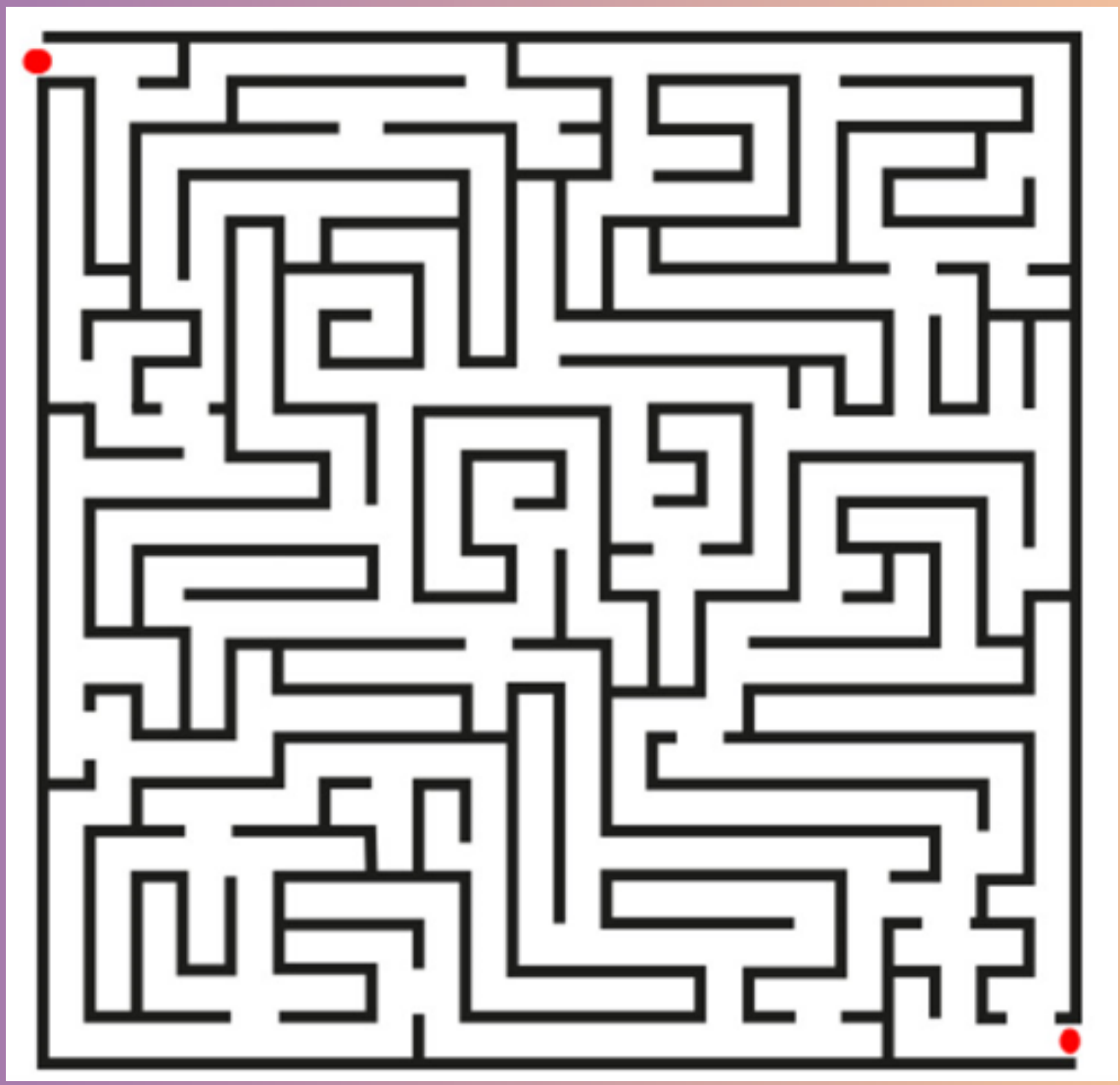

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FUN PAGE

Solve the acronym

by Athina Stergiannidou & Spyros Terzis

1) P_ _ _ _ _ _
2) H_ _ _ _ _ _ _ _
3) Y _ _ _
4) S _ _ _ _ _
5) I_ _
6) C _ _ _
7) S _ _ _ _

1. A well-known painter was called Pablo…
2. Water type is: …….. 2 Oxygen
3. The back garden is called……..
4. He was very dirty and he decided to take a……..
5. It's a desert which is cold and called…… cream
6. It rains ….. & dogs
7. Can you ….. loudly?

