Committee: Environmental Committee

Issue: The question of extraterrestrial threat

Student Officer: Nikos Beltsos

Position: Co-Chair

PERSONAL INTRODUCTION PARAGRAPH:

Dear Delegates,

It is my pleasure to officially welcome you to the Environmental Committee of this year's PS-MUN. My name is Nicholas Beltsos and I am going to be serving as one of your Chairs. Those of you that have attended a similar conference in the past already know what a unique experience MUN is. For the newcomers, I believe that MUN will allow you to expand your knowledge, engage in problem solving, develop your language, communication and negotiation skills and, additionally, it offers you the opportunity to meet people with diverse ideas and backgrounds. The expectations concerning the Committee work are high and I hope that you will do your best during the sessions. However, we expect from you no more than what we know you can offer. You are highly encouraged to be fully prepared, since the more thoroughly you research the more interesting the debate will be. Please be aware of the fact that during debate you are representing your country's policy and not your own, regardless of any moral qualms that may arise. We are aware that some of you might think they do not possess adequate linguistic abilities or face difficulties when delivering a speech in front of a public. Therefore, I would like to ensure you that, when it comes to the procedure, the composition of your official papers and the debate, I will be at your disposal in any way possible, providing you with the answers, the materials and the support you might need. Should any questions concerning the topic or the procedure arise, feel free to contact me via email (nbeltsos@hotmail.com). I expect to see motivated and well-prepared delegates and I, as yourCo-Chair, promise to be objective, impartial and devote time and effort in order to establish an interesting and beneficial experience for all of us!

Sincerely,
Nicholas J. Beltsos

INTRODUCING TOPIC:

Setting on the framework on which the question of extraterrestrial threat is going to be analyzed the most important question arising is how do we define extraterrestrial threat. In theory any threat that originates from outer space and not earth is an extraterrestrial one. In the forthcoming PS-MUN conference however we are going to approach the issue from three separate points of view.

I. It will be elaborated upon how extraterrestrial objects, such as but not limited to meteors and comets, can be considered a serious threat for humanity and our natural surroundings.

II. The potential danger that radiation from outer space poses to our environment and biosphere in general will be analyzed.

III. Last but not least it will be examined what peril our environment and species might face in the case of an alien form of life reaching Earth.

KEY TERMS:

Here are the definitions of some of the topic's key terms according to the Oxford Dictionary:

- Asteroid: a small rocky body orbiting the sun. Large numbers of these, ranging enormously in size, are found between the orbits of Mars and Jupiter, though some have more eccentric orbits.
- Meteor: a small body of matter from outer space that enters the earth's atmosphere, becoming incandescent as a result of friction and appearing as a streak of light.
- Meteorite: a piece of rock or metal that has fallen to the earth's surface from outer space as a meteor. Over 90 per cent of meteorites are of rock while the remainder consists wholly or partly of iron and nickel.
- Meteoroid: a small body moving in the solar system that would become a meteor if it entered the earth's atmosphere.
- Comet: a celestial object consisting of a nucleus of ice and dust and, when near the sun, a 'tail' of gas and dust particles pointing away from the sun. Originating in the remotest regions of the solar system, most comets follow regular eccentric orbits and appear in the inner solar system as periodic comets, some of which break up and can be the origin of annual meteor showers.

- UFO (Unidentified Flying Object): a mysterious object seen in the sky for which it is claimed no orthodox scientific explanation can be found, often supposed to be a vehicle carrying extraterrestrials.
- Impact event: a collision between celestial objects causing measurable effects. Most impact events involve asteroids, comets or meteoroids and have minimal impact. Large-scale impact events can have disastrous physical and biospheric consequences. Major impact events have significantly shaped our planet, have been implicated in the formation of the Earth–Moon system, the evolutionary history of life, the origin of water on Earth and several mass extinctions.

HISTORICAL INFORMATION:

INCOMING EXTRATERRESTRIAL OBJECTS:

Our planet is constantly being hit by asteroids and comets, with the clear majority of which being in the form of dust or very small meteorites that appear like shooting stars.

An impact crater is the most noticeable result of the falling of an asteroid or comet on the earth's surface. An impact event can have catastrophic consequences on the land. When occurring, the falling asteroid explodes under extreme pressure, destroying everything in the surrounding area.

A meteorite impact causes alteration to the composition of some natural minerals when it comes in contact with them.

A large-scale impact event, causes massive amounts of dust and small pieces to be sent up to the atmosphere, forming a cloud of dust and rock. Its presence and expansion in the atmosphere will block sunlight and generally solar rays from reaching earth's surface. At that point, dark spreads and freezing conditions occur in the oceans. In addition, since there would be no sunlight, the life-supporting process of photosynthesis in plants will stop, resulting into detrimental, irreversible consequences on the fauna and climate.

Wildfires or firestorms are another outcome of impact events. The impact event causes the release of huge amounts of methane. Since Methane is an extremely flammable substance, a lightning can set fire on the released gas. Such fires would be of much larger magnitude than simple forest fires. Owing to the high concentration of methane

it is possible that the atmosphere itself will be ignited. As a result many species of animals and plants will be soon subject to extinction and at the same time there will be a dramatic decrease in the amount of oxygen in the atmosphere and increase in the amount of carbon dioxide.

RADIATION:

Radiation originated from outer space has been constantly reaching and hitting our planet from the time of its creation. Much of this radiation, coming from astronomical objects such as but not limited to the sun and black- holes can prove lethal and catastrophic for our health and environment. Fortunately however, we have our atmosphere to protect us from any harmful form of outer space radiation.

It was not until the 19th century that scientists and mainly astronomers started making progress in the enigmatic field of space radiation. Till, now they have detected several types of radiation with various characteristics, applications and of course potential threats. In our conference we are going to concentrate on some of the most significant types, which are:

I. Cosmic Rays
II. Ultraviolet Radiation
III. Infrared Radiation

Cosmic Rays:

Cosmic rays are high energy particles originating from the sun, black holes and supernovae. They travel at nearly the speed of light and pour down on our planet every second. Although we cannot see cosmic rays with our bare eyes, scientists support that they played a consequential and determining role in the evolution of life on Earth. With our atmosphere acting as a radiation shield, much of the cosmic radiation is absorbed. When cosmic rays collide with the upper atmosphere atoms, they form secondary subatomic particles, which manage to penetrate and ultimately reach the surface of our planet.

Rays of life or death?

Cosmic radiation's effect on life depends mainly on the degree of our exposure to its powerful rays. An increase in the amount of cosmic radiation we receive as a planet could result in the mass extinction of all forms of life on Earth. Such incident could be the

outcome of a supernovae (stellar explosion) occurring in close proximity to our planet (30 light years are considered a short distance).

It is supposed that cosmic rays are likely to have caused genetic mutations. When cosmic rays penetrate the human body (after long term radiation exposure) they may cause damage to the DNA in our cells, mainly on account of the rays' high energy capacity. The collision of these high energy particles with the DNA in our bodies could lead to the partial destruction of our genetic information resulting in cell malfunction, cancer, neurological disorders and even death.

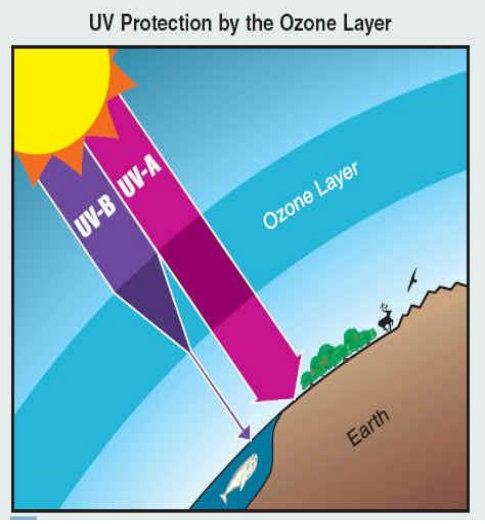
Our average annual exposure to cosmic rays is the equivalent of about 10 chest X-rays. As concerning as the example may sounded, cosmic radiation is a part of the natural background radiation under which all forms of lives on earth evolved. On that basis we cannot entirely associate cosmic-ray-induced mutations with death and extinction. On the contrary, some species' adaptation to such genetic reactions might have triggered their evolution and secured their survival. As a matter of fact, according to many scientists it is certain that in some way cosmic rays shaped evolution of organisms on our planet. Such belief, suggests that evolution is not entirely a product of natural selection as Charles Darwin claimed. His well-known theory of evolution is based on the notion known as 'the survival-of-the-fittest', while the former view supports that genetic diversity and the evolution of life as we know it, could also be attributed to the exposure of organisms to cosmic rays.

The role of cosmic radiation, in the evolution of life on the earth is illustrated in the following key-questions:

- Is there any contradicting point between Charles Darwin's theory and the supposed role of cosmic radiation in the evolution of organisms?
- Throughout the history of our planet, what fraction of environmental mutagenesis could be attributed to cosmic rays?
- Could genetic diversity be considered a product of cosmic ray-induced mutation?

Ultraviolet Radiation

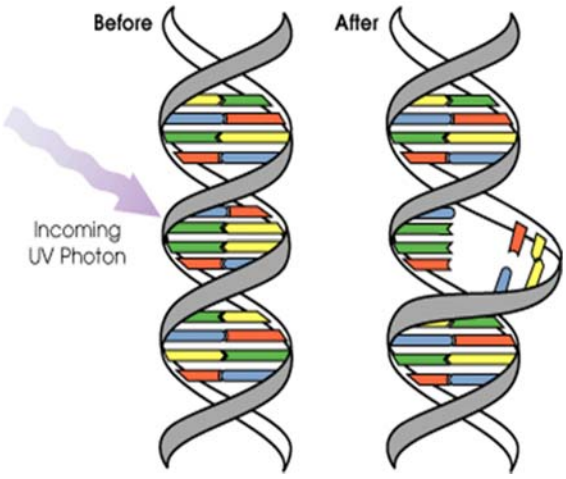
Ultraviolet radiation (UV) is a type of electromagnetic radiation with more energy than visible light (wavelength from 400 nm to 10 nm). UV radiation can be subdivided into a number of ranges (types) according to their energy capacity. The three most important UV types are: UV-A, UV-B and UV-C.



- UV-A radiation is the least harmful and has the lowest level of energy. UV-A rays do not have enough energy to be absorbed by the ozone molecules, so UV-A radiation passes the earth's atmosphere and reaches its surface. UV-A rays, are conducive to the formation of vitamin D but at the same time are likely to cause sunburn and cataracts in our eyes.
- UV-B rays are more energetic than UV-A. Therefore, just as UV-A rays are able to penetrate the ozone layer, with many of them reaching our planet's surface.
- UV-C radiation is the most energetic and most harmful. Fortunately, UV-C radiation never penetrates the earth's atmosphere because of the ozone layer, since they are completely absorbed by the ozone molecules in the upper atmosphere.

UV radiation and the Depletion of ozone layer

In the upper atmosphere (stratosphere) there is a layer of ozone (O3). This chemical gas, which is formed from dioxygen (O2) by the action of ultraviolet light, protects all living organisms on the Earth by absorbing the harmful UV rays coming from the sun. Unfortunately however, since the mid-1970s, we are witnessing a significant reduction in the amount of ozone in the atmosphere. Responsible for this phenomenon are human activities (such as but not limited to the production of man-made chlorofluorocarbons (CFCs)), which have been causing alterations in atmosphere's chemistry and therefore resulting into the depletion of the ozone layer. The chemical's reduction means that more ultraviolet radiation can penetrate the atmosphere and reach Earth's surface. It is thought that the destruction of ozone molecules is caused by active chlorine produced by UV rays' reaction with CFCs. Overall it is obvious that life on our planet is highly dependent on the ozone of our atmosphere and thus its dramatic depletion would bring catastrophic consequences on all living organisms.

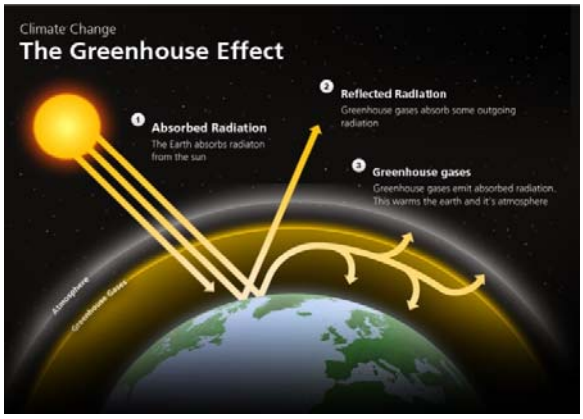


Some Effects of Ultraviolet Radiation on the Biosphere

Long term exposure to UV radiation has serious effects on the human organism, crops, terrestrial and aquatic ecosystems.

UV-B rays harm the DNA molecules of living organisms, by altering DNA's shape and damaging its structure. This could result into the production of distorted proteins or even the death of the organism's cells. As UV radiation has always been a part of our natural background radiation, many living cells have managed to evolve and adapt to the UV-B rays' molecular effects, thus

developing the ability to repair the damaged DNA by the production of special enzymes. In that way, the damage of the DNA by UV rays has been considerably reduced.



Long term UV radiation exposure has serious impacts on human skin. It is likely to cause skin cancer by mutating the DNA and damaging the immune system. According to the United Nations Environment Program, 1 percent depletion of ozone will ultimately lead to a 2-3 percent increase in the non-melanoma skin cancer incident rates.

Our eyes, in contradiction to our hair and clothing, are very vulnerable to UV radiation. When exposed to UV radiation (and especially UV-B) for a long time period, it is certain that we will suffer from serious eye diseases and disorders such as but not limited to cataracts and ultraviolet keratitis.

As far as flora is concerned, UV radiation hinders the photosynthesis process in many species. In fact, overexposure to UV-B rays is said to negatively affect the size, the productivity and the quality in many of the crop plant species. Apart from that, UV radiation makes plants more susceptible to diseases and since UV vulnerability is variable among the plant species, it is likely that an increase in the UV exposure could lead to the alteration of a regions biodiversity.

Similarly, in the marine biosphere UV radiation affects the biological functions of phytoplankton and debilitates their photosynthesis. As the basis of the marine food chain, phytoplankton are conducive to the production of at least half of the organic material in the biosphere.

Infrared Radiation

Infrared radiation (IR radiation) is a type of electromagnetic radiation with less energy than the visible light (wavelength from 700 nm to 1.000.000 nm). Infrared radiation is also known as 'heat radiation', on account of its ability to heat the surfaces that absorb them. In fact, it is estimated that 49% of the heating of the earth is a result of IR radiation with the rest 51% being attributed to the visible light.

Infrared rays and the Greenhouse Effect

Solar rays (referring to any radiation coming from the sun including IR radiation) that pass the atmosphere and reach the Earth's surface, are absorbed and then re-emitted back to the atmosphere in the form of infrared radiation. Naturally formed gases in the atmosphere, such as

nitrogen and oxygen, enable the incoming IR rays to pass through and ultimately exit the atmosphere. Unfortunately however, human activities have contributed to the increase in concentration of certain substances (known as greenhouse gases) which block the IR rays and re-emit them to all directions including the Earth's surface. This constant flow of IR radiation around the surface of our planet, results into its overheating and as consequence to climate change.

ALIEN FORMS OF LIFE:

Regardless of it seeming as an unrealistic and probably future rather than current possibility, the question of extraterrestrial threat by aliens is an issue of paramount importance. Although there has been no sign whatsoever whether or not extraterrestrial forms of life actually exist, we will examine the threat that such life would pose on humanity. It could be first of all in any form we dare to imagine -from microorganisms to gigantic creatures- and therefore it is obvious that we cannot determine the exact threat they could pose. Of course there always is the possibility that they will come with no hostile intentions. Still, however it is clear that their arrival would significantly affect our planet and its species. We can thus speculate that an alien form of life is likely to attempt among many other things our specie's extermination and the full exploitation of our planet's natural resources.

MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED:

Although the consequences of an extraterrestrial threat would affect each and every country in the world, it is only the ones with highly developed space technology that are in the position to confront any such threat in outer space. On that basis the three member states with the most advanced space technology are the United States of America (USA), Russian Federation and China:

- China: Responsible for the country's space program is China's National Space Administration namely CNSA. The country invests billions of dollars in their space programs. China's constantly advancing and promising space technology renders it one of the most 'space' active member state.
- USA: With NASA (The National Aeronautics and Space Administration) being the most significant space agency -responsible for the civilian space program as well as aeronautics and aerospace research- in the world, it is clear that USA has been at the frontier of many successful space programs. Since the agency's creation more than $480 billion have been spent on human space flights alone.

- Russian Federation: As the first country to ever have launched a space mission, Russia's presence in space has been remarkable. Probably USA's most important competitor in outer space exploration, the two mega-powers have always been claiming the title of the world's most 'space' active country. The Russian Federal Space Agency, also known as Roscosmos, carries out Russia's aerospace programs and research.

There are several organizations specializing in extraterrestrial threat. As far as radiation is concerned there are three international organizations which recommend radiation protection levels: the International Commission on Radiological Protection (ICRP), the International Atomic Energy Agency (IAEA) and the International Commission on Radiation Units and Measurements (ICRU).

- ICRP: Established in 1928 the ICRP is concerned with the safety of all sources of radiation. Its mission is "to deal with the basic principles of radiation protection and to leave to various national protection committees the responsibility of introducing the detailed technical regulations, recommendations or codes of practice best suited to the needs of their individual countries."

- IAEA: Established 1956, IAEA is a specialized agency of the UN. Its aim is to promote the peaceful uses of nuclear energy.

- ICRU: Established in 1925, ICRU develops aims in the safe and efficient application of radiation to medical diagnosis, radiation science and technology, and radiation protection of individuals and populations.

In addition to that:

- EPA: The U.S. Environmental Protection Agency also specializes in recommending federal guidance on protecting the environment from radiation.

- SETI: SETI Institute (Search for Extraterrestrial Intelligence) is a non-profit organization focusing on the exploration and understanding of the origin, nature and prevalence of life. SETI is also searching for evidence of the existence of extraterrestrial life by using radio and optical telescopes.

TIMELINE OF EVENTS:

- 65 million years ago: asteroid impact in the Yucatan Peninsula, causing a global firestorm, extreme temperature decrease and ultimately global warming. This impact event is said to have extinguished the dinosaurs
- 3.3 million years ago: meteorite impact in Argentina, causing the extinction of numerous species
- 50,000 years ago: meteorite impact in Arizona
- 1490: Asteroid impact causes 10,000 casualties in the Chinese city of Chi1ing-yang
- 1801: Johann W. Ritter discovers ultraviolet radiation
- 1801: Sir William Hershel discovers infrared radiation
- 1908: Asteroid explodes in Tunguska, Siberia just before it reaches the surface, resulting in the killing of a thousand reindeers and fortunately no humans
- 1937: Asteroid Hermes crosses the earth at a very short distance (600,000 miles).
- 1938: Small meteorite impact in Illinois
- 1972: The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) issues a report radiation risks.
- 1980: University of Arizona creates the Spacewatch program, intent on cataloging orbiting asteroids in our solar system.
- 1992: Small meteorite impact in New York.
- 2003: Small meteorite impact in New Orleans
- 2003: Meteorite impact in India

POSSIBLE SOLUTIONS:

In conclusion the question of extraterrestrial threat in any of its three forms is an issue that calls for the immediate co-operation of all member states. It has become obvious that such a threat does not concern just some countries but mankind as a whole. Thus the only way to confront a potential extraterrestrial threat is by multilateral collaboration so that we take action as a species

and not as countries with different interests and goals. After all, there is only one goal that each and every member state shares, and that is survival. With that being said, international co-operation should be encouraged.

The issue of a effective defensive system against meteoroids and similar extraterrestrial threats as well as measures in order to prevent sicknesses and mutations due to UV-Cs, etc. In course of that the destruction of the ozone layer should not only be reduced but completely eliminated as well as the emission of carbon dioxide should be reduced whereas measures to achieve such have often been proposed and may be referred to but most of those measures should be proposed in the committee not only in a altered from but a improved form and new proposals should is what the main part of any resolution should consist of.

Last but not least, it is important that scientific research, conducted either by organizations and universities or agencies, on the issue is financially supported by the world's governments and especially by the countries with a significant presence in space.

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