Mstari wa Wakati wa Kikosmolojia
Cosmological Time Line

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Malengo
Goals

- Fikiria historia ya Ulimwengu kwa mfuatano wa matukio
- Kuelewa taratibu muhimu ambazo zilihitajika kufikia katika malezi ya maisha.
- Kuelewa marekebisho ya maisha kwa hali tofauti sana

- Visualize the history of the Universe with a time line.
- Understand the important processes that were necessary for the formation of life.
- Understand the adaptation of life to very varied conditions.

Shughuli 1: Mfululizo

Mwanzo wa ulimwengu, Big Bang,
alikuwa na nafasi kuhusu bilioni 13.8 miaka iliyopita, hiyo ni, 13.8 miaka 10^9 iliyopita

The beginning of the Universe, the Big Bang,
took place about 13.8 billion years ago (13.8 x 10^9 years ago).

Mita ya 1 = miaka 10^9

mm 1 = miaka milioni 1

Mfululizo wa Mita 13.8

Timeline of 13.8 meters

Shughuli 1: Mfululizo Activity 1: Timeline

Mlipuko Mkuu)

t=0 seg. (13.8 10^9 miaka iliyopita mwanzo wa Ulimwengu,

t=0 sec (13.8 10^9 years ago beginning of the Universe, the Big Bang.)

10^{-45} seg. mwisho Planck Era (wala T. Relativity Einstein)

10^{-45} sec End Planck Era (N.B. Relativity Einstein)

10^{-35} seg. MFUMUKO (exponential upanuzi Ulimwengu)

10^{-35} sec Inflation (Exponential Expansion Universe)

10^{-6} seg. Supu ya Primordial (chembe mbalimbali za msingi)

10^{-6} sec Primordial Soup (Various Elementary Particles)

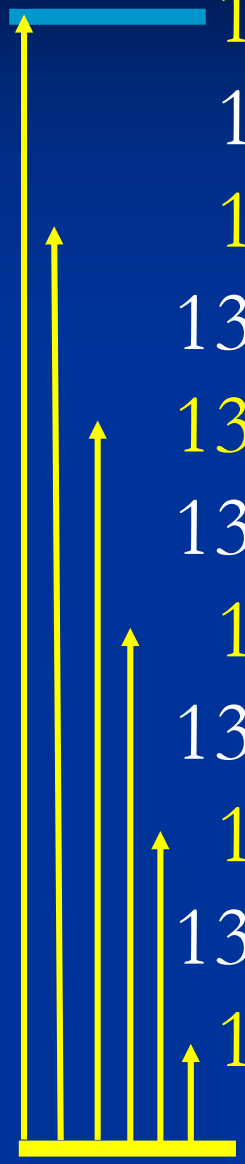
3 min. Nucleosynthesis ya awali na "H“

3 min. Primordial Nucleosynthesis of “H”

Haiwezi kuwakilishwa kwenye mstari wa wakati tangu 1 mm = miaka 10^6)

This period cannot be represented on the time line as 1 mm = 10^6 years)

Shughuli 1: Mfululizo (Activity 1: Timeline)



13.80 Miaka 10^9 Big Bang

13.8 x 10^9 years Big Bang

Mm100

13.70 10^9 miaka 1 primordial mambo

13.7 x 10^9 years 1st primordial elements

Mm100

13.60 10^9 miaka 1 maji molekuli

13.6 x 10^9 years 1st water molecules

Mm50

13.55 10^9 miaka 1 nyota

13.55 x 10^9 years 1st stars

Mm420

13.13 10^9 miaka 1 galaxies

13.13 x 10^9 years 1st galaxies

Mm130

13.00 Miaka 10^9 ya Primitive Milky Njia

13.0 x 10^9 years Primitive Milky Way Present Time Sasa

Shughuli 1: Mfululizo (Activity 1: Timeline)

13.00 Miaka 10^9 ya Primitive Milky Njia

Wakati wa miaka bilioni 8.4 (mita 8.4) mfululizo wa matukio ya wakati huo huo hufanyika.

Nyota ya kwanza hubadilika kutoa milipuko mbalimbali ambayo huondoa aina tofauti za atomi na utofauti wa vipengele vya meza ya mara kwa mara huonekana na aina tofauti za vitu vinatokea kwa wakati mmoja.

- Blue giant na nyota supergiant: mwisho miaka milioni 10-100 (10-100mm). Milipuko hiyo inalipuka kama supernovae, ikitawala atomi nzito kama vile Chuma, Risasi, Dhahabu, Urani, na kadhalika.
- Nyota za njano kama Jua: miaka milioni ya mwisho ya 10,000 (mm 10000). Zinaishia kama chembechembe kubwa za sayari, na kutengeneza atomi nzito kati, kama vile Kaboni, Oksijeni, nitrojeni na kadhalika.
- nyota kibete nyekundu: muda mrefu zaidi kuliko umri wa ulimwengu.

4.60 10^9 Malezi ya Sun

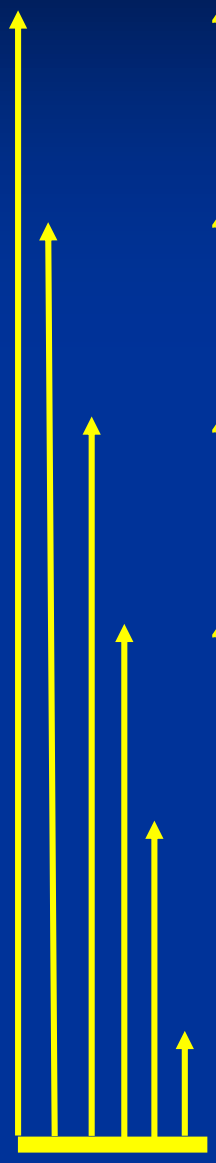
Mm8400

During the first 8.4 billion years (8.4 meters) a series of simultaneous phenomena took place.
The first stars evolved giving rise to different explosions that expelled different types of atoms and the diversity of elements of the periodic table appear. Different types of objects arise simultaneously:

- Blue giant and supergiant stars: last 10-100 million years (10-100mm). They explode as supernovae, ejecting heavy atoms such as Iron, Lead, Gold, Uranium, etc.
- Yellow stars like the Sun: last 10,000 million years (10 000 mm). They end up as planetary nebulae, ejecting medium-heavy atoms such as Carbon, Oxygen, Nitrogen, etc.
- Red dwarf stars: Last longer than the age of the Universe.

4.6 x 10^9 years The Formation of the Sun

Shughuli 1: Mfululizo Activity 1: Timeline



4.6 10^9 Miaka Sun Malezi years SunFormation

1. Alkoli 1st alcohols

30 mm

4.570 10^9 Miaka Kuzaliwa kwa Mfumo wa Jua

years Birth of the solar system

4 mm

4.566 10^9 Miaka Sayari kubwa

years Gian Planets

6 mm

4.56 10^9 Miaka ya Dunia na Sayari za Mwamba

years Earth and Rocky Planets

20mm

4.540 10^9 Miaka Duniani sumaku Field

years Earth's Magnetic Field

60mm

4.480 10^9 Miaka ya Mwezi Malezi

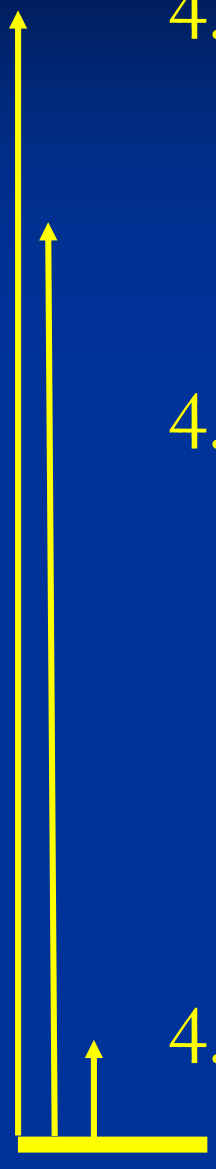
Sasa Now

Years Moon's Formation

Shughuli 1: Mfululizo

Activity 1 : Timeline

Shughuli 1: Mfululizo Activity 1: Timeline



4.48 10^9 Miaka Mwezi Malezi

years Moon's Formation

30mm

4.45 10^9 Miaka Primitive Dunia ya Anga

years Primitive Earth's Atmosphere

45mm

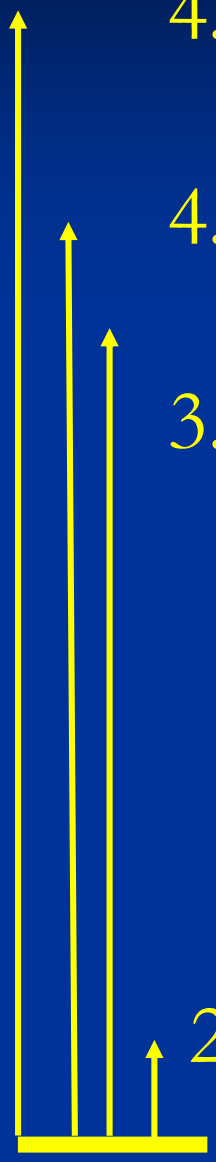
4.10 10^9 Miaka ya marehemu Bombardment nzito

