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Учреждение высшего образования
«Саратовский национальный исследовательский государственный
университет им. Н.Г. Чернышевского»

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EARTH SCIENCES IN THE GLOBAL WORLD

Учебное пособие для магистрантов географического и геологического
факультетов, изучающих науки о Земле

Саратов 2019

Учебное пособие «Earth Sciences in the Global World» предназначено для магистрантов, изучающих науки о Земле на геологическом и географическом факультетах.

Целью данного пособия является формирование навыков чтения и перевода научной и научно-популярной литературы по специальности, а также умения составить аннотацию и кратко изложить содержание статьи, что способствует подготовке студентов к дальнейшей научно-исследовательской и профессиональной деятельности.

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Предисловие

Настоящее учебное пособие предназначено для магистрантов, изучающих науки о земле на геологическом и географическом факультетах.

Цель пособия – научить студентов в полной мере понимать и адекватно переводить оригинальные научные тексты по специальности.

В качестве текстового материалы были взяты аутентичные тексты с сайта www.sciencedaily.com, который представляет собой электронный ресурс, регулярно публикующий последние научные разработки и исследования в области географии, геологии, медицины, физики, химии, и др. наук.

Тексты, на материале которых строится обучение, представляют собой статьи по актуальным проблемам наук о земле. Их объем и лексика оптимальны для формирования навыков чтения и понимания научной литературы по специальности. Более того, благодаря им студенты получают представление о научном стиле и усваивают не только термины, но и общенаучную лексику.

Задания на проверку понимания текста обладают четкой структурой и при этом разнообразием, что помогает сформировать ключевые навыки чтения для понимания общей и детальной информации. Кроме того, для студентов-магистрантов очень важным является написание аннотаций на собственные статьи для публикации результатов своих научных исследований, поэтому в пособии представлены задания, направленные на формирование этого умения. Также уделяется внимание тому, как кратко изложить содержание научных статей и монографий, столь необходимое магистрантам, например, для обзора научной литературы.

Пособие содержит 15 научных текстов по специальности, сопровождаемые упражнениями и терминологическим словарем, который помогает устранить лексические трудности. Структура пособия обеспечивает эффективную работу студентов как самостоятельную, так и под руководством преподавателя.

Content

TEXT 1

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

average temperature – средняя температура
forage – добывать корм
food web – пищевая цепочка
deep water - глубоководье
nutrients – питательные вещества
lake trout – озерная форель
harness - использовать
natural capacity – естественная способность
tissue - ткань
shore - берег
invertebrates - беспозвоночные
angler - рыболов
data – информация, данные

Warmer temperatures are having a ripple effect on food webs in Ontario lakes

Researchers have found warmer **average temperatures** over the past decade have forced fish to **forage** in **deeper water**. There they hunt different prey species, causing a climate-induced "rewiring" of **food webs**, altering the flow of energy and **nutrients** in the lake.

Monitoring the movement of generalist species like **lake trout** may offer an early warning system for impacts of climate change on ecosystems.

"We can **harness** the **natural capacity** of species to detect and respond to changes in their environment," said Tim Bartley, a post-doc in the Department of Integrative Biology and study lead author. "As species are changing their behaviour, they are telling us about what's happening around them in their environment. We can use this information. The behavioral changes we see imply major reorganization of ecosystems."

Published in the journal *Nature Ecology and Evolution*, the study entailed tracking lake trout movement and feeding in hundreds of lakes in northwestern Ontario.

Bartley caught fish to analyze their **tissues** to see what they ate. The team also used similar data about fish feeding habits and locations across the province from the Ontario Ministry of Natural Resources.

Tissue analysis showed that lake trout spend more time in deeper water than near **shore**, although the researchers were unable to identify specific prey species. Lake trout prefer to catch lake herring; Bartley said trout are flexible feeders that will eat other fish species as well as **invertebrates**.

He said warming may also be pushing lake herring into colder waters, meaning that lake trout may still feed on them in offshore locations.
Monitoring behavioral changes in species such as lake trout is important for humans who rely on ecosystems for resources and services from food to water quality, said Bartley.

Climate change effects are complicated and vary within ecosystems to create a patchwork of new conditions, he said. Other organisms, including lake trout prey, are also moving in response to warming.

Tracking the movement, feeding habits and condition of generalist species such as lake trout may give resource managers an early warning system for detecting the effects of warming.

That's important for managing the entire ecosystem and for looking after populations of lake trout, a popular sport fish for **anglers**, said Bartley.
But it's not just happening in lakes.

The study also includes **data** from American researchers showing similar ecosystem "rewiring" in grasslands involving grasshoppers and predatory spiders moving down to cooler areas nearer the soil.

The U of G researchers also point to other studies of climate change effects on rewiring of ecosystems involving beluga whales and halibut in Nunavut, polar

bears and ringed seals across the Arctic, and Kodiak bears feeding on elderberries and sockeye salmon on the Pacific coast.

The report's authors, including integrative biology professors Kevin McCann and Andrew McDougall, concluded: "With further research, we can harness generalists' responses to predict functional outcomes of climate change on the world's ecosystems."

https://www.sciencedaily.com/releases/2019/03/190322105739.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

patchwork ecosystem whale climate change species feeding coast location

1. All species form part of an **……………..**
2. There are approximately 8,000 **……….……** of ants.
3. Several children were **……………...** bread to the ducks.
4. What do these fossils tell us about **……………..** ?
5. The **…………...** surfaced and then dove back down.
6. The map shows the precise **……………** of the crash.
7. We live only a few miles from the **……………..** .

Task 3. *Answer the questions.*

1. What forced fish to forage in deeper water?
2. Why do species change their behavior?
3. What tells us the behavioral changes of species about?
4. What kind of research was made and what did it show?

Task 4. *Make the summary of the text (70-100 words)*

TEXT 2

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

flooding - наводнение
worsen – ухудшать, усугублять
low-income – низкий уровень дохода
green spaces – зеленые насаждения
hazard potential – возможность возникновения опасности
population density – плотность населения
overwhelm – затоплять
storm drains – ливневый сток
target area – зона наблюдения
cluster – группировать
ease - снизить
heat island effect – эффект локального перегрева
intercept – преграждать путь
tree canopy – дерево с густой кроной

Low-income neighborhoods more vulnerable to flooding, extreme heat

Portland experiences both extreme heat in the summer months and frequent nuisance **flooding** in the winter and spring, and that's only expected to **worsen** with climate change. A new Portland State University study found the potential for flooding and extreme heat is most acute in East Portland's **low-income** neighborhoods that have fewer **green spaces** and larger concentrations of less-educated residents.