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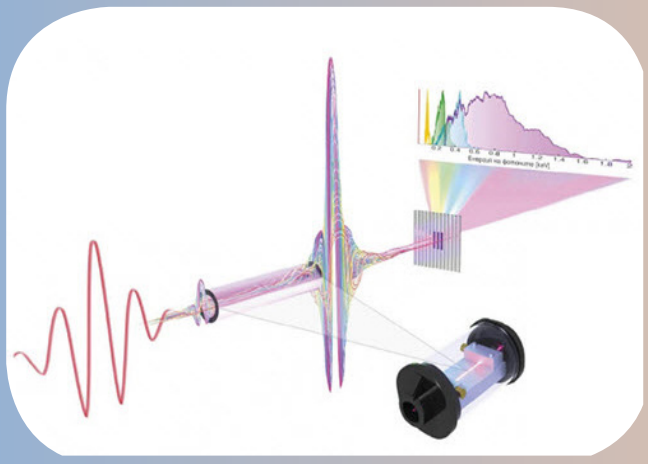
New Bulgarian discoveries

Новите български открития

by Lucy Andonova and Ina Milcheva

Portable X-ray laser



Desktop X-ray laser is an evolutionary invention that Tenyo Popminchev made after more than 100years, since the discovery of X-rays. The name of the scientist from the University of Colorado appeared in prestigious scientific journals and televisions worldwide, precisely because of his discovery. Before such devices have been an area as football course, but today they are already able to gathered on the table. Create a device converts infrared radiation in the X-ray laser pulses, making it possible to monitor the movement of electrons in atoms, cellular processes, studying the dynamics and structure of molecules and probably in the future will serve to create a more faster than current computers. Portable X-ray laser will undoubtedly be very useful for medical!

Decision of the greatest geometric problem

18-year-old then, Radko Kotev stunned the world with a decision of one of the most difficult geometric problems - Apollonius. The ancient Greek mathematician Feathers poses a problem 200 years BC. The original solution of the problem burned in a fire in the library of Alexandria. Many scientists have tried to solve the task, but only four have managed to do so. The decision of Radko

Преносим рентгенов лазер

Настолният рентгенов лазер е еволюционно изобретение, което Теньо Попминчев прави след повече от 100г. След откриването на рентгеновите лъчи. Името на учена от Колорадския университет се появява в престижни научни списания и телевизии по цял свят, именно благодарение на неговото откритие. Отпреди подобни устройства са били с площ колкото футбулно игрище, но днес те вече могат да се съберат върху маса. Създаденият апарат преобразува инфрачервеното излъчване в рентгенови лазерни импулси, правейки възможно наблюдението на движенията на електроните в атома, кетъчни процеси, изучаване динамиката и структурата на молекулите и вероятно в бъдеще ще послужи за създаването на по бързи от сегашните компютри. Преносимият рентгенов лазер несъмнено ще бъде и много полезен за медицината !

Решение на най-великия геометричен проблем

18годишният тогава , Радко Котев смайва целия свят с решение на една от най-трудните геометрични задачи – Аполониевата. Древногръцкият математик Пера поставил проблема 200 години преди новата ера. Оригиналното решение на задачата изгаря при пожар в Александрииската библиотека. Много учени са се опитали да решат задачата, но само 4 са успяли да го направят. Решението на Радко е петото и го нарежда редом до имената на тези велики математици. Днес всички GPS системи се основават на принципа на Аполониевата задача за определяне на местоположението на Земята.