Sasa Now

years Late Heavy Bombardement

Shughuli 1: Mfululizo

Activity 1: Timeline



4.1 10^9 Miaka ya marehemu Bombardment nzito

years Late Heavy Bombardement

100mm

4.0 10^9 Miaka DNA na Prokaryot seli

years DNA and Prokaryotic Cells

30mm

3.70 10^9 Miaka 1st primitive baharini mfumo wam

years 1st primitive Marine Life

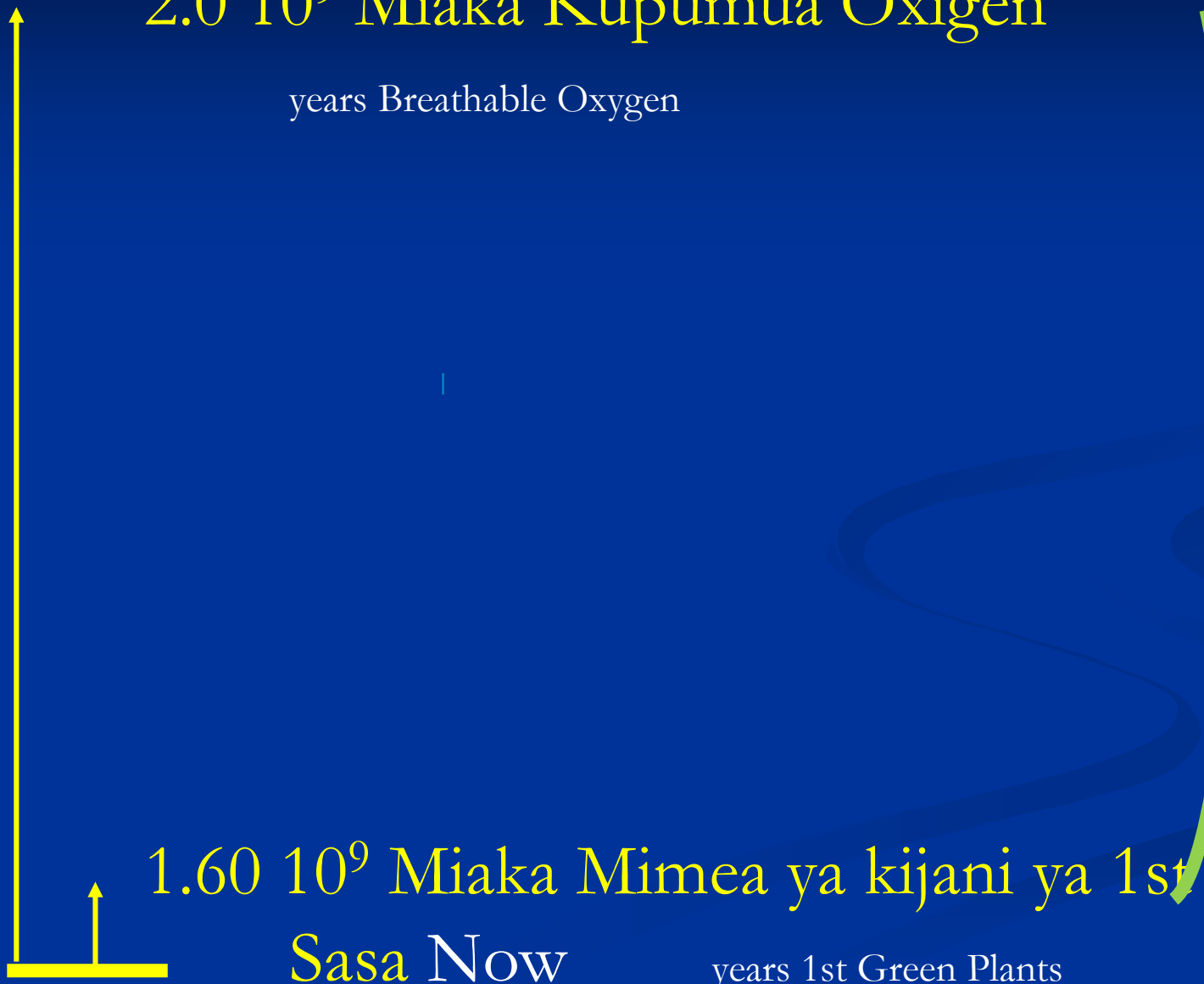
1700mm

2.0 10^9 Miaka Kupumua Oxigen

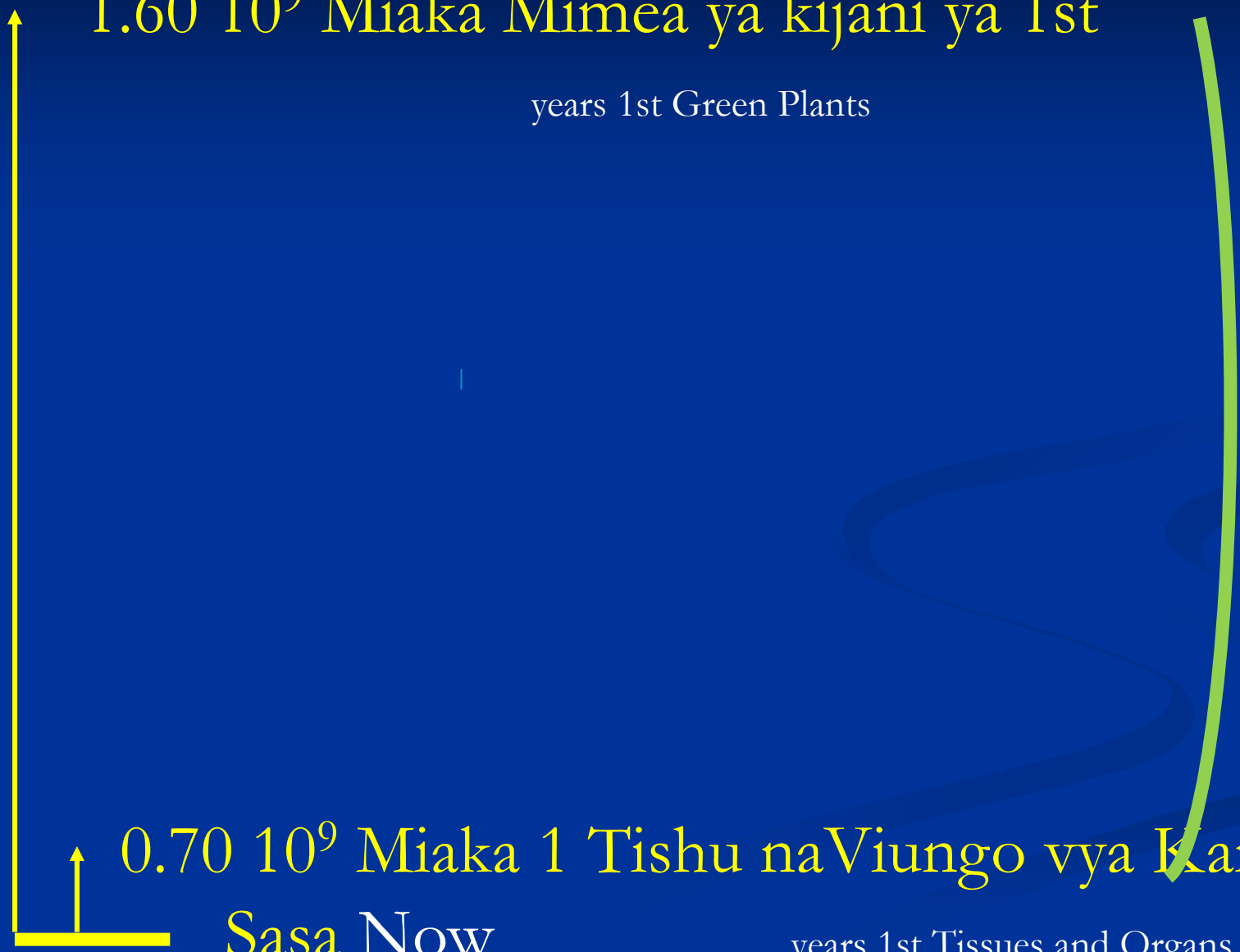
Sasa Now

years Breathable Oxygen

Shughuli 1: Mfululizo Activity 1: Timeline



Shughuli 1: Mfululizo Activity 1: Timeline



Shughuli 1: Mfululizo

0.700 10^9 Miaka 1 Tishu naViungo vya Kama

years 1st Tissues and Organs

150mm

0.550 10^9 Miaka viumbe vya baharini na shell au mifupa

years Marine organisms with shells or skeletons

50mm

0.520 10^9 Miaka Trilobiti za Trilobites

50mm

0.470 10^9 Miaka 1 Maisha anaibukakutoka kwamaji ya mvua

years 1st Life emerges from the water

70mm

0.400 10^9 Miaka ya Waamoni years Ammonite

3mm

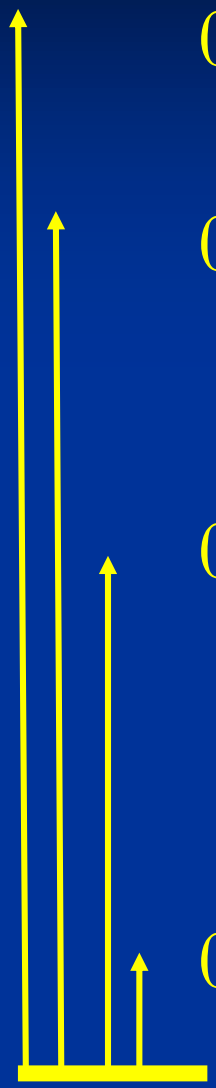
0.397 10^9 Miaka 1 wanyama wenye uti wa mgongo ardhini years 1st Vertebrates on Earth