The PSU research team -- geography graduate students Benjamin Fahy and Emma Brenneman, geography professor Heejun Chang and urban studies and planning professor Vivek Shandas -- mapped winter flood and summer heat **hazard potential**, then tested it against sociodemographic and physical variables at a neighborhood scale, including income, level of education, **population density**, green space and the amount of impervious surface area. This study focused on nuisance flooding, the kind of flooding that shuts down roads, **overwhelms storm drains** and seeps into basements.

Their findings were published in the journal *International Journal of Disaster Risk Reduction*.

"Not surprisingly, those poorer, low-lying areas on the eastside along Highway 205 are disproportionately exposed to floods and urban heat islands," said Heejun Chang, a geography professor in PSU's College of Liberal Arts and Sciences and director of the WISE research group or Water as an Integrated System and Environment. "Those are the potential **target areas** where the city needs to pay attention to."

Among the findings:

- High-flood potential areas are located consistently in East Portland along Highway 205, while most low-flood potential areas are found in NW and SW Portland and near the NE-SE Portland transition along I-84.

- Most areas with high-heat hazards are **clustered** in East Portland, as well as North Portland and along major roadways, while low-heat hazard clustering is found in the western hills, central NE and SE Portland.

- The areas with the greatest combined hazard potential (both extreme heat and flooding) were clustered in East Portland, SE Portland and North Portland. Conversely, the city's western hills and central NE and SW neighborhoods -- wealthier neighborhoods -- showed the lowest risk.

The methods used by the team are meant to be replicated by any researcher, practitioner or policy maker interested in identifying which regions of their cities are most at risk and what demographic factors characterize the most vulnerable citizens.

Chang said planting trees is an easy and effective action to **ease** both urban heat and flooding.

"If you can better manage land, you can better manage water in the urban areas," he said. "During the summer, trees can provide shading and reduce the **heat island effect**. But during winter, they can **intercept** the rainwater, hold water in the soils longer, and release water gradually."

Chang said that in some areas where impervious surface areas are too high, green roofs might be a better alternative. He and his students are continuing to look at ways to expand green infrastructure to reduce heat and nuisance flooding

potentials. Shandas has worked with Portland city officials to develop an online mapping tool to identify specific locations where expanding **tree canopy** can improve social and environmental conditions.

Chang said cities also need to better educate the public, as the places likely to experience the most severe impacts of nuisance flooding and extreme heat often lack access to information and the ability to prepare for hazards.

https://www.sciencedaily.com/releases/2019/03/190322105731.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

flooding	surface	research	vulnerable	hazard
green space	demographic factors		environmental conditions	

1. She sent us her review of the ………….
2. Certain ……………… such as an aging population and an aversion to immigration are pointing to a troubling future for the island nation of Japan.
3. If it rains much more, we can expect some ………….
4. Polluted water sources are a ………… to wildlife.
5. Dead leaves floated on the ………….. of the water.
6. Cairo has only thirteen square centimeters of …………… for each inhabitant.
7. All living organisms have to adapt to changes in ………………

Task 3. *Answer the questions.*

1. Which areas are the most vulnerable to flooding?
2. Where were the results of the research published?
3. What were the findings of the research?
4. What methods can help to reduce both urban heat and flooding?

Task 4. *Put the phrases in the sentence into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words)*

1) replicated by cities 2) characterize the most vulnerable citizens 3) which neighborhoods are most at risk 4) The methods can be 5) to help them identify 6) and what demographic factors.

TEXT 3

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

contribute – привести к чему-либо, спровоцировать
drought – засуха
be in store - предстоять
precipitation – осадки
jet stream – струйное течение
wind pattern – направление и скорость ветра
steep - резкий
mid-latitudes – умеренные широты
geological evidence – геологические данные
vegetation – растительная жизнь
facilitate – задействовать
glacier ice – лед ледника

Arctic warming contributes to drought

When the Arctic warmed after the ice age 10,000 years ago, it created perfect conditions for **drought**.

According to new research led by a University of Wyoming scientist, similar changes could **be in store** today because a warming Arctic weakens the temperature difference between the tropics and the poles. This, in turn, results in less **precipitation**, weaker cyclones and weaker mid-latitude westerly wind flow - a recipe for prolonged drought.

The temperature difference between the tropics and the poles drives a lot of weather. When those opposite temperatures are wider, the result is more precipitation, stronger cyclones and more robust wind flow. However, due to the Arctic ice melting and warming up the poles, those disparate temperatures are becoming closer.

"Our analysis shows that, when the Arctic is warmer, the **jet stream** and other **wind patterns** tend to be weaker," says Bryan Shuman, a UW professor in the Department of Geology and Geophysics. "The temperature difference in the

Arctic and the tropics is less **steep**. The change brings less precipitation to the **mid-latitudes**."

Shuman is a co-author of a new study that is highlighted in a paper, titled "Mid-Latitude Net Precipitation Decreased With Arctic Warming During the Holocene," published today (March 27) online in *Nature*, an international weekly science journal. The print version of the article will be published April 4.

Researchers from Northern Arizona University; Universite Catholique de Louvain in Louvain-In-Neuve, Belgium; the Florence Bascom Geoscience Center in Reston, Va.; and Cornell University also contributed to the paper.

"The *Nature* paper takes a global approach and relates the history of severe dry periods of temperature changes. Importantly, when temperatures have changed in similar ways to today (warming of the Arctic), the mid-latitudes -- particularly places like Wyoming and other parts of central North America -- dried out," Shuman explains. "Climate models anticipate similar changes in the future."

Currently, the northern high latitudes are warming at rates that are double the global average. This will decrease the equator-to-pole temperature gradient to values comparable with the early to middle Holocene Period, according to the paper.

Shuman says his research contribution, using geological evidence, was helping to estimate how dry conditions have been in the past 10,000 years. His research included three water bodies in Wyoming: Lake of the Woods, located above Dubois; Little Windy Hill Pond in the Snowy Range; and Rainbow Lake in the Beartooth Mountains.

"Lakes are these natural recorders of wet and dry conditions," Shuman says. "When lakes rise or lower, it leaves **geological evidence** behind."

The researchers' Holocene temperature analysis included 236 records from 219 sites. During the past 10,000 years, many of the lakes studied were lower earlier in history than today, Shuman says.

"Wyoming had several thousand years where a number of lakes dried up, and sand dunes were active where they now have **vegetation**," Shuman says.

"Expanding to the East Coast, it is a wet landscape today. But 10,000 years ago, the East Coast was nearly as dry as the Great Plains."