Сливокайсия

В института по овощарство в Пловдив успяха да сътворят хибрид между синя слива и кайсия. Кръстоската, която съчетава едновременно вкуса и на двата плода се нарича – Стендесто. Новият вид се ражда след 25-годишна селекция на екип учени и е получен по класическия метод на полова хибридизация, т.е. нанесен е прашец от кайсията върху близалцата на цветовете на сливата. Външния вид на плода е тъмносин и издължен като сливата. Узрява в края на месец юли. Покрит е с нежен мъх и има аромат на кайсия. Освен, че е устойчив на болести, хибридът не е генномодифициран и със своето захарно съдържание е идеален за ракия.

Зелен оазис над бетонен град

Русенеца Цветан Тошков създава 3D

is the fifth and ranks alongside the names of the great mathematicians. Today, all GPS systems are based on the principle of Apollonius task of identifying the location of Earth.

Slivokaysiya

At the Institute of Pomology in Plovdiv managed to create a hybrid between plum and apricot. Crossing, which combines both the taste of both the fetus is called - Stendesto.The new species is born after 25 years of selection of a team of scientists is obtained by the classical method of sexual hybridization, ie pollen is deposited on the stigma of the apricot color of plums. Appearance of the fruit is dark blue and elongated like plum. Ripens in late July. Covered with soft moss and has aromas of apricot Besides being resistant to diseases hybrid is not genetically modified, and with its sugar content is ideal for brandy.

Green oasis above the concrete city

Tsvetan Toshkov create 3D visualization which materializes in an ingenious way ilyuziorno escape from the stressful and hectic city life. Gorman, Indian lotus, which is part of Eastern culture, totally inspiring project of the Bulgarians. The plant always bloomes, although thrive under extremely difficult conditions. Philosophical significance can be interpreted as the ability to rise above the problems and concerns of everyday life. With this invention we can go over there where there is no noise, the air is crystal clear. It sounds like you are in heaven, but that paradise never reduced to be created.

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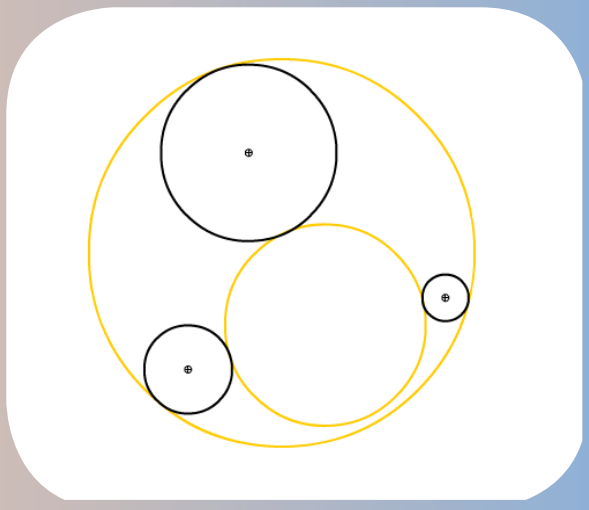

визуализация, която материализира по гениален начин едно илюзиорно бягство от стресирания и забързан живот е големия град. Гормата на индийския лотос, която е част от източната култура, изцяло вдъхновява проекта на българина. Растението винаги разцъфва, въпреки че вирее при изключително трудни условия. Значението му философски може да се тълкува като способността да се издигнем над проблемите и притесненията на ежедневието. С това изобретение можем да се пренесем там където няма шум, въздухът е кристално чист. Това звучи все едно си попаднал в рая, но онзи рай, който никога нама да бъде създаден.

http://daznaempoveche.com/%D0%BD%D0%BE%D0%B2%D0%B8%D1%82%D0%B5-%D0%B1%D1%8A%D0%BB%D0%B3%D0%B0%D1%80%D1%81%D0%BA%D0%B8-%D0%B8%D0%B7%D0%BE%D0%B1%D1%80%D0%B5%D1%82%D0%B5%D0%BD%D0%B8%D1%8F/

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Brucella Melitensis

by Panagiotis Manasian

Brucella Melitensis

Brucella species in general are coccobacilli of 0.6-1.5 μm long and 0.5-0.7 μm in width. They are arranged to small groups, they don't form flagella, pili or spores. Brucellas are Gram-negative bacteria. They are aerobic except some strains that need an environment containing 5%-10% carbon dioxide. The optimum pH in which they grow ranges from 6.6 to 7.4 and finally the optimal temperature for maximum growth is 360- 380 C (European Commission 2001). All the above characteristics are common to all the strains of the Brucella species.