147mm

0.250 10^9 Miaka Nautilus years Nautilus

Sasa Now

Shughuli 1: Mfululizo Activity 1: Timeline



0.250 10^9 Miaka Nautilus years Nautilus

5mm

0.245 10^9 Miaka 1 Dinosaurs years 1st Dinosaurs

450mm

0.200 10^9 Miaka 1 Mamalia years 1st mammals

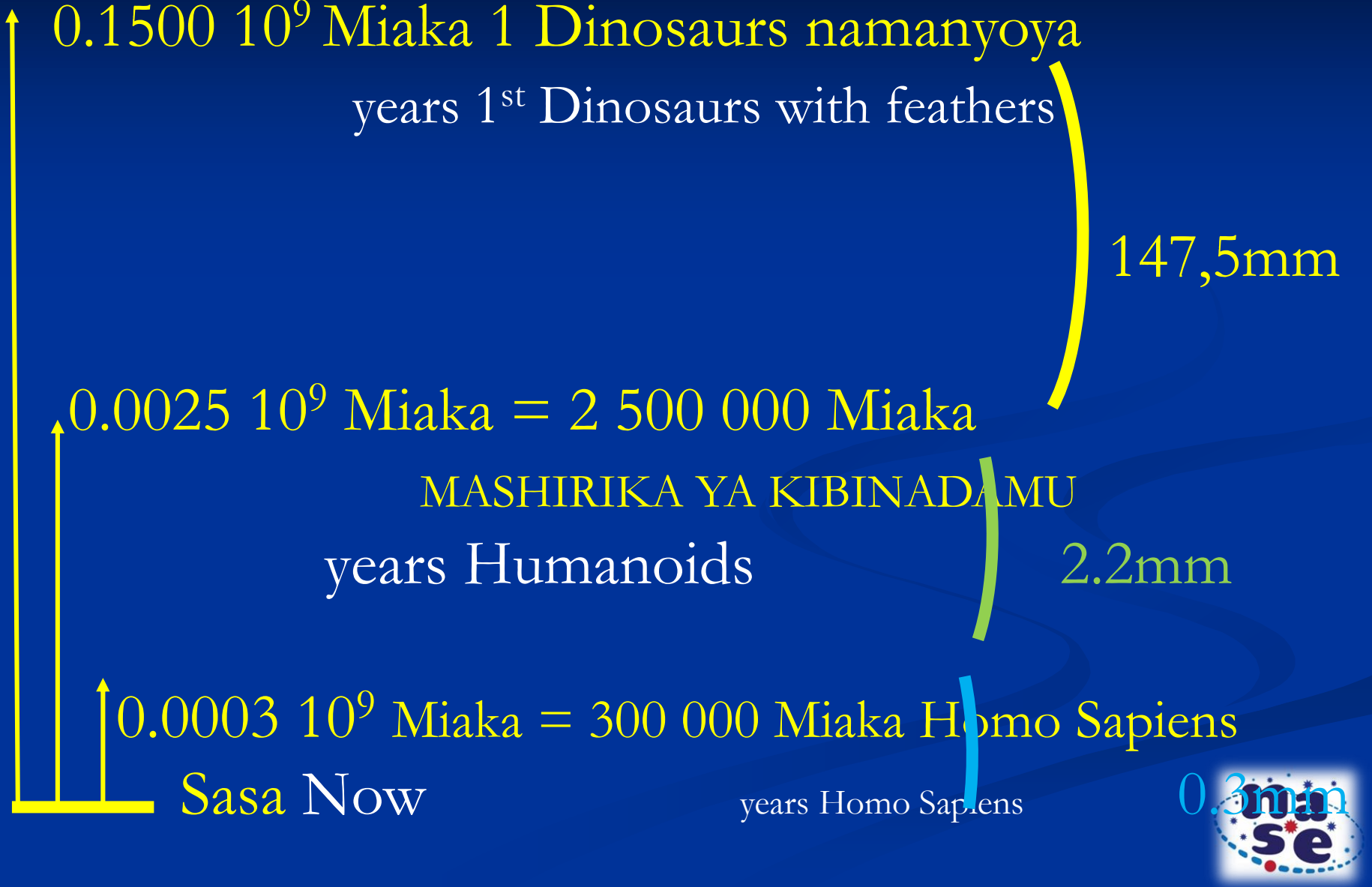
500mm

0.150 10^9 Miaka 1 Dinosaurs namanyoya

Sasa Now years 1st Dinosaurs with feathers

Shughuli 1: Mfululizo

Activity 1: Timeline



Shughuli 1: Mfululizo

Activity 1: Timeline

Galaksi za Kanada Cannibal Galaxies

Magalaksi ni makundi ya nyota zinazounganishwa na nguvu za uvutano zinazopitana.

Makundi ya magalaksi hufanyiza makundi ya nyota katika ulimwengu. Galaxy makundi kuunda katika makutano ya filaments cosmic. Katika makundi haya nyota vijana hushindana ili kupata gesi bure na makundi ya nyota ya zamani zaidi ni washindi. Makundi makubwa ya nyota kama vile magalaksi, kukutana kwao, kugongana, na ulaji wa watu wakubwa katika vikundi hivyo vidogo hukuza nyota.

(ESO ya Mkopo)

Galaxies are groups of stars bound by gravity, rotating about each other.

Groups of galaxies form the filaments of the universe. Galaxy clusters form at the junctions of cosmic filaments.

In these clusters the young galaxies compete to acquire the free gas and the older galaxies are the winners.

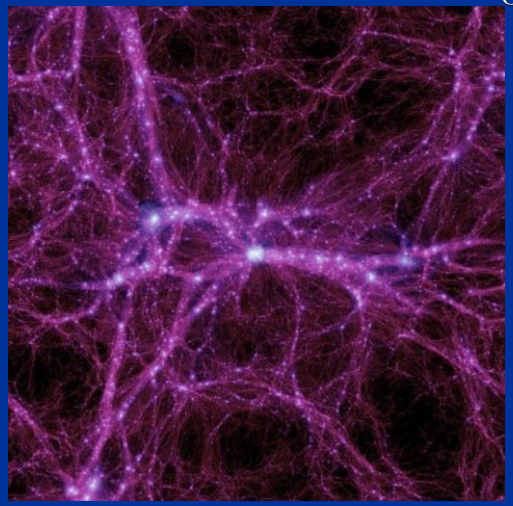
The ballet of galaxies, their encounters, their collisions and the cannibalism of the large ones over the small ones promotes star formation.

Shughuli 2: Mfano wa filamentous

Activity 2: Filamentary Model

Kwa kuwa kuna ukuta wa ndani wa Ulimwengu, huenda tukafikiri kwamba maji hayo yana povu na hasa juu ya viputo hivyo. Uwe tu na maji safi, majani, au nyasi.

The filamentary structure of the Universe can be thought of as a bubble bath where matter accumulates on top of the bubbles and especially at their intersections.
Just use soapy water and a straw or straw.



Modelling the filamentary structure of the universe (Credit: Illustris Project)

Modeling of the filamentary structure with a detergent solution

Modeling muundo filamentary ya ulimwengu (Mikopo: Illustris Project)

Mfano wa muundo wa filamentous na ufumbuzi wa sabuni

Uainishaji wa Galaksi

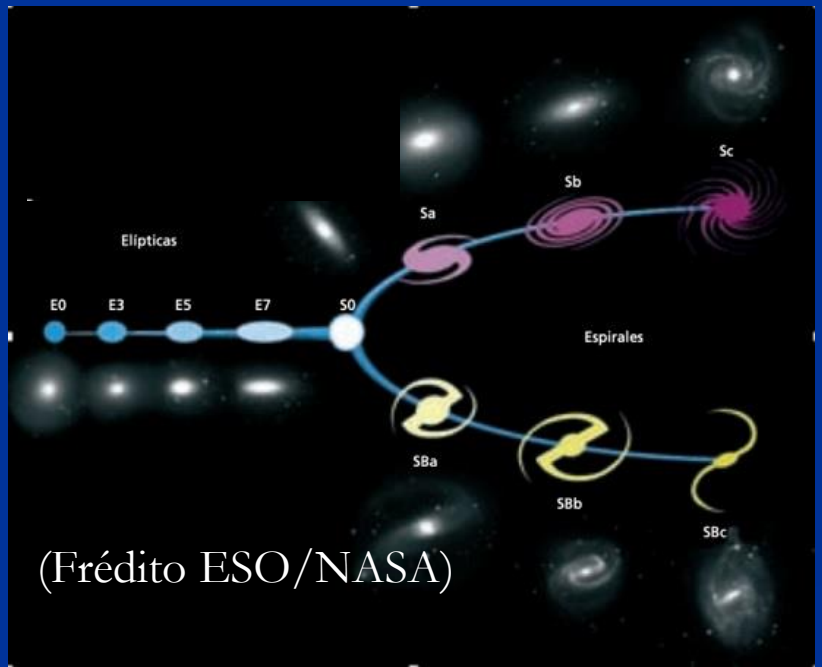
Galaxy Classification

Kuna upepo, vikwazo, mviringo, isiyo ya kawaida...

Kwa kawaida huainishwa kwa mujibu wa mofolojia yao, katika mpangilio unaojulikana sana wa Hubble

There are spirals, barred, elliptical, irregular…

They are usually classified according to their morphology in the well-known sequence by Hubble



(Frédito ESO/NASA)

Sasa inajulikana kwamba mfuatano wa mageuko si si

It is now known that this is not an evolutionary sequence.

Shughuli 3: Simulation ya Malezi Spiral Galaxy

Activity 3: Simulation of Spiral Galaxy Formation

Kielelezo kinaweza kutengenezwa kwa glasi iliyojaa maji, na kuchochea maji kwa penseli. Unapomaliza kuchochea, tupa ndani ya kijiko cha majani yenye bikaboneti, mchanga laini au chumvi ya kawaida. Wanapotulia, chembe hizo zina maumbo yanayofanana na yale ya magalaksi.

A model can be made with a glass filled with water and stirring the water with a pencil. When you stop stirring, throw in a tablespoon of bicarbonate, fine sand or common salt. Upon settling, the grains are left in shapes similar to spiral galaxies.

Spiral galaxy seen from above the plane. (Credit ESA/Hubble)

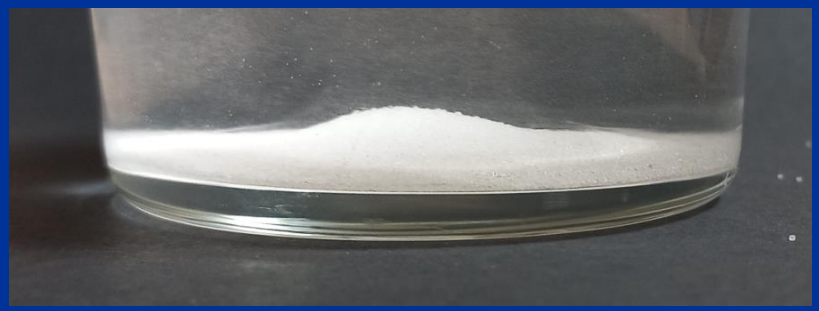
Ond galaxy kuonekana kutoka ndege. (ESA/Hubble ya Mkopo)

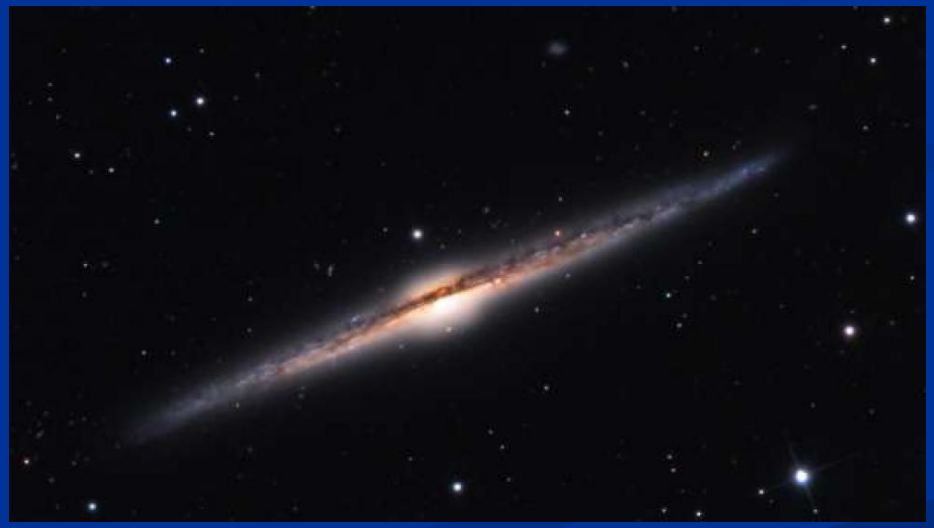
Shughuli 3: Simulation ya Malezi Spiral Galaxy

Activity 3: Simulation of Spiral Galaxy Formation

Unapotazama modeli hiyo kutoka upande mwingine, ukubwa wa galaksi ni sawa na ule wa katikati wa galaksi.

Looking at the model from the side, the central bulge of galaxies is simulated.





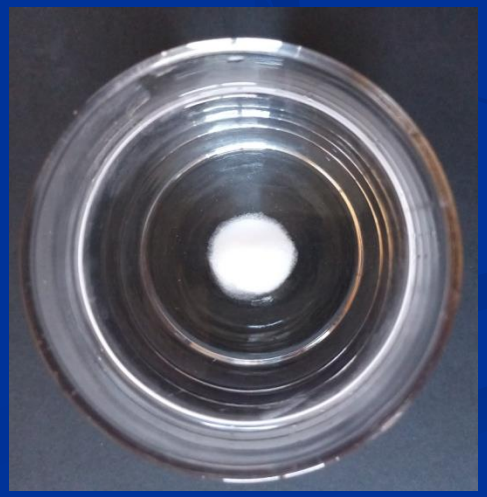
Ond galaxy makali-juu ya mtazamo
(Picha na ESO/NASA)

Shughuli 3: Simulation ya Malezi Spiral Galaxy

Activity 3: Simulation of Spiral Galaxy Formation

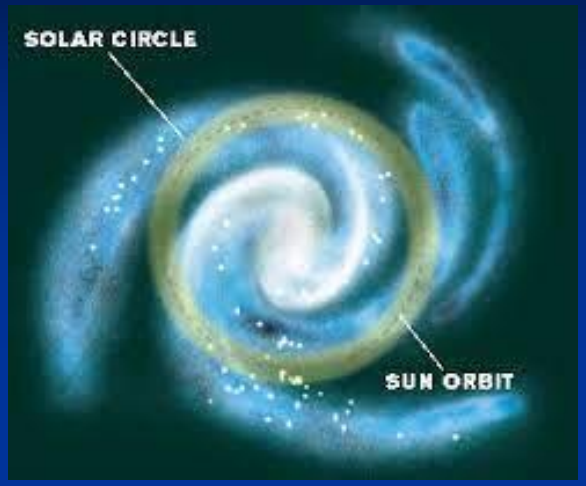
Baada ya kikundi cha nyota kuundwa, ikiwa maji yataendelea kuondolewa, inawezekana kupata kitu kama hicho cha mviringo.

Once the galaxy is formed, if the water continues to be removed, it is possible to obtain a shape similar to elliptical galaxies.



Eneo linaloweza kuishi katika Galaxies

Habitable Zone in Galaxies



- Eneo linaloweza kukaliwa katika galaxi kawaida huwa katika eneo la kati ya 23,000 na 30,000 l.y. kutoka katikati ya galaxy (Sun ni saa 27,000 l.y.).
- Nje ya eneo hili, kuelekea ukingoni kuna atomi nzito zaidi kuliko H na Yeye ambazo ni muhimu kwa maisha.
- Nje ya eneo hili, karibu na kituo, kuna mlipuko mkubwa wa gamma-ray na matukio yenye nguvu sana na ya vurugu ambayo hufanya maisha yasiwezekane.

Kwa njia ya mfano, kulinganisha muda na umbali katika mfano wetu wa mstari wakati, galaxy yetu inachukua 220 10^6 miaka (220 mm) mzunguko mapinduzi moja.

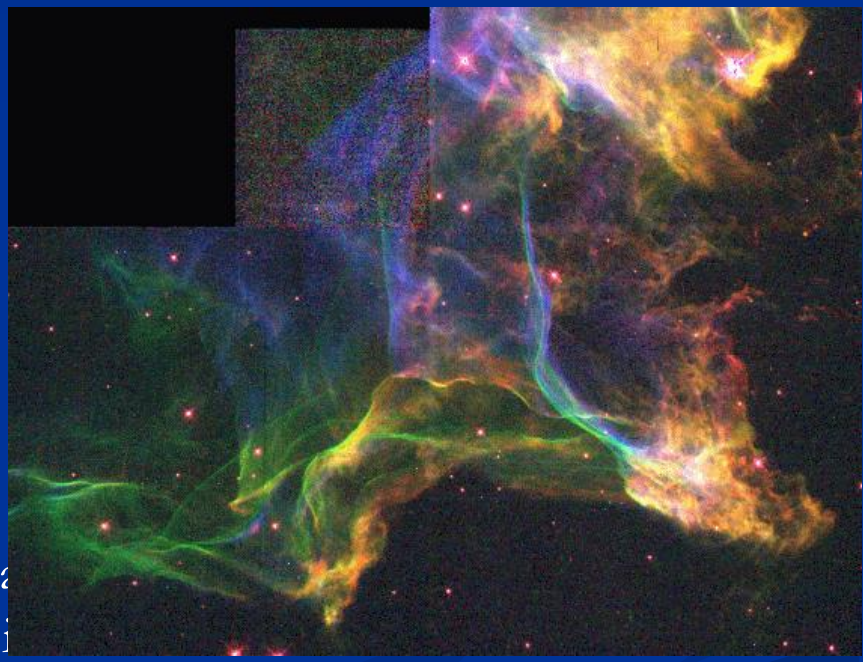
By way of example, to compare time and distance in our model of the time line, our galaxy takes 220 x 10^6 years (220 mm) to make one revolution.

- The habitable zone in galaxies is normally located at a radius of between 23 000 to 30 000 l.y. from the centre of the galaxy (the Sun is at 27 000 l.y.).
- Outside this zone, toward the edge, the atoms heavier than H and He that are necessary for life are missing.
- Outside this zone, closer to the centre, there are massive gamma-ray bursts with very energetic and violent events that make life impossible.

Plasma na sumaku Field

Plasma and Magnetic Fields

- Katika kati ya intergalactic, katika kati interstellar na katika nyota wenyewe, jambo ni kawaida katika hali plasma.
- Plazma hii huwa na elektroni, protoni, chembe zenye nguvu nyingi, na gesi yenye sumu.



Mabula ya Upatanisho na filaments (Mikopo NASA)

- In the intergalactic medium, in the interstella medium and in the stars themselves, matter i usually in the plasma state.
- This plasma is made up of electrons, protons, high-energy particles and ionized gas.

Plasma na sumaku Field

Plasma and Magnetic Fields

Duniani kuna jambo katika hali hii kama vile umeme, mambo ya ndani ya mirija umeme au matumizi ya taa za chini, wachunguzi na skrini ya televisheni, mipira plasma au moto wa mshumaa

On Earth there is matter in this state in lightning, the interior of fluorescent tubes or low consumption lamps, monitors and television screens, plasma balls and the flame of a candle.

Plasma na sumaku Field

Plasma and Magnetic Fields

Upepo wa jua pia ni plazma, mtiririko wa chembe zilizoshtakiwa kutoka kwa corona ya Jua. Mtiririko wa chembe hizi hubadilika na unaweza kuzalisha dhoruba za geomagnetic, na kusababisha kupanda kwa auroras (taa katika kaskazini na kusini) na kuunda plasma ya mikia ya comets ambayo daima huelekeana dhidi ya jua.

The solar wind is also plasma. It is a stream of charged particles released from the Sun's corona. The flow of these particles is variable and can generate geomagnetic storms, giving rise to auroras (The Northern and Southern Lights). It also deforms the plasma in the ion tails of comets.

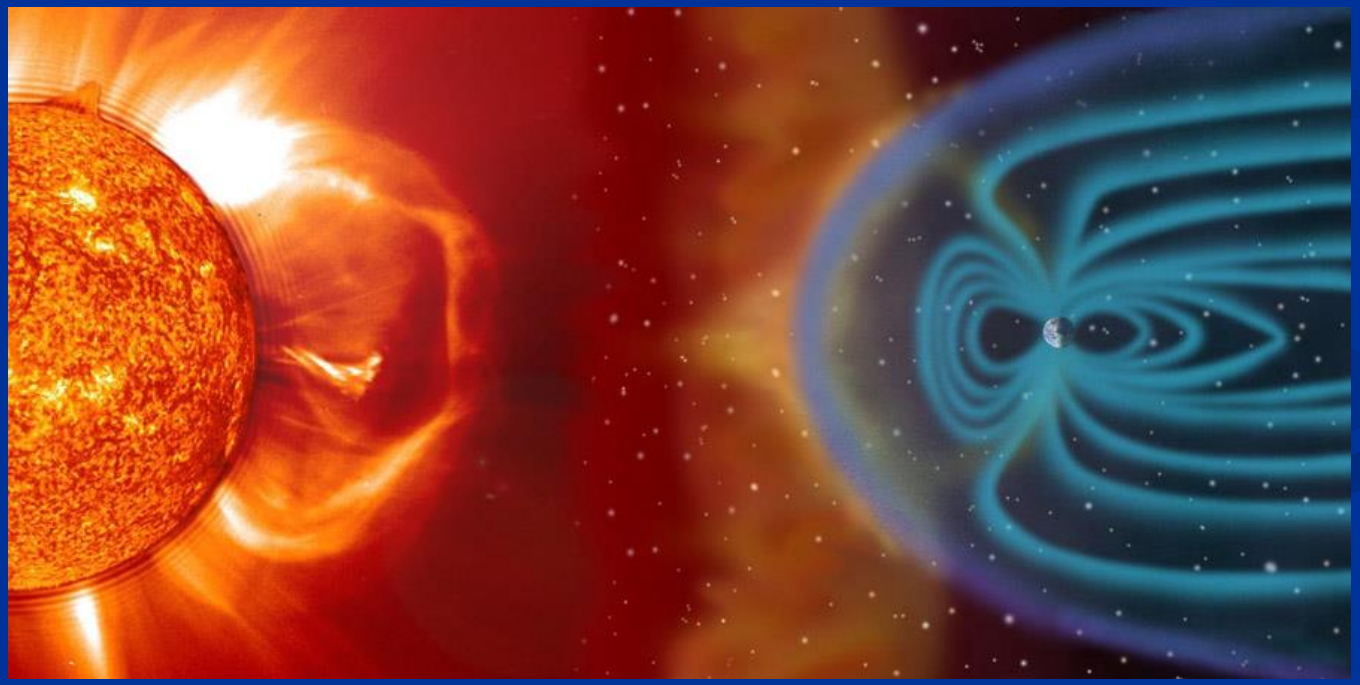
C/2002 E3
(Credit Rykis Babianskas, Carlos Viscasillas)

Plasma na Magnetic Field

Plasma and Magnetic Fields

Nguvu za sumaku za Dunia ni kama ngao ya uhai duniani. Chembechembe za upepo za jua zinazosafiri kwa kasi na nishati nyingi zina nguvu kubwa zinazopenya na zinaweza kuharibu DNA ya seli.

The Earth's magnetic field acts as a protective shield for life on the planet. Solar wind particles that travel at high speed and with a lot of energy have great penetrating power and would damage the DNA of cells.



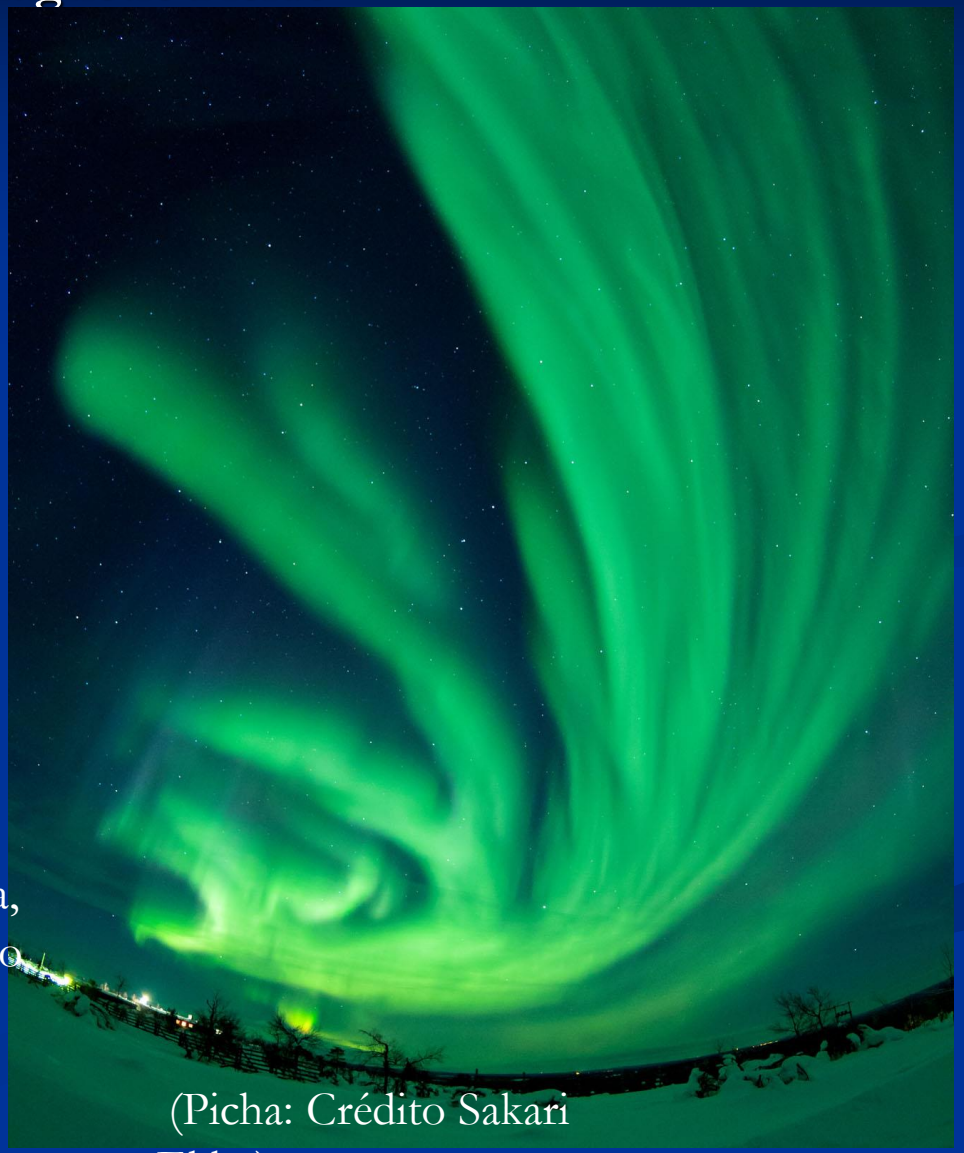
Jua upepo, hisia ya msanii (NASA ya Mkopo)
Sun wind, artist impression. (Credit NASA)

Plasma na sumaku Field

Plasma and Magnetic Fields

Nguvu za sumaku za Dunia ni kama mwamvuli, na kutenganisha vipande vikubwa vyenye nishati ambavyo ni hatari sana kwa uhai kutoka ardhini hadi angani na hivyo kutangamana na angahewa hutokeza maumbo maridadi yenye rangi mbalimbali.

The Earth's magnetic field acts like an umbrella, diverting charged particles that are dangerous to life, from reaching the Earth's surface. Their interaction with the atmosphere generates the beautiful auroras of various colours.



(Picha: Crédito Sakari Ekko)

Plasma na sumaku Field

Plasma and Magnetic Fields

Rangi za aurora hutegemea nishati ya molekuli hewani nazo. Katika eneo la:

Oksijeni katika viwango vya juu sana vya nishati ni kijani / njano na kwa viwango vya chini ni nyekundu / zambarau.

Nitrojeni, inapopoteza elektroni katika tabaka la nje, hutokeza mwangaza wenye rangi ya bluu, na rangi hiyo hutokeza rangi nyekundu/zambarau kwenye ncha za chini za aurora.

The colours of the auroras depend on the energy of the molecules in the air with which they interact. In an area of:

Oxygen at very high energy levels emits green/yellow light and at low levels red/purple.

Nitrogen, if it loses electrons in its outermost layer, produces a bluish light, while it gives a red/purple colour at the lower edges of auroras.

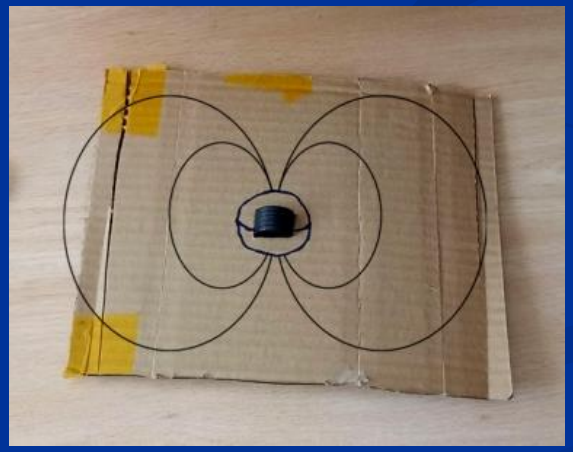
(Picha Na Sakari Ekko)

Shughuli ya 4: Sehemu ya Sumaku ya Dunia

Activity 4: Earth's Magnetic Field

Tunaweza kuibua uwanja wa sumaku wa dunia na sumaku, ambayo inawakilisha Dunia, na dira, ambayo tunapitia mistari ya nguvu ya shamba.

We can visualize the terrestrial magnetic field with a magnet, which represents the Earth, and a compass, with which we go through the lines of force of the field.

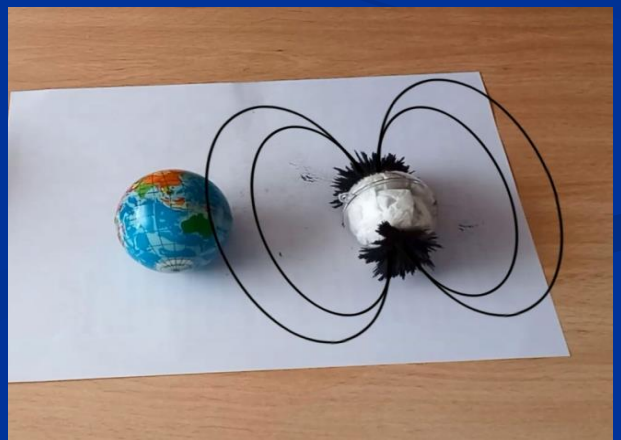


Shughuli ya 4: Sehemu ya Sumaku ya Dunia

Activity 4: Earth's Magnetic Field

Katika nyanja ya plastiki, tunaweka sumaku iliyofunikwa kwenye kitambaa cha karatasi. Inawakilisha Dunia.
Kwa kufungua chuma karibu na miti, mistari ya shamba la magnetic katika eneo hilo, ambapo auroras hutokea, inaonekana vizuri sana.

In a plastic sphere, we put a magnet wrapped in a paper napkin. It represents the Earth.
With iron filings near the poles, the magnetic field lines in that area, where the auroras occur, are very well visualized.



Uhai ulitokeaje duniani? How did life arise on Earth?

- Nadharia zinazokubalika zaidi zinakisia kwamba uhai ulitokea duniani kutokana na viumbe visivyo na viumbe miaka 4,500 106 iliyopita
- Lakini wanasayansi wengine wanafikiri kwamba uhai ulitokana na chanzo kingine cha ulimwengu. Ikiwa uhai haukuanza Duniani, huenda uliwafikia watu kama vile vimondo, na vimondo.
- Vijidudu vinaweza kuishi ndani ya miamba, ambayo inalindwa kutokana na hali ngumu zilizopo kwenye anga la nje

The most accepted hypotheses assume that life arose on Earth from inorganic matter 4 500 x 10^6 years ago.

But other scientists assume an extraterrestrial origin of life. If life did not start on Earth, it could have arrived on comets, asteroids or meteorites.

Microbes could survive embedded in rocks, protected from the extreme conditions of outer space.

Uhai ulitokeaje duniani? How did life arise on Earth?

Hakuna mtu anayeamini kwamba kiumbe wa kwanza alikuwa wa ajabu sana. Kumekuwa na aina rahisi zaidi ya maisha ambayo yametumika kama uhusiano kati ya viumbe wa kwanza na maisha ya leo. Inawezekana kwamba vijiumbe vya uliokithiri duniani vilifika kwenye asteroidi na vimondo vilivyoathiri uso wake; kwa kweli, sampuli hai hupatikana katika baadhi ya vimondo. Si rahisi kujua vimondo, lakini ni rahisi **kuviwinda** vimondo **vidogo**.

No one supposes that the first living being was very complex. There must have been simpler forms of life that have served as a connection between the first organism and life today. It is possible that extremophile microorganisms reached Earth on asteroids or meteorites that impacted on its surface. In fact organic samples are found in some meteorites. It is not easy to find meteorites, but it is easy to **hunt micrometeorites**

Pia tutaona maeneo fulani ya Dunia ambako wenye siasa kali wanapatikana na ambayo hufundishwa na NASA na ESA

We will also see some areas of the Earth where extremophiles are found and which are studied by NASA and ESA.

Vimondo Micrometeorites

Dunia ikiwa inaizunguka Jua, inapitia kwenye mizunguko ya nyota nyingine kama vile magimba yenye madoa ya vumbi. Nyota hizo ndogo huanguka kwenye uso wa Dunia na kusababisha mikrohewa kwenye eneo hilo. Maelfu ya ndege huanguka kila siku na kwa kawaida huteketea (hasa kwa sababu ya msuguano na angahewa) kabla ya kufikia ardhini, na kuunda nyota zinazopiga risasi.

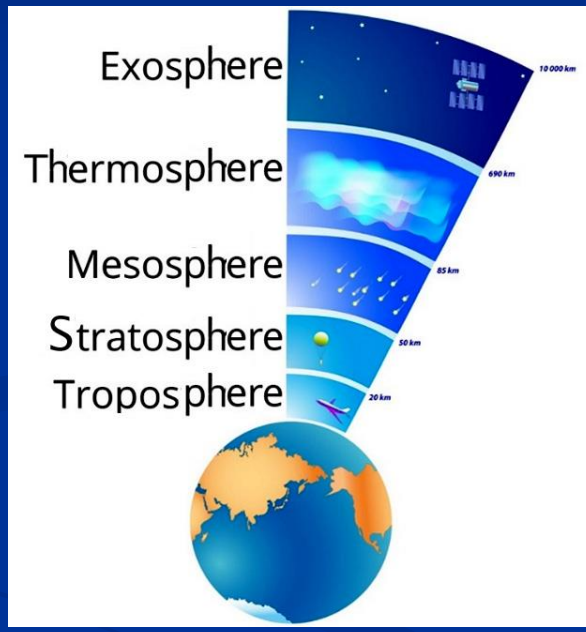
The Earth goes through the orbits of comets where it encounters traces of dust. This dust falls on the Earth's surface and gives rise to micrometeorites. Thousands of them fall every day and they normally burn up (due to friction with the atmosphere) before reaching the ground, forming shooting stars.

Wale ambao hufikia ardhi inaweza kukusanywa, wao ni mahali popote, hasa katika maeneo yenye shughuli kidogo za binadamu na vigumu kupata. Umbo lake la mviringo lina nyufa zilizotokea.

Those that reach the ground can be collected. They are everywhere. They are easier to find in places with little human activity or places that are difficult to access. Their rounded shapes and grooves

Vimondo Micrometeorites

Meteors kupita katika exosphere na thermosphere bila matatizo mengi kwa sababu tabaka wale si mnene sana. Lakini wanapofikia sakafu ya bahari, uzito wa mwili huwa juu zaidi na hewa kusababisha msuguano na kutokeza joto.
Kisha kipande hicho huyeyuka na kujiimarisha ili mwishowe kiwe na nyufa na wakati mwingine mapovu madogo, ambayo husababisha kunawiri haraka.



Meteors pass through the exosphere and thermosphere without much trouble because these layers are not very dense. But when they reach the mesosphere, the density is higher and the air will cause more friction and create heat.
The material melts and then solidifies so that in the end it presents grooves and sometimes small bubbles, the effect of rapid solidification.

Shughuli 5: Simulation ya micrometeorites ya chakula Activity 5: Simulation of Spherical Micrometeo

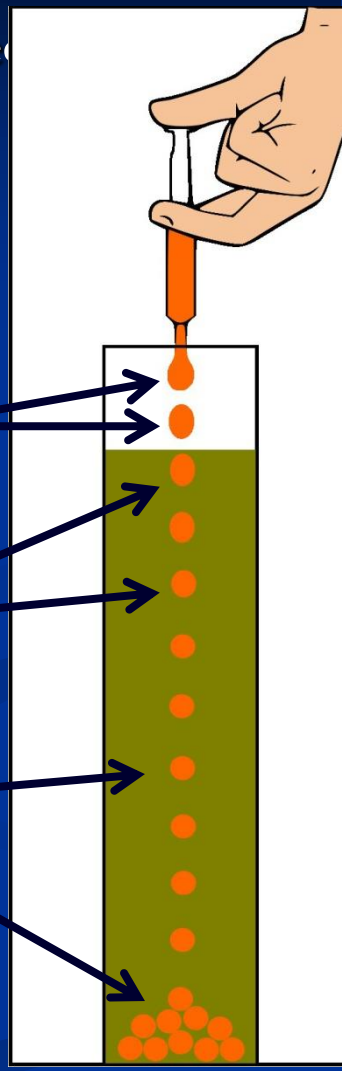
Uzoefu sahihi zaidi wa hatua ya mchakato wa kubadilisha meteoroid katika nyanja ndogo ni spherifications kwamba zinafanywa jikoni na agar-agar au kuku gelatin mguu.

Fill a tall glass with sunflower oil. Drops of water or cola are dropped from a syringe. Small spheres are formed and can be seen slowly falling down the oil column.

Matone ya Kioevu ya **MESOSPHERE**
MESOSPHERE Liquid drops

Matone bado kioevu, Kuwa spherical ndani ya kati KINATACHO
TABAKASTRATO NA TROPOSPHERE
Matone ya mviringo huganda na kurundamana chini
Drops still liquid, become spherical within the viscous medium.
STRATOSPHERE AND TROPOSPHERE
Spherical drops solidify and accumulate at the bottom.

GANDA LA BARA NA BAHARI
CONTINENTAL CRUST AND OCEANIC FLOOR.



Shughuli 5: Simulation ya micrometeorites ya chakula Activity 5:

Simulation of Spherical Micrometeorites

nyanja ndogo za simulated "micro-meteorites" huundwa.

small spheres of simulated "micro-meteorites" are formed.

micrometeorite halisi

real micrometeorite

Kila siku wanaanguka juu ya uso wa Dunia Tani 5 za nyenzo za kigeni!

Every day they fall on the Earth's surface 5 tons of alien material!

Shughuli 6: Angalia Micrometeorites

Activity 6: Look for Micrometeorites

Micrometeorotes zimejengwa kwenye paa na matuta au hata kubaki kusimamishwa katika anga kwa muda mrefu, na kuanguka pamoja na mvua au theluji. Njia iliyopendekezwa zaidi ya kurejesha nyenzo hii ni kutafuta katika mabirika, ambayo kukusanya nyenzo iliyowekwa kwenye paa, au katika mabirika ya barabara au barabara.

Micrometeorites are deposited on roofs and terraces or even remain suspended in the atmosphere for a long time and then fall together with rain or snow. The best method for the recovery of this material is to look for it in gutters, which collect the material that has been deposited on the roofs, or in the gutters of the streets or highways.

Vimondo hivyo hutoka moja kwa moja kwenye jambo lililotokeza mfumo wa jua. Kwa hiyo, wana umri wa karibu miaka milioni 4,500.

These meteorites come directly from the matter that gave rise to the Solar System. They are therefore about 4 500 million years old.

Shughuli 6: Angalia Micrometeorites

Activity 6: Look for Micrometeorites

Vimondo vingi kati ya hivyo vina miamba, lakini vingine vimetengenezwa kwa chuma na nikeli, na vinaweza kutenganishwa na vingine kwa sumaku.

Most of these meteorites have a rocky composition, but others are made of iron and nickel and can be separated from the rest with a magnet.

Kwa brashi, mchanga hukusanywa kutoka kwenye shimo au mtaro, na huwekwa kwenye karatasi. Sumaku hupitishwa chini ya karatasi, na tunabaki kwenye karatasi tukiwa tu na vifaa vinavyosonga.

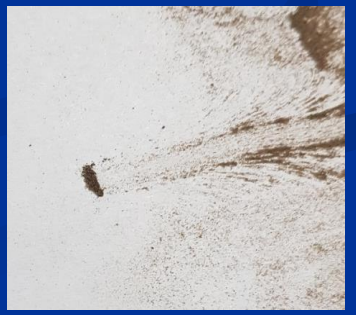
Most of these meteorites have a rocky composition, but others are made of iron and nickel and can be separated from the rest with a magnet.

Shughuli 6: Angalia Micrometeorites

Activity 6: Look for Mircometeorites

Usipokuwa na matuta au mahandaki ambapo unaweza kuyatafuta, unaweza kutayarisha mtego wa kukusanya mikrovimondo. tray ni wa kutosha ambapo sisi mahali karatasi cellophane na kuondoka nje katika wazi kwa wiki katika mahali kidogo juu ili wanyama wasikaribie. mchakato wa kukusanya micrometeorites pia ni pamoja na sumaku

If you don't have terraces or ditches where you can look for micrometeorites, you can prepare a trap to collect them. Place cellophane paper in a tray and leave it out in the open for a week in a slightly elevated place so that animals do not approach. The process of collecting the micrometeorites is also done with a magnet.



Shughuli 6: Angalia Micrometeorites

Activity 6: Look for Micrometeorites

Kuna uwezekano mwingine kwamba mtatumia mtego wa kila mwanafunzi aliyebeba kikombe cha karatasi kilichofungwa kwa uzi na sumaku ndogo ndani ya kikombe. Wanafunzi wanazunguka eneo la shule na vikombe vya sumaku na, wakati wa kuondoa sumaku, ikiwa kuna chembe za chuma, wataanguka kwenye karatasi nyeupe. Hebu tazama kamera za simu zao ili kupata mikrohewa.

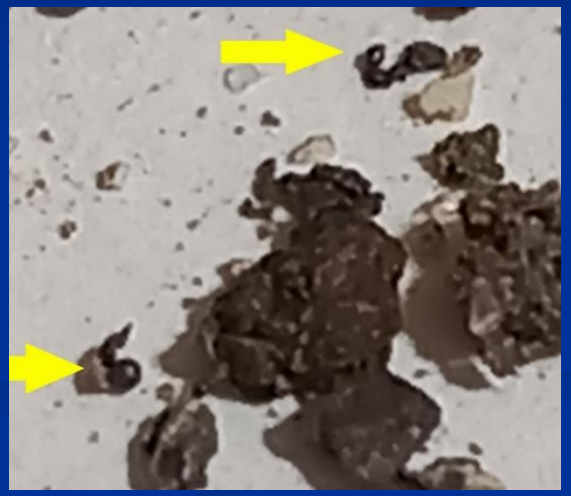
Another possibility is to prepare a trap for each student with a paper cup tied with a string and a small magnet inside the cup. Students move around the schoolyard area with the magnet cups and, when removing the magnet, if there are iron particles, they will fall on the white sheet of paper. Just look through the cameras of their mobile phones to find the micrometeorites.

Shughuli 6: Angalia Micrometeorites

Activity 6: Look for Micrometeorites

Utambuaji wa vipima-hewa:

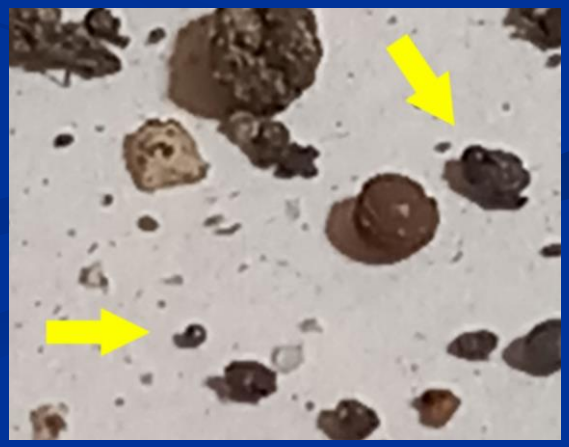
Vifaa vilivyosonga kwa sumaku, bila kuiondoa kwenye karatasi, tunaikagua kwa simu ya mkononi au kamera ya rununu, kwa kutumia upeo wa ukubwa.



Vipima-hewa hubainishwa kwa kutokeza umbo lenye umbo la mviringo na miangavu karibu.

Identification of micrometeorites:

Inspect the material that has moved with the magnet, without removing it from the paper, with a cell phone or camera, using the maximum zoom.



Micrometeorites are identified by having a nearly spherical and bright shape.

Uainishaji wa Hati-Kunjo

Extremophile Classification

Extremophile ni kiumbe (mara nyingi microorganization) kinachoishi katika hali mbaya sana (wale ambao ni tofauti sana na wale wenye uzoefu wa aina nyingi za maisha ya duniani). Hadi hivi karibuni, ilidhaniwa kwamba mahali ambapo watu wenye siasa kali hukua haingewezekana kuishi. Kwa mfano, katika maji yenye asidi na chuma ya Rio Tinto, au katika jangwa la Atacama lenye kina kikubwa cha metali kavu.
Lakini imeonyeshwa kuwa kuna viumbe wanaoishi katika maeneo haya.

An extremophile is an organism (often a microorganism) that lives in extreme conditions (conditions that are very different from those experienced by most terrestrial life forms).

Until recently, it was thought that it was impossible for life to exist where extremophiles grow. For example, in the highly acidic and metal-containing waters of the river Rio Tinto in Spain, or in the extremely dry and heavy-metal-containing Atacama desert o en la Antártida con sus bajas temperaturas.

But it has been shown that there are organisms that live in these areas.

Extremophiles huko Antaktika

Extremophiles in Antarctica

Huko Antaktika, vikundi kadhaa vya wanasayansi vimepata maisha chini ya uso wake, kwa mfano:

In Antarctica, several groups of scientists have found life below its surface, for example:

- vijiumbe waliokithiri wanaoishi kwa mita 36 na halijoto ya -20ºC katika maji ya chumvi (haijagandishwa kwa sababu ya mkusanyiko mkubwa wa chumvi)
- mfumo wa ikolojia kwa kukosekana kwa mwanga kwa kina cha 800 m

- extremophile microbes living at 36 m with temperatures of -20ºC in salt water (not frozen due to the high concentration of salt)
- an ecosystem in total absence of light at 800 m depth

Jangwa la Extremophiles na Atacama

Baadhi ya watu wenye siasa kali wanaishi bila maji au hawawezi kustahimili hali ngumu kwa kuishi bila maji mengi. Kama wadudu walio kwenye udongo wa Jangwa la Atacama.

Some extremophiles live in the near absence of water or are able to withstand desiccation by living with very little. Like the microbes in the soil of the Atacama Desert.

Kuna jambo la kushangaza sana: jangwa la maua. Hii ni jangwa la ukame duniani, miaka ambayo kuna mvua nyingi kuliko kawaida na kisha mbele ya baridi inaonekana idadi kubwa na utofauti wa maua (aina 14) ambayo hudumu kwa miezi michache.

There is a very spectacular phenomenon: the flowery desert. This is the most arid desert in the world. In years when there is more precipitation than normal and a cold front appears, a large number and diversity of flowers (14 varieties) last for a few months.

Photo August 2022 after several years of dryness, the last years were 2015 and 2017.

Picha Agosti 2022 baada ya miaka kadhaa ya ukame, ya mwisho ilikuwa 2015 na 2017

Krioli na Riotinto

Extremophiles and the Rio Tinto

Extremophiles nyingine kustawi katika mazingira na acidity juu na viwango vya juu ya chuma (Chuma, Shaba, Cadmium, Arsenic, Zinc, Kiongozi). Athari katika mto huu hutanguliwa na bakteria za acidophilic, ili kama asidi itapungua, idadi ya bakteria huongezeka, ambayo huzalisha oxidation zaidi ya sulfidi na asidi zaidi katika mchakato unaopunguza nyuma. Wenyeji wa eneo hilo wanajua wakati wa mvua kwa sababu ya mabadiliko ya rangi ya mto (bakteria huzalisha asidi zaidi ili kudumisha ph wakati wa mafuriko ya mto).

Other extremophiles thrive in environments with high acidity and high metal concentrations (Iron, Copper, Cadmium, Arsenic, Zinc and Lead). The reactions in this river are catalysed by acidophilic bacteria, so that if the acidity is reduced, the bacteria population multiplies. This generates more oxidation of sulphides and more acidity in a process that feeds back. The inhabitants of the area know when it is going to rain because of the colour changes of the river (bacteria generate more acidity to maintain the pH during the flooding of the river).

Extremophiles & mimea RioTinto

Extremophiles & Vegetation - Rio Tinto

Kuna vichaka vingi vya Erica Andevalensis au "heather ya madini", kusambazwa kando ya mto.

There are extensive groups of the shrub Erica Andevalensis or “mining heather” distributed along the riverbed.

Mimea hiyo ina mizizi yenye asidi na virutubisho vichache. Baadhi ya mimea hata kukua kwenye kingo za mto na mizizi yao sehemu iliyokuwa imezama katika maji na udongo asidi na viwango vya juu vya Shaba na Risasi.

These plants have their roots in highly acidic soils with few nutrients. Some plants even grow on the banks of the river with their roots partially submerged in acidic water and soils with high concentrations of Copper and Lead.

Shughuli 7: uchimbaji wa DNA

Activity 7: Extraction of DNA

NASA na ESA wanabiolojia utafiti juu ya ardhi (Ríotto Mines, Atacama Jangwa, nk) jinsi maisha yanazidi au adapts kuelewa jinsi asili.

Hatua ya kwanza ya wengi ya itifaki kwamba zinafanywa kugundua extremophiles lina DNA mchakato uchimbaji na kwa sababu hii shughuli hii inafanywa

NASA and ESA astrobiologists study on the ground (Rio Tinto Mines, Atacama Desert etc.) to understand how life evolves or adapts and how it originated. The first step of many of the processes that are carried out to discover extremophiles consists of DNA extraction.

Shughuli 7: DNA uchimbaji

Activity 7: DNA Extraction

Mfuatano wa DNA unaruhusu kugundua uwepo wa maisha (ya sasa au ya zamani), na hii hutumiwa kutafuta maisha katika nafasi. Moleku ya DNA ni ndefu sana na ina protini (kama mpira wa sufu) ndani ya seli.

Suluhisho la kuvunja kiini: glasi 1 / 2 ya maji

Kijiko 1 cha Chumvi, Sodium Chloride, ili kuondoa protini na hivyo kutolewa DNA

Vijiko 3 vya Sodium Bicarbonate, kuweka pH ya ufumbuzi wa msingi na mara kwa mara na kwamba DNA bado haijapotoka

Kuongeza dishwashing kioevu mpaka ufumbuzi ina rangi sawa, kuvunja utando wa seli greasy. **changanya** bila matendo kupata mtazamo mzuri wa DNA.

The sequence DNA allows the detection of the existence of life (current or past) and this is used to search for life in space. The DNA molecule is very long and packed with proteins (like a ball of wool) inside cells.

Solution to break the cell: Take half a glass of water,

1 teaspoon of Salt (Sodium Chloride) to remove the proteins and thus release the DNA.

3 teaspoons of Sodium Bicarbonate, to keep the pH of the solution basic and constant so that the DNA remains undegraded. **Add dishwashing liquid** until the solution has the same colour, to break the membrane of the greasy cells. **Mix** without foaming to get a good view of the DNA.

Shughuli 7: DNA uchimbaj Activity 7: DNA Extraction

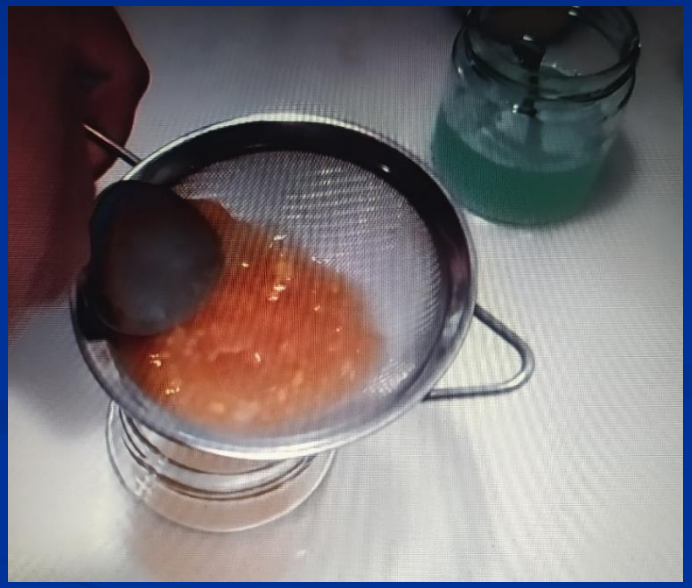
Tayarisha maji ya chembe "nyanya"

2 vijiko nyanya massa, mash kwa uma mpaka kuwa pureed

Tunaongeza suluhisho la ubunifu (kiasi cha suluhisho ni mara mbili ikilinganishwa na ile ya puree ya nyanya).

Tunachanganya kwa uangalifu ili tuvunje chembe, huku tukiwa waangalifu tusichafue.

Kisha sisi huchuja na kuondoa kabisa vipande vikubwa vya mbao.



Mmaudhui ndani ya seli yamo kwenye maji ya matunda

Prepare the cell juice "of tomato".

Take 2 tablespoons tomato pulp, mash it with a fork until it becomes pureed.

Add the innovative solution (the volume of the solution is double the volume of the tomato puree).

Mix carefully to break the cells, being careful not to foam. Then strain to remove the large pieces.

The content that was inside the cells is in the juice

Shughuli 7: DNA uchimbaj Activity 7: DNA Extraction

Fanya DNA ionekane

Wakati kuna ncha nyingi za DNA tunaona kama wingu nyeupe (chumvi inatoa rangi nyeupe, DNA haionekani kwa macho). Tunaongeza pombe taratibu, tukidondoka kwenye ukuta wa glasi ya maji ya matunda, kwa sababu tunataka safu ya pombe ibaki juu ya juisi bila kuichanganya. Katika dakika 3 au 4 wingu nyeupe ya fomu ya DNA ambayo agglomerates na inakuwa inayoonekana (kupanda juu). Kileo huongezwa kwa sababu DNA haina kiini katika kileo na hivyo chembe ya DNA hufanyizwa.

Make DNA visible.

When there are many strands of DNA we see it as a white cloud (salt gives it a whitish colour, DNA is not visible to the naked eye). We slowly add alcohol, dripping it on the wall of the glass of juice, because we want the layer of alcohol to remain above the juice without mixing. In 3 or 4 minutes a white cloud of DNA forms which agglomerates and becomes visible (rising to the top). Alcohol is added because the DNA is not soluble in alcohol and thus a cloud of DNA is formed.

Hitimisho

Conclusions

- Kuelewa mchakato mrefu kwa muonekano wa maisha
- Kujua hali ya maisha hulinda uhai.
- Kujua mazingira uliokithiri ambao maisha wanaweza kuendeleza.
- Kuelewa mchakato wa uchimbaji wa DNA kuthibitisha uwepo wa maisha.

- Understanding the long process for the appearance of life.
- Know the conditions that protect life.
- Know the extreme environments in which life can develop.
- Understand the DNA extraction process to verify the presence of life.

Asante sana kwa makini yako!

Thank you very much for your attention!