The research group looked at the evolution of the tropic-to-pole temperature difference from three time periods: 100 years ago, 2,000 years ago and 10,000 years ago. For the last 100 years, many atmospheric records **facilitated** the analysis but, for the past 2,000 years or 10,000 years, there were fewer records available. Tree rings can help to expand studies to measure temperatures over the past 2,000 years, but lake deposits, cave deposits and **glacier ice** were studied to record prior temperatures and precipitation.

"This information creates a test for climate models," Shuman says. "If you want to use a computer to make a forecast of the future, then it's useful to test that computer's ability to make a forecast for some other time period. The geological evidence provides an excellent test."

The research was funded by the Science Foundation Arizona Bisgrove Scholar Award, the National Science Foundation and the state of Arizona's Technology and Research Initiative Fund administered by the Arizona Board of Regents.

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

climate	lake	cyclone	forecast	geological evidence
vegetation	precipitation		atmospheric records	

1. Rain, snow and hail are collectively known as **……………..**.
2. The weather **……………**. is good for tomorrow.
3. They reject **………………..** of climate change because they reject the science of geology itself.
4. The **………………** here is milder than that of Moscow.
5. Since 1987, Bangladesh had suffered two major floods and a severe **…………..**
6. The local **……………** is flourishing as a result of the recent rains.

7. It offers you panoramic mountain and **…………..** views and free parking on site.

Task 3. *Answer the questions.*

1. Why can Arctic warming lead to drought?
2. What regions are the most vulnerable to drought?
3. What are the peculiarities of the research?
4. What are the main results of the research?

Task 4. *Make the summary of the text (70-100 words)*

TEXT 4

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

distribution - распространение
relevant – важный, значимый
biodiversity – разнообразие форм жизни
nutrient retention – удержание питательных веществ
pollination – опыление
pest control – борьба с вредителями
slope – склон
abundance – изобилие, большое количество
foothill – подножье горы
livestock grazing – пастбищное животноводство
alter – изменять
moderate climate – умеренный климат
detrimental – пагубный, негативный

Mount Kilimanjaro: Ecosystems in global change

2019 marks the 250th anniversary of Alexander von Humboldt. He was one of the first naturalists to document the **distribution** and adaptation of species on tropical mountains in the 19th century. Humboldt also observed that high mountains represent a microcosm of the earth's climate zones. Today, his scientific findings are more **relevant** than ever.

In a world threatened by climate change, tropical mountains are centers of **biodiversity** and as such they are important refugia for plants and animals. These organisms perform vital functions such as carbon storage, **nutrient retention** in soil, water supply, **pollination** and **pest control**. But tropical mountain regions are increasingly under threat by the spread of agriculture and overexploitation.

Nature **publishes results of the study**

"Until now it has been unclear how human land use affects the biodiversity and ecological functionality of tropical mountain ecosystems," says Marcell Peters from the Chair of Animal Ecology and Tropical Biology at Julius-Maximilians-Universität Würzburg (JMU) in Bavaria, Germany. Now an international team of researchers led by JMU scientists set out to study biodiversity as well as ecosystem functions in natural habitats and in habitats with different land-use intensities in all elevation zones on the southern **slopes** of Mount Kilimanjaro.

The results of the study have been published in *Nature*. It took the 50 researchers from 30 universities and research institutes in Germany, Tanzania, Switzerland, Denmark and South Africa six years to collect the data.

About land use on Kilimanjaro

At 5,895 meters, Mount Kilimanjaro is the highest mountain in Africa and home to a rich **abundance** of plant and animal species. The climatic conditions change with elevation as do the plant and animal species that live there. Maize is the most widely grown crop in the **foothill** area. At higher elevations, farmers cultivate mixed systems of coffee and forest or grassland for **livestock grazing**.

The research team studied species richness of plants, animals and microorganisms as well as ecosystem functions like soil nutrient contents, pollination and leaf decomposition at elevations between 850 and 4,550 meters. "The present study is unique in terms of the number of recorded species groups and ecological functions, the number of studied sites and the elevation gradient from tropical savanna to Afroalpine ecosystems," says Professor Ingolf Steffan-Dewenter who initiated the study.

Different interactions between climate and land use

The results show that land use leads to a significant loss of biodiversity and **alters** the ecosystem functions of tropical mountains. The intensity of these changes varies in different elevation zones.

"In the savanna zone at the foot of the mountain, up to 50 percent of species are lost even when land use is moderate and the functionality of ecosystems exhibits significant changes. In contrast, the ecosystems at medium elevations with a **moderate climate** are slightly more robust," Peters explains. He says that although biological communities still suffer major changes, the overall biodiversity and ecological functionality are less severely affected than in the savanna areas at the foothills of Kilimanjaro.

"Our study shows that the impact of land use on the biodiversity and functionality of ecosystems is strongly correlated with the climatic context." This is highly relevant for understanding land use and climate change on mountains but also in a world threatened by climate change: Studies at different montane elevation zones can help make more accurate predictions of how climate change will impact natural habitats and systems used by humans.

Supporting sustainable use is crucial

Land use has particularly **detrimental** consequences for the biodiversity and ecosystem functions of dry and hot ecosystems as are encountered in the foothills of Mount Kilimanjaro. Protecting and promoting land use that is sustainable and compatible with biodiversity is vital to preserve the diversity of species and nature-based ecosystem functions.

"Our study underpins that different drivers of global change cannot be addressed separately; the impact of land use is also influenced by the climatic situation and vice versa," says Steffan-Dewenter and he adds: "We hope that our study will contribute to a better understanding of how global environmental changes affect biodiversity and ecological functions on tropical mountains and will help to preserve these unique ecosystems in the long run."

https://www.sciencedaily.com/releases/2019/03/190327142016.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

ecosystem	habitat	threaten	cultivate	climate zone
spread	biodiversity	adaptation		

1. These problems …………… the very foundations of modern society.
2. The fire …………. quickly through the building.
3. The land was too rocky to …………...
4. It is covered with primary rainforest that rivals the ……………. of the Amazon.
5. The length of the day changes in the ……………. with the change of seasons.
6. The bay has a very complex and delicate ……………. .
7. We were watching monkeys in their natural ……………. .

Task 3. *Answer the questions.*

1. What did Humboldt study?
2. How do human land use affect the biodiversity and ecological functionality of tropical mountain ecosystems?
3. Why are tropical mountain regions under threat?
4. What are the peculiarities of Mount Kilimanjaro?