Picture 1 ("colonial morphology exhibited by colonies of Brucella abortus bacterial, which had been cultivated on chocolate agar, for a period of 72 hours."(eol.org 2009))

Brucella species cause a disease commonly known with different names: "undulant fever", "Mediterranean fever" or "Malta fever"; scientifically the disease is called "brucellosis". Brucellosis is zoonosis that invariably is transmitted to humans by either indirect or direct contact with infected animals, or by consuming their products. (M.J Corbel 2006). The symptoms of brucellosis in humans are similar to common flu: the initial symptoms include fatigue and headache followed by high fever, chills, sweats, joint pains, backache and lost of weight and appetite .(USDA) Brucellosis nowadays is still a public health hazard due to

Τα βακτήρια Brucella spp είναι κοκκοβάκιλλοι με μήκος 0,6-1,5 μm και πλάτος 0.5-0.7 μm. Σχηματίζουν μικρές ομάδες, , δεν σχηματίζουν μαστίγια, τρίχες ή σπόρια. Τα βακτήρια Brucella είναι Gram-αρνητικά. Είναι αερόβια, εκτός από ορισμένα στελέχη τα οποία χρειάζονται ένα περιβάλλον που περιέχει 5% -10% διοξείδιο του άνθρακα. Το ιδανικό pH στο οποίο αναπτύσσονται κυμαίνεται μεταξύ 6,6 και 7,4 και, η ιδανική θερμοκρασία, προκειμένου να έχουν τον μέγιστο ρυθμό ανάπτυξης είναι 36- 38oC (Ευρωπαϊκή Επιτροπή, 2001). Όλα τα παραπάνω χαρακτηριστικά είναι κοινά για όλα τα στελέχη των ειδών Brucella.

Εικόνα 1 («αποικιακή μορφολογία που παρουσιάζεται από αποικίες Brucella abortus βακτήρια, τα οποία είχαν καλλιεργηθεί σε άγαρ σοκολάτας, για μια περίοδο 72 ωρών.» (Eol.org 2009))

Η ασθένεια που προκαλείται από τα περισσότερα στελέχη του γένους Brucella είναι γνωστή με διαφορετικά ονόματα όπως: "μελιταίος πυρετός», «Μεσογειακός πυρετός» ή «πυρετός της Μάλτας", αλλά η επιστημονική ονομασία είναι "βρουκέλλωση». Η βρουκέλλωση είναι ζωονόσος που πάντα μεταδίδεται στον άνθρωπο είτε με την έμμεση ή άμεση επαφή με μολυσμένα ζώα είτε με την κατανάλωση των προϊόντων τους. (M.J Corbel 2006). Τα συμπτώματα της βρουκέλλωσης στον άνθρωπο είναι παρόμοια με την κοινή γρίπη: τα αρχικά συμπτώματα συμπεριλαμβάνουν κούραση και πονοκεφάλους και ακολουθούνται από υψηλό πυρετό, ρίγη, εφίδρωση, πόνους στις αρθρώσεις, πόνος στην πλάτη και απώλεια βάρους και όρεξης (USDA). Η βρουκέλλωση σήμερα εξακολουθεί να είναι κίνδυνος για την δημόσια υγεία λόγω της έλλειψης μέτρων υγιεινής κατά την παραγωγή ζωικών προϊόντων. Ένας άλλος λόγος είναι η εισαγωγή εξωτικών γαλακτοκομικών προϊόντων σε περιοχές που δεν έχουν ιστορικό βρουκέλλωσης και η πιθανή εξάπλωση της ασθένειας στους τόπους αυτούς. (MJ Corbel 2006) . Η Brucella melitensis είναι το πιο διαδεδομένο είδος της Brucella και ο έλεγχος της είναι μια πρόκληση που απασχολεί πολλές χώρες.