Task 4. *Put the phrases in the sentences into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words)*

1) in tropical mountain regions; of biodiversity; Land use; and ecological functions; leads to considerable changes
2) of such changes; by the climate; The intensity; is greatly affected

TEXT 5

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

marine snow – морской снег
carbon dioxide – углекислый газ
acidity – степень кислотности

carbon sink – сток углерода
chalk cliffs – меловые горы
deposit - месторождение
net increase – чистое увеличение
seafloor – морское дно
composition – состав
ocean basin – океанический бассейн
removal – удаление, вывод
to store away - сохранить
databases – имеющиеся данные

How marine snow cools the planet

University of Sydney scientists have modelled how carbonate accumulation from **'marine snow'** in oceans has absorbed **carbon dioxide** over millennia and been a key driver in keeping the planet cool for millions of years.

The study, published in *Geology*, also helps our understanding of the ocean's future capacity to store carbon dioxide, which is vital given warming-ocean **acidity** has increased 30 percent since 1800.

"Marine snow is the falling debris of dead organisms in the ocean, such as plankton and algae," said the study's lead author, Dr Adriana Dutkiewicz.

"The deep ocean floor is covered with the remains of these tiny sea creatures. They produce more than 25 percent of the oxygen we breathe and form the Earth's largest **carbon sink**. When organic particles fall from the surface ocean to the seafloor, a small but significant proportion of atmospheric carbon is stored away."

When compacted over millions of years, these marine snow deposits become carbonate structures, such as the White Cliffs of Dover and similar structures along England's south coast. These **chalk cliffs** and their related structures under the ocean act as millennia-old carbon capture devices.

"Deep-sea carbonates represent a huge volume, so even small changes in the sequestration of carbonate carbon into this enormous sink are quite important for understanding net changes in atmospheric carbon dioxide and climate," Dr Dutkiewicz said.

Her team found that the amount of carbon stored in carbonate layers on the seafloor has increased tremendously over time. About 80 million years ago, only one megatonne of carbon ended up in carbonate layers annually, growing to about 30 megatonnes about 35 million years ago and 200 megatonnes today.

While carbonates forming in shallow waters decreased, the rise in deeper **deposits** was far greater, creating a **net increase** in the total volume of carbonate sediments in the oceans in the past 80 million years.

The study used data from drilled core samples from the past 50 years to develop a dynamic model describing the formation of carbonate deposits back 120 million years to the Cretaceous period.

Marine snow forms a blanket on the **seafloor** up to many hundreds of metres thick. Understanding what it is composed of, what drives its **composition** and how it has changed through time is important. If the supply of marine snow increases, then more carbon is stored, reducing the atmosphere's CO_2 content.

To understand how much carbon has been stored over time in sedimentary carbonates in the **ocean basins**, Dr Dutkiewicz and her colleagues from the EarthByte group in the School of Geosciences, University of Sydney, developed a computer model of carbonate accumulation in deep-sea sediments spanning the past 120 million years. The researchers used the model to look at the impact of carbonate accumulation on global climate through time.

The researchers believe that the growth of a significant carbon sink over millions of years may be responsible for the **removal** of carbon dioxide from the atmosphere that led to global cooling 50 million years ago, triggering the transition from a hothouse to an icehouse climate around 35 million years ago.

The recently released Australian Bureau of Meteorology (BOM) and CSIRO biennial State of the Climate report stresses the importance of oceans as carbon sinks, potentially holding future warming extremes at bay.

"We need to understand better how the ocean's capacity to store CO_2 will be affected by future warming," said EarthByte team leader Professor Dietmar Muller.

"Ocean acidity has increased by 30 percent since 1800, reducing the capacity of the ocean to **store away** carbon."

Dr Dutkiewicz urged funding agencies and the scientific community to devote more resources to synthesising the incredible amount of data collected over 50 years of ocean drilling expeditions at a total cost of about $US200 million.

"This enormous ocean drilling investment and data set should be used much more extensively for understanding Earth's deep carbon cycle," she said. "Once you have coherent **databases**, a wide array of questions could be addressed."

https://www.sciencedaily.com/releases/2019/03/190313103238.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

carbon	urge	marine snow	removal
algae	deposit	composition	carbon dioxide

1. Soft corals, several meters across collect the ……………….. as it drifts past.
2. …………… monoxide is a poisonous gas.
3. …………… your child to verbalize his feelings.
4. Rivers and lakes are often coloured green by ……………..
5. Scientists study the ……………. of the soil.
6. When water comes into contact with air, …………….. is released.
7. Last August, this giant …………….. situated off the Caspian coast was ranked the world's most expensive energy project.

Task 3. *Answer the questions.*

1. What does marine snow form?
2. What does the growth of a significant carbon sink lead to?
3. What did the researchers develop to understand how much carbon has been stored over time in sedimentary carbonates in the ocean basins?
4. How will the ocean's capacity to store CO_2 be affected by future warming?

Task 4. *Make the summary of the text (70-100 words)*

TEXT 6

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

yield - производить
conventional – общепринятый
coolant – охладитель
flammable – воспламеняемый
leak - проникать
devour - поглощать
materials scientists – материаловеды
collaborator – сотрудник
thermal change – изменение температурных условий
fluid - жидкость
chemical bond – химическая связь
permit – позволять
malleability – эластичность
unprecedentedly – беспрецедентно
forefront – важнейшее место

Green material for refrigeration identified

Researchers from the UK and Spain have identified an eco-friendly solid that could replace the inefficient and polluting gases used in most refrigerators and air conditioners.

When put under pressure, plastic crystals of neopentylglycol **yield** huge cooling effects - enough that they are competitive with **conventional coolants**. In addition, the material is inexpensive, widely available and functions at close to room temperature. Details are published in the journal *Nature Communications*.

The gases currently used in the vast majority of refrigerators and air conditioners -- hydrofluorocarbons and hydrocarbons (HFCs and HCs) -- are toxic and **flammable**. When they **leak** into the air, they also contribute to global warming.

"Refrigerators and air conditioners based on HFCs and HCs are also relatively inefficient," said Dr Xavier Moya, from the University of Cambridge, who led the research with Professor Josep Lluís Tamarit, from the Universitat

Politècnica de Catalunya. "That's important because refrigeration and air conditioning currently **devour** a fifth of the energy produced worldwide, and demand for cooling is only going up."

To solve these problems, **materials scientists** around the world have sought alternative solid refrigerants. Moya, a Royal Society Research Fellow in Cambridge's Department of Materials Science and Metallurgy, is one of the leaders in this field.