Εικόνα 2: κατσίκα Μάλτας, το πρώτο είδος της

the lack of hygiene measures during animal product processing. Another reason is the import of exotic dairy products to regions that don't have a Brucellosis history and the possible establishment of the disease in these areas.(M.J Corbel 2006).

Picture 2: Maltese goat, the first goat breed found positive to B. melitensis (eng.agraria.org 2010)

Brucella melitensis is the most wide spread species of Brucella and its control is a challenge for many countries.
B. melitensis is the main cause for brucellosis in small ruminants. It was the first Brucella species to be described. Bruce isolated Brucella melitensis in 1880 from dieing soldiers who had Mediterranean fever on Malta. Bruce named it Micrococcus melitensis. (European commission 2001).
Across history, there were a lot of references of brucellosis before 1880s, which described brucellosis from the symptoms. In animals caused epidemics of animal abortions and fever to humans. At the Crimean war, brucellosis was the reason of much treason especially in the Royal Navy. In 1905 the Bureau of Animal Industry of the USDA rejected a whole shipment of Maltese goats. The reason for that decision was that the sailors who drunk the raw goats' milk were all suffered from brucellosis. (M.S. Rahman et al, 2006)
B. melitensis mostly infects goats, especially the Maltese goats, but people get infected too when they come in contact with an infected animal The B. melitensis bacteria can contaminate the goat milk too. The infections with B. melitensis are common fact in regions of the Mediterranean Sea, central Asia and Latin America. Over the last 10 years the infections with B. melitensis have grown dramatically. In order to decrease the rate of the infections specific rules must be followed.

Picture 3: USDA logo (www.usda.gov)

"Ranchers, farmers, or animal managers should clean and disinfect calving areas and other places likely to become contaminated with infective material. All individuals should wear gloves and clean them with soap and water afterwards" these are the instructions for the prevention of B. melitensis infection according to USDA (U.S. Department of Agriculture). Another way of getting contaminated

κατσίκας που ήταν θετική για B. melitensis (eng. agraria.org 2010)

Η B. melitensis είναι η κύρια αιτία για τη βρουκέλλωση των μικρών μηρυκαστικών. Ήταν το πρώτο από τα στελέχη του γένους Brucella που περιγράφθηκε. Το βακτήριο Brucella melitensis αρχικά απομονώθηκε το 1880, μετά το θάνατο στρατιωτών που έπασχαν από μεσογειακό πυρετό στη Μάλτα. Ο David Bruce πρώτα το ονόμασε Micrococcus melitensis. (Ευρωπαϊκή Επιτροπή, 2001). Ιστορικά, υπήρξαν πολλές αναφορές στην βρουκέλλωση και πριν από 1880 που την περιέγραψαν από τα συμπτώματα. Στα ζώα προκαλούνταν επιδημίες αμβλώσεων και στον άνθρωπο πυρετό. Κατά τον Κριμαϊκό πόλεμο η βρουκέλλωση ήταν η αιτία πολλών λιποταξιών ειδικά στο Βασιλικό Ναυτικό. Το 1905, το Προεδρείο της Βιομηχανίας Ζώων του USDA απέρριψε ένα ολόκληρο φορτίο αιγών της Μάλτας. Η αιτία της απόφασης ήταν ότι οι ναυτικοί που έπιναν το μη παστεριωμένο γίδινο γάλα, έπασχαν όλοι από βρουκέλλωση. (MS Rahman et al, 2006). Η B. melitensis μολύνει κυρίως αίγες, ειδικά τις κατσίκες της Μάλτας, αλλά και τους ανθρώπους που έρχονται σε επαφή με ένα μολυσμένο ζώο. Η B. melitensis μπορεί να μολύνει επίσης το γάλα της κατσίκας.. Οι λοιμώξεις με B. melitensis είναι ένα σύνηθες γεγονός σε ορισμένες περιοχές της Μεσογείου, της Κεντρικής Ασίας και της Λατινικής Αμερική. Τα τελευταία 10 χρόνια οι λοιμώξεις από B. melitensis έχουν αυξηθεί δραματικά. Προκειμένου να μειωθεί το ποσοστό των λοιμώξεων πρέπει να ακολουθηθούν συγκεκριμένοι .κανόνες.

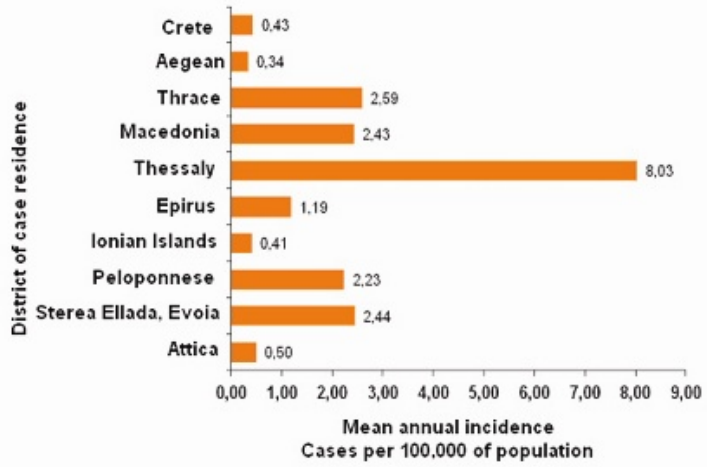
Εικόνα 3: USDA λογότυπο (www.usda.gov)

"Κτηνοτρόφοι, αγρότες, ή οι διαχειριστές των ζώων θα πρέπει να καθαρίζουν και να απολυμαίνουν τις περιοχές τοκετού και άλλες θέσεις που μπορεί να υπάρξει μολυσματικό υλικό. Όλα τα άτομα θα πρέπει να φορούν γάντια και να τα πλένουν με σαπούνι και νερό αργότερα "αυτές είναι οι οδηγίες για την πρόληψη της μόλυνσης B melitensis σύμφωνα με το USDA. Ένας άλλος τρόπος να μολυνθεί κάποιος από B melitensis είναι η κατανάλωση μη παστεριωμένων γαλακτοκομικών προϊόντων που παρήχθησαν από προσβεβλημένα ζώα όπως ωμό γάλα και κάποια τυριά. Οι καταναλωτές μπορούν να προστατευθούν καταναλώνοντας μόνο παστεριωμένα γαλακτοκομικά προϊόντα. Η παστερίωση εξασφαλίζει την καταστροφή όλων των παθογόνων μικροβίων συμπεριλαμβανόμενης της B. melitensis στα γαλακτοκομικά προϊόντα.

with the B. melitensis is to consume products produced from infected animals like raw dairy products (raw means not processed – not pasteurized) such as raw milk and some cheeses.
Consumers can protect themselves by consuming only pasteurized dairy products. Pasteurization assures the destruction of all pathogenic microbes including B. melitensis in dairy products. Pasteurization is a heat-treatment process during which the milk's temperature is raised for a short period of time, usually at 72o C for 15 seconds. (www.cdc.govc, 2012). Consumption of meat from infected animals does not transmit Brusellosis to humans. The USDA gives an explanation for this: during cooking, the bacteria in meat are killed.
To find if someone is infected, B. melitensis' phenotypic characteristics are examined in a sample of blood such as CO2 requirement, phage typing and metabolic tests (Poester F.P. 2010).
How do we examine the existence of B. melitensis in animals such as sheep and goats?
Testing methods for animals have been developed which include isolation, identification, detection, and estimation of the antibodies induced in response to the bacterium. MRT (Milk Ring Test) is the most widely used test for finding brucellosis in dairy cattle. The B. melitensis bacteria can be identified by culture methods which have some disadvantages: they do not have a high success ratio and they are time consuming. In modern laboratories, bacteria are usually identified by characterization of their DNA: Thus the PCR method is used in order to make the examination of fastidious or slow growing bacteria that cause infectious diseases. (Ilhan Z. et al 2008). PCR, which is sometimes also called "molecular photocopying", is a fast and cheap method that amplify –copy- small segments of DNA.(www.genome.gov).
Although there are so many different ways for testing and identifying B. melitensis presence, brucellosis is common in many parts of the world and millions of dollars are spend for treating infected humans and animals. That's why the EU legislation is very strict about the Brucella melitensis infections. In Europe many places are found brucellosis –free. In order a region to be named brucellosis-free 5%of all the sheep and goats in a country over the six months old have been tested negative. Ireland, Denmark, Sweden, Finland, Netherlands and Belgium are considered brucellosis free, also some areas of France, Italy and Spain are brucellosis-free.(DEFRA, 2009) Even though some Italian and French PDO products which should be made with unpasteurized milk, the EU legislation is forcing them to pasteurize the milk. Greece according to the Hellenic Center for Disease Control and Prevention (HCDCP) cannot be certified as brucellosis-free country, because

Η παστερίωση είναι η διαδικασία κατά την οποία το γάλα θερμαίνεται σε μία υψηλή θερμοκρασία για μικρό χρονικό διάστημα, συνήθως στους 72ο C για 15 δευτερόλεπτα (www.cdc.govc, 2012). Η κατανάλωση κρέατος προσβεβλημένου ζώου δεν μεταδίδει την βρουκέλλωση στον άνθρωπο. Το USDA δίνει την εξής εξήγηση: Κατά το μαγείρεμα, τα βακτήρια στο κρέας σκοτώνονται.
Για να βρεθεί αν κάποιος έχει μολυνθεί, εξετάζονται κάποια φαινοτυπικά χαρακτηριστικά της B. melitensis σε δείγμα αίματος, όπως η απαίτηση για το CO2, λυσιτυπία και μεταβολικές δοκιμές (Poester ΠΠ 2010).
Πώς εξακριβώνουμε την ύπαρξη της B. melitensis στα ζώα όπως πρόβατα και κατσίκες; Υπάρχουν μέθοδοι δοκιμής για τα ζώα όπως η απομόνωση, ταυτοποίηση, ανίχνευση και εκτίμηση των αντισωμάτων που παράγονται σε σαν αντίδραση του οργανισμού προς το βακτήριο. Η MRT (Milk Ring Test) είναι η πιο ευρέως χρησιμοποιούμενη μέθοδος για την εύρεση της βρουκέλλωσης των βοοειδών γαλακτοπαραγωγής. Οι μέθοδοι καλλιέργειας έχουν μερικά μειονεκτήματα: δεν έχουν υψηλό ποσοστό επιτυχίας και είναι χρονοβόρα.. Στα σύγχρονα εργαστήρια, τα βακτήρια συνήθως ταυτοποιούνται με χαρακτηρισμό του DNA τους. Έτσι, η μέθοδος της PCR χρησιμοποιείται προκειμένου να γίνει η εξέταση του απαιτητικών ή βραδέως αναπτυσσομένων βακτηριδίων που προκαλούν μολυσματικές ασθένειες (Ilhan Z. et al 2008). Η PCR, που μερικές φορές ονομάζεται επίσης «μοριακή φωτοτυπία», είναι μια γρήγορη και φθηνή μέθοδος που πολλαπλασιάζει –αντιγράφει- μικρά τμήματα του DNA. (Www.genome.gov). Αν και υπάρχουν πολλοί τρόποι ελέγχου της ύπαρξης και ταυτοποιήσης της B.m elitensis, η βρουκέλλωση είναι συνήθης σε πολλά μέρη του κόσμου και εκατομμύρια δολάρια ξοδεύονται για την θεραπεία προσβεβλημένων ανθρώπων και ζώων. Αυτός είναι ο λόγος για τον οποίο η νομοθεσία της ΕΕ είναι πολύ αυστηρή για τις λοιμώξεις της βρουκέλλωσης των αιγοπροβάτων. Στην Ευρώπη, υπάρχουν πολλές περιοχές που βρέθηκαν απαλλαγμένες από τη βρουκέλλωση. Μια περιοχή ονομάζεται απαλλαγμένη από τη βρουκέλλωση όταν το 5% του συνόλου των αιγοπροβάτων σε μια χώρα ηλικίας πάνω από έξι μηνών έχει ελεγχθεί και έχει βρεθεί αρνητικό (στην παρουσία B. Melitensis). Η Ιρλανδία, η Δανία, η Σουηδία, η Φινλανδία, η Ολλανδία και το Βέλγιο θεωρούνται απαλλαγμένες από βρουκέλλωση, επίσης, ορισμένες περιοχές της Γαλλίας, της Ιταλίας και της Ισπανίας είναι απαλλαγμένες από βρουκέλλωση. (DEFRA, 2009), Αν και κάποια Ιταλικά και Γαλλικά προϊόντα ΠΟΠ, πρέπει να παράγονται από μη παστεριωμένο

Figure 3: Mean monthly incidence of brucellosis by month of onset of symptoms in Greece, 2005-2011



Information regarding the date of symptom onset was available for 1,078 cases (77%).

the disease affects a lot people compare to the EU average. As you can see to the table below the Greek cases of brucellosis are ten to twenty times higher than the EU average. In Greece all of the milk products are made by pasteurized milk. The distribution, though, of homemade dairy products made by unpasteurized milk is the main reason for the spread of brucellosis.(HCDCP, 2012)

Brucellosis is more spread in areas where the husbandry is extensive. In Greece these places are Thessaly, Macedonia, Thrace, Peloponnesus and Sterea Ellada as it is shown on figure 3. So Greece maybe has increased cases of brucellosis but the protection measures are getting tighter day-by-day. At the end someday Greece like UK will be brucellosis free.

Table 1: Mean annual brucellosis incidence (cases per 100,000 of population) in Greece and the EU as a whole, 2006-2009

	2006	2007	2008	2009
Greece	2.50	1.34	3.13	1.03
EU	0.20	0.13	0.15	0.08

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FAO technical meeting in collaboration with WHO

γάλα, η νομοθεσία της ΕΕ υποχρεώνει την παστερίωση του γάλακτος. Η Ελλάδα, σύμφωνα με το Ελληνικό Κέντρο Ελέγχου και Πρόληψης Νοσημάτων (ΚΕΕΛΠΝΟ), δεν μπορεί να πιστοποιηθεί ως απαλλαγμένη από τη βρουκέλωση χώρα, επειδή η ασθένεια επηρεάζει πολλά άτομα σε σύγκριση με τον μέσο όρο της ΕΕ. Όπως μπορείτε να δείτε στον παραπάνω πίνακα οι ελληνικές περιπτώσεις βρουκέλλωσης είναι δέκα έως είκοσι φορές υψηλότερες από το μέσο όρο της Ε.Ε. Στην Ελλάδα όλα τα γαλακτοκομικά προϊόντα παράγονται από παστεριωμένο γάλα. Η διανομή όμως των σπιτικών γαλακτοκομικών προϊόντων που παρασκευάζονται από μη παστεριωμένο γάλα συνεχίζει την εξάπλωση της βρουκέλλωσης. (ΚΕΕΛΠΝΟ, 2012) Έτσι, η βρουκέλλωση είναι πιο εξαπλωμένη σε περιοχές όπου η κτηνοτροφία είναι εκτατική. Στην Ελλάδα αυτά τα μέρη είναι η Θεσσαλία, η Μακεδονία, η Θράκη, η Πελοπόννησος και η Στερεά Ελλάδα, όπως φαίνεται στο παρακάτω σχήμα. Η Ελλάδα ίσως έχει αυξημένα κρούσματα βρουκέλλωσης, αλλά τα μέτρα προστασίας γίνονται όλο και πιο σφιχτά μέρα με τη μέρα. Κάποια μέρα και η Ελλάδα όπως το Ηνωμένο Βασίλειο θα είναι απαλλαγμένη από βρουκέλλωση.

Μέσος όρος μηνιαίων εμφανίσεως βρουκέλλωσης στην Ελλάδα, 2005-2011.

Table 1: Mean annual brucellosis incidence (cases per 100,000 of population) in Greece and the EU as a whole, 2006-2009

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