In their newly published research, Moya and **collaborators** from the Universitat Politècnica de Catalunya and the Universitat de Barcelona describe the enormous **thermal changes** under pressure achieved with plastic crystals.

Conventional cooling technologies rely on the thermal changes that occur when a compressed **fluid** expands. Most cooling devices work by compressing and expanding fluids such as HFCs and HCs. As the fluid expands, it decreases in temperature, cooling its surroundings.

With solids, cooling is achieved by changing the material's microscopic structure. This change can be achieved by applying a magnetic field, an electric field or through mechanic force. For decades, these caloric effects have fallen behind the thermal changes available in fluids, but the discovery of colossal barocaloric effects in a plastic crystal of neopentylglycol (NPG) and other related organic compounds has leveled the playfield.

Due to the nature of their **chemical bonds**, organic materials are easier to compress, and NPG is widely used in the synthesis of paints, polyesters, plasticisers and lubricants. It's not only widely available but also is inexpensive. NPG's molecules, composed of carbon, hydrogen and oxygen, are nearly spherical and interact with each other only weakly. These loose bonds in its microscopic structure **permit** the molecules to rotate relatively freely.

The word "plastic" in "plastic crystals" refers not to its chemical composition but rather to its **malleability**. Plastic crystals lie at the boundary between solids and liquids.

Compressing NPG yields **unprecedentedly** large thermal changes due to molecular reconfiguration. The temperature change achieved is comparable with those exploited commercially in HFCs and HCs.

The discovery of colossal barocaloric effects in a plastic crystal should bring barocaloric materials to the **forefront** of research and development to achieve safe environmentally friendly cooling without compromising performance.

Moya is now working with Cambridge Enterprise, the commercialisation arm of the University of Cambridge, to bring this technology to market.

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

coolant	refrigerator	magnetic field	replace
nature	available	flammable	materials scientists

1. Every …………… space on the wall was covered in pictures.
2. A meteorite collided with Earth at the same time, delivering a one-two punch to the ……………...
3. The atomic reactor used a gas ……………..
4. Avoid wearing loose ……………… clothing when using the blowtorch.
5. The …………….. has a separate compartment for meats.
6. She was named to ……………….. him as the company's vice president.
7. All things in …………… are dependent on one another.

Task 3. *Answer the questions.*

1. What kind of polluting gases are used in most refrigerators and air conditioners?
2. What green material can produce cooling effects?
3. How do most cooling devices work?

Task 4. *Put the phrases in the sentence into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words)*

1) used in most 2) Researchers have identified 3) that could replace 4) an eco-friendly solid 5) refrigerators and air conditioners 6) the inefficient and polluting gases

TEXT 7

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

trade-off – компромиссное решение
quality of life – качество жизни
greenhouse gas – парниковый газ
resilience – устойчивость, приспособляемость
heat waves – период жары
emissions – выхлопные газы
brownfield – вторичная застройка
urban sprawl – рост городов
shrinking – уменьшение, сокращение
consumption – потребление
impetus – импульс, стимул
accelerate – ускорять
congestion – перенаселенность, скопление
irreconcilable - неразрешимый

Cities under pressure in changing climate

Cities to swelter as planners face unenviable **trade-off** between tackling climate change and **quality of life**, new research has shown.

The study, led by experts at Newcastle University, UK, has shown the challenge we face to reduce **greenhouse gas** emissions, increase cities' **resilience** to extreme weather and also give people quality space to live in.

Publishing the research in the journal *Cities*, the team have for the first time analysed the trade-offs between different sustainability objectives. These include minimising climate risks such as **heat waves** and flooding, reducing **emissions** from transport, constraining urban sprawl, making best use of our **brownfield** sites, ensuring adequate living space, and protecting green space which is important for our health and wellbeing.

Focussing on London - an example of a large rapidly growing city that is also at the forefront of tackling climate change - the team show the 'best case' scenario would be to increase development in a small number of central locations, such as East Barnet, Wood Green and Ealing.

Avoiding development along the Thames, this optimum plan would reduce flood risk, minimize transport emissions and reduce **urban sprawl**.

But, says author Dr Dan Caparros-Midwood, the trade-off will be more people exposed to extreme temperatures.

"Many of the lowest heat hazard areas coincide with the flood zone on the banks of the River Thames due to the cooling effect of blue infrastructure," explains Dr Caparros-Midwood, who carried out the work as part of his PhD at Newcastle University and is now a Senior GIS Specialist at Wood.

"But moving development away from the river while also protecting our green spaces and reducing sprawl really only leaves two options; either **shrinking** our homes or developing in higher heat risk areas.

"And while our study looked at London, this could apply to most cities in the world."

Building resilience in our cities

By 2050 it is estimated that two-thirds of the world's population will live in cities, highlighting the urgent need for urban development to be sustainable.

"Urban areas must radically transform if they are to reduce their greenhouse gas emissions and **consumption** of resources whilst also increasing their resilience to climate change and extreme weather," explains Professor Stuart Barr, co-author and part of the Geospatial Engineering group at Newcastle University.

Project lead Professor Richard Dawson, of the School of Engineering at Newcastle University, said the findings reinforced the scale of the challenge.

"We are already starting to see the impact of hotter summers and flooding on our cities," he says.

"Balancing trade-offs between these objectives is complex as it spans sectors such as energy, buildings, transport, and water.

"What our study shows in stark detail is this cannot be done using our current approach to planning and engineering our cities - difficult choices will have to be made."

Even in Europe, says Professor Dawson, only a quarter of cities have a comprehensive climate strategy. And yet, with the right **impetus**, we have the potential to **accelerate** and upscale action in our cities to tackle climate change.

"We have to be more creative about how we design and build our buildings and infrastructure," he says.

"This will include weaving green infrastructure into urban spaces; facilitating lifestyle choices such as walking and cycling that reduce energy demand, pollution and greenhouse gas emissions; and integrating new technologies that can shift carbon-intensive energy patterns by optimizing transport efficiency, vehicle sharing and reducing **congestion**.

"For the moment though, there are difficult, and often **irreconcilable**, trade-offs to be made in urban areas and we need to be making them now."

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence with the extra word.*

congestion	emissions	hazard	development
heat wave	urban	infrastructure	flood zone

1. Richer countries must do more to cut back carbon ………………..
2. Loneliness is a disease of our ………….. communities.
3. Let's hope that old air conditioner keeps up through this ……………...
4. Polluted water sources are a ………….. to wildlife.
5. Some countries lack a suitable economic …………………….
6. Driver information and traffic control systems are being improved to relieve …………………
7. My greatest anxiety was the ……………….. of the new software.

Task 3. *Answer the questions.*

1. What did the researchers analyze?
2. Which city did the team focus on?
3. How should the urban infrastructure be transformed?

Task 4. *Make the summary of the text (70-100 words)*

TEXT 8

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

carbon-bearing minerals – углеродосодержащие минералы
statistical calculations – статистические расчеты
collecting community – сообщество коллекционеров
professional and amateur mineral collectors – профессиональные коллекционеры и коллекционеры-любители
chemically diverse elements – химические разнообразные элементы
in compounds – в соединении
periodic table – периодическая таблица
ore – руда
mine (v) – добывать
iron – железо
copper – руда
coal – уголь
diamond – алмаз
critical component – необходимый элемент
specimen - образец
investigation - исследование
identify – устанавливать, определять
discover - обнаруживать
telltale geobiological footprint – характерный геобиологический след
life-supporting planetary body – планетарное тело, пригодное для жизни
projection – перспектива, прогноз
detect – обнаруживать
recognize – распознавать
mineral species – виды минералов
estimate - устанавливать
prediction - прогноз
hydrous carbonates – гидратированные карбонаты

Carbon mineral challenge: Worldwide hunt for new carbon minerals

The Carbon Mineral Challenge sets the stage for both **professional and amateur mineral collectors** to make their mark by discovering never-before described minerals.

Why carbon minerals?

Carbon is one of the most **chemically diverse elements**, and occurs **in compounds** with almost every element of the **periodic table**. Some carbon-containing minerals form **ores**, which are **mine**d for metals such as **iron**, nickel, and **coppe**r. **Carbon-bearing minerals** can contain rare Earth elements, **critical components** of smart phones and tablets. Carbon also becomes **coal** and **diamond**. And, most importantly, without carbon, there is no life.

Given the scientific value of potential new carbon-bearing mineral discoveries, the Deep Carbon Observatory (DCO) is challenging both amateur collectors and professional mineralogists around the world to find these **rare specimens**.

DCO is a global community of multi-disciplinary scientists unlocking the inner secrets of Earth through **investigations** into life, energy, and the fundamentally unique chemistry of carbon. A key goal of DCO is to **identify** the forms of carbon in Earth. Any new carbon minerals **discovered** as part of the Carbon Mineral Challenge will address this important scientific question, and add to our growing understanding of Earth's unique chemical makeup.

Earth is the only known planet that supports life. Life on Earth has interacted with rocks over billions of years, generating a **telltale geobiological footprint**. Such a footprint should be visible on other **life-supporting planetary bodies**.

"Figuring out the mineral signature of a life-supporting planet is a really exciting prospect," says Robert Hazen, Senior Staff Scientist at the Carnegie Institution of Washington, USA and Executive Director of the Deep Carbon Observatory. "Without life, fewer than a third of the different kinds of minerals we

see on Earth would exist. Our new **projections** will inform planetary investigations, with probes tuned to **detect** mineralogical signs of life."

How many are out there?

Today, mineralogists **recognize** 406 carbon minerals out of more than 5000 known **mineral species** on Earth. Since 2010, the International Mineralogical Association has reported the discovery of an average of about four new carbon minerals every year for the past five years. However, DCO researchers now estimate there are at least 145 more carbon minerals still awaiting discovery.

Hazen and his colleagues, including mathematician Grethe Hystad of Purdue University Calumet, used a type of analysis called Large Number of Rare Events (LNRE) modeling to formulate this prediction, and will share the work in American Mineralogist in early 2016, as well as during the Friday morning poster session at the 2015 AGU Fall Meeting (V51C-3039) and -3040.

"Imagine reading a book," says DCO's Hazen. "Some words you read over and over throughout, such as 'and' and 'the.' These common words are everywhere and easy to spot. On the other hand, there are words that may appear only one or two times in an entire book. Earth's missing minerals are like these rare words; we haven't found them yet because they formed only in very few places and in very small quantities."

The LNRE model also **predicts** that the majority of the carbon-bearing minerals awaiting discovery are **hydrous carbonates**, a potentially challenging fact for collectors.

https://www.sciencedaily.com/releases/2015/12/151216231250.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence. using the extra word.*

periodic table	projection	ore	statistical calculations
diamond	rare specimens	planetary body	mine

1. Mendeleev developed … … which is widely used in science.
2. Most … contain sufficient minerals with economically important elements, typically metals.
3. … … are used by scientists to estimate the occurrence of undiscovered minerals.
4. The hardness of … is 10 on the Mohs scale.
5. … … are especially praised by the collectors.
6. People … valuable minerals or other geological materials from the earth.
7. In the Solar System there are such … as a planet, dwarf planet, or the larger moons and asteroids.

Task 3. *Answer the questions.*

1. How many undiscovered minerals according to statistical calculations?
2. What is the main purpose of The Carbon Mineral Challenge?
3. Why are carbon-containing minerals so important for humans?
4. What is a key goal of Deep Carbon Observatory?
5. How can geobiological footprint help to detect life-supporting planetary bodies?

Task 4. *Put the words in the sentences into the correct order to make up an abstract for the text.*

1. *New research* remain 145 of Earth's at least carbon-bearing minerals undiscovered that predicts.
2. by 2019 collectors find *How many* can?
3. Earth's undiscovered *The hunt* is for carbon on minerals.
4. are now *Scientists* know statistical calculations, how using many there.
5. where even *They* some ideas have about to look.
6. the to find them, help need of the they world's mineral collecting community *But*

TEXT 9

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

dedicated - преданный
remain hidden – оставаться скрытым
locality – местность

quantity – количество
ephemeral – недолговечный
colorless – бесцветный
crystallized – кристализированный
dissolved – растворимый
rewarding – стоящий, полезный
consider – рассматривать
quarry – шахта
array – набор, совокупность
constituent – компонент
database – база данных
verification – проверка
comprehensive guidelines – всесторонние рекомендации

Carbon mineral challenge: Worldwide hunt for new carbon minerals

Part 2

Where are these undiscovered minerals and what do they look like?

Hazen's team predicts finding missing carbon minerals will challenge even the most **dedicated** mineral collectors. To have **remained hidden** for so long, these minerals must reside in remote localities and in small **quantities**. In some cases the minerals are likely **ephemeral** in nature. Many of the carbon species on Hazen's list, including hydrous carbonates, are potentially **colorless**, poorly **crystalized**, or easily **dissolved** in water.

While Hazen and colleagues have not identified a treasure map for finding the missing carbon minerals, there are some potentially **rewarding localities** to **consider**. These include the Poudrette **Quarry** in Canada, Kukisvumchorr Mountain in Russia, and Clara Mine in Germany, where collectors have already found a diverse **array** of carbon minerals.

"There's something magical about mineral collecting that's hard to put into words," said Hazen's colleague and DCO early career scientist Daniel Hummer. "You're collecting fundamental **constituents** of the natural world that only exist because life has interacted with rocks over millions, or even billions, of years."

"One of the most exciting prospects," Hummer continues, "is we might even stumble upon minerals we didn't predict in our analyses. We could be in for a surprise!"

In fact, some of the missing carbon minerals might be hiding in plain sight, sitting in a museum drawer.

"As a PhD student at the University of Arizona, I work on the development of the RRUFF mineral **database** in (co-author) Professor Robert Downs' lab," said Barbara Lafuente. "It's quite possible we'll find one or two new carbon minerals in our university's mineral collection, now that we know what we're looking for."

How does the Carbon Mineral Challenge work?

Amateur and professional mineral collectors should follow the procedures outlined by the International Mineralogical Association Commission on New Minerals Nomenclature and Classification. Once the commission has approved the new mineral, the team responsible for its discovery and **verification** should submit their entry to the Carbon Mineral Challenge via mineralchallenge.net.

Interested collectors may contact Carbon Mineral Challenge International Advisory Board members in their region with questions about mineral analysis and verification.Mineralchallenge.net also contains **comprehensive guidelines**, useful links, a photo gallery of known carbon minerals, and a list of FAQs for potential participants.

The Carbon Mineral Challenge will continue until September 2019. DCO will publicly recognize each discovery as it happens and celebrate the final suite of newly discovered carbon minerals at the culmination of its decadal program in late 2019.

The Carbon Mineral Challenge shines a light on a very specific, but important, subset of minerals. Over the next four years, and with each new discovery, a new piece of Earth's mineralogical puzzle will fall into place.

https://www.sciencedaily.com/releases/2015/12/151216231250.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence using the extra word.*

Rewarding	locality	colorless	verification	database	array

mine	quarries	constituents

1. Every theory needs … to prove it is true
2. … contains some valuable information about minerals.
3. Mineral collecting is a … hobby for amateur collectors.
4. People … natural resources from the ground.
5. There are a lot of … in which coal is excavated in Russia.
6. Water is a … liquid.
7. The Urals in Russia is a popular … for collectors who search for gems.

Task 3. *Answer the questions.*

1. Why is it so difficult to find missing carbon minerals?
2. Where are potentially rewarding localities for carbon minerals situated?
3. How does the Carbon Mineral Challenge work?
4. What kind of information does Mineralchallenge.net provide?
5. How long will The Carbon Mineral Challenge continue?

Task 4. *Make the summary of the text (70-100 words).*

TEXT 10

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

fossil – ископаемое
bloom – цвести
angiosperms – скрытосеменной
flowering plant – цветущее растение
throw into question – ставить под сомнение
suggest – считать, полагать
long-standing debate – долгие дебаты
molecular clock – молекулярные часы
indicate – показывать, выявлять

convincing fossil-based evidence – убедительные доказательства, основанные на ископаемых
to prove – доказывать
rock slab – блок горной породы
outcrop of rocks – обнажение горной породы
abundance – множество, достаток
dissect – анализировать
sophisticated microscopy – передовая микроскопия
magnification – увеличение
fully enclosed ovule – полностью закрытая семяпочка
precursor – предшественник
seeds – семена
pollination – опыление
receptacle – цветоложе
confirm – подтверждать
monophyletic – монофилетический
polyphyletic – полифилетический
evolutionary dead end – эволюционный тупик

Fossils suggest flowers originated 50 million years earlier than thought

Scientists have described a **fossil** plant species that suggests flowers **bloomed** in the Early Jurassic, more than 174 million years ago, according to new research in the open-access journal eLife.

Before now, **angiosperms (flowering plants)** were thought to have a history of no more than 130 million years. The discovery of the novel flower species, which the study authors named Nanjinganthus dendrostyla, **throws** widely accepted theories of plant evolution **into question**, by suggesting that they existed around 50 million years earlier. Nanjinganthus also has a variety of 'unexpected' characteristics according to almost all of these theories.

Angiosperms are an important member of the plant kingdom, and their origin has been the topic of long-standing debate among evolutionary biologists. Many previously thought angiosperms could be no more than 130 million years old. However, **molecular clocks** have **indicated** that they must be older than this. Until now, there has been no **convincing fossil-based evidence to prove** that they existed further back in time.

"Researchers were not certain where and how flowers came into existence because it seems that many flowers just popped up in the Cretaceous from nowhere," explains lead author Qiang Fu, Associate Research Professor at the Nanjing Institute of Geology and Paleontology, China. "Studying fossil flowers, especially those from earlier geologic periods, is the only reliable way to get an answer to these questions."

The team studied 264 specimens of 198 individual flowers preserved on 34 **rock slabs** from the South Xiangshan Formation -- an **outcrop of rocks** in the Nanjing region of China renowned for bearing fossils from the Early Jurassic epoch. The **abundance** of fossil samples used in the study allowed the researchers to **dissect** some of them and study them with **sophisticated microscopy**, providing high-resolution pictures of the flowers from different angles and **magnifications**. They then used this detailed information about the shape and structure of the different fossil flowers to reconstruct the features of Nanjinganthus dendrostyla.

The key feature of an angiosperm is 'angio-ovuly' -- the presence of **fully enclosed ovules**, which are **precursors** of seeds before **pollination**. In the current study, the reconstructed flower was found to have a cup-form **receptacle** and ovarian roof that together enclose the ovules/seeds. This was a crucial discovery, because the presence of this feature confirmed the flower's status as an angiosperm. Although there have been reports of angiosperms from the Middle-Late Jurassic epochs in northeastern China, there are structural features of Nanjinganthus that distinguish it from these other specimens and suggest that it is a new genus of angiosperms.

Having made this discovery, the team now wants to understand whether angiosperms are either **monophyletic** -- which would mean Nanjinganthus represents a stem group giving rise to all later species -- or **polyphyletic**, whereby Nanjinganthus represents an **evolutionary dead end** and has little to do with many later species.

"The origin of angiosperms has long been an academic 'headache' for many botanists," concludes senior author Xin Wang, Research Professor at the Nanjing

Institute of Geology and Paleontology. "Our discovery has moved the botany field forward and will allow a better understanding of angiosperms, which in turn will enhance our ability to efficiently use and look after our planet's plant-based resources."

Task 2. *Match the words to make word combinations from the text and make up your own sentences using them.*

1. reliable	a. discovery
2. plant	b. feature
3. key	c. kingdom
4. accepted	d. theory
5. crucial	e. way

Task 3. *Fill in the gaps with suitable words from the box to make a definition. There is one extra word. Then translate the sentences into Russian. Make up your own sentence using the extra word.*

fossil	molecular clock	plant kingdom	outcrop of rocks
pollination	precursors	evolutionary dead end	seed

1. … refers to the transfer of pollen to a stigma, ovule, flower, or plant to allow fertilization.
2. … is a basic group of natural objects that includes all living and extinct plants.
3. … is the unit of reproduction of a flowering plant, capable of developing into another such plant.
4. … remains or impression of a prehistoric plant or animal embedded in rock and preserved in petrified form.
5. … means that some species cannot adapt if their environment changes or their food source dies off, so they're doomed to extinction sooner or later.
6. … is a visible exposure of bedrock or ancient superficial deposits on the surface of the Earth.

7. … is figurative term for a technique that uses the mutation rate of biomolecules to deduce the time in prehistory when two or more life forms diverged.

Task 4. *Answer the questions.*

1. According to new research, how many years ago did flowers bloom?
2. How old was angiosperms thought to be before this research?
3. How can real age of flowering plans be proved?
4. How many specimens did the research team study?
5. What is the key feature of an angiosperm?
6. Why does the discovery of the novel flower species, named Nanjinganthus dendrostyla, throw widely accepted theories of plant evolution into question?

Task 5. *Put the words in the sentences into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words).*

The discovery of fossil of a flower Early Jurassic called from the widely accepted theories of specimens plant shakes up evolution in China Nanjinganthus.

TEXT 11

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

aftermath – последствия
mass extinction – массовое исчезновение
marine organism – морской организм
terrestrial species – наземные виды
biological community – биологическое сообщество
excavations - раскопки
site – место раскопок
southern arm – южный рукав (водоема)
altitude – высота местности
shallow basin – мелководный бассейн
fringed – окаймленный
taxonomic re-evaluation – таксономический повторный анализ
sedimentary beds – пласт осадочных пород
calcareous shells – известковые раковины

generalist – универсал
adapt more flexibly – адаптироваться более гибко
fluctuating conditions – меняющиеся условия
well-established ecosystem – твердо установившая экосистема
differentiation – приспособленность

Pay attention to the words grouped below. They are widely used in scientific communication:

report their findings – сообщать о достигнутых результатах
originate from – брать начало от
remains the subject of controversial debate – оставаться предметом противоречивых дебатов
throw new light on the issue – проливать свет на эту проблему
undertake – предпринимать
accompany – сопровождать
particular significance – особое значение
account – составлять
assign – определять
occur – происходить
coexisted side by side – сосуществовать бок о бок
occupy – занимать
equipped with – быть оборудованным
exploit – использовать

Paleontology: Aftermath of a Mass Extinction

The largest episode of **mass extinction** in the history of the Earth, which led to the demise of about 90% of **marine organisms** and a majority of **terrestrial species**, took place between the Late Permian and Early Triassic, around 240 million years ago. How long it took for biological communities to recover from such a catastrophic loss of biodiversity **remains the subject of controversial debate** among paleontologists. A new study of fossil fishes from Middle Triassic strata on the shores of Lake Lugano **throws new light on the issue**.

The study, **undertaken** by researchers led by Dr. Adriana López-Arbarello, who is a member of the GeoBiocenter at Ludwig-Maximilians-Universitaet (LMU) in Munich and the Bavarian State Collection for Paleontology and Geology, suggests that the process of recovery was well underway within a few million

years. The authors, including Dr. Heinz Furrer of Zurich University and Dr. Rudolf Stockar of the Museo Cantonale di Storia Naturale in Lugano, who led the **excavations** at the **sites**, and Dr. Toni Bürgin of the Naturmuseum St. Gallen **report their findings** in the journal PeerJ.

The fossil fishes analyzed by López-Arbarello and her colleagues **originate from** Monte San Giorgio in the canton Ticino in Switzerland, which is one of the most important sources of marine fossils from the Middle Triassic in the world. The Monte San Giorgio rises to an **altitude** of 1000 m on the promontory that separates the southern **arms** of Lake Lugano in the Southern Swiss Alps. But in the Middle Triassic, it was part of a **shallow basin** dotted with islands **fringed** by lagoons, which were separated by reefs from the open sea. "

The **particular significance** of its fossil fauna lies in the careful stratigraphic work that has **accompanied** the excavations here. The positions of each of the fossil finds discovered here have been documented to the centimeter," says Adriana López-Arbarello. On the basis of detailed anatomical studies of new material and a **taxonomic re-evaluation** of previously known specimens from the locality, she and her colleagues have **identified** a new genus of fossil neopterygians, which they name Ticinolepis. The Neopterygii include the teleost fishes, which account for more than half of all extant vertebrate species. However, the new fossil species are **assigned** to the second major group of neopterygians, the Holostei, of which only a handful of species survives today. The researchers assign two new fossil species to the genus Ticinolepis, namely T. longaeva and T. crassidens, which **occur** in different **sedimentary beds** within the so-called Besano Formation on Monte San Giorgio.

The two species **coexisted side by side** but they occupied distinct ecological niches. T. crassidens fed on mollusks and was **equipped with** jaws and teeth that could handle their hard calcareous shells. T. longaeva was more of a generalist, and was found in waters in which T. crassidens could not survive. The authors interpret the different distribution patterns as a reflection of changing environmental conditions following the preceding mass extinction event. The less

specialized T. longaeva was able to **exploit** a broader range of food items, and could thus **adapt more flexibly to fluctuating conditions**. On the other hand, the dietary **differentiation** between the two species indicates that a variety of **well-established ecosystems** was available in the Besano Formation at this time. "This in turn suggests that the marine biota is likely to have recovered from the great mass extinction relatively quickly," Adriana López-Arbarello concludes.

https://www.sciencedaily.com/releases/2016/07/160719124254.htm

Task 2. *Mark the statements True or False. If they are false, correct them according to the text.*

1. The largest episode of mass extinction in the history of the Earth, which led to the demise of about 90% of marine organisms and a majority of terrestrial species, took place between the Late Permian and Early Triassic, around 420 million years ago.
2. The Monte San Giorgio rises to an altitude of 1000 m on the promontory that separates the southern arms of Lake Lugano in the Southern Swiss Alps.
3. The particular significance of its fossil fauna lies in the careful species gathering that has accompanied the excavations here.
4. The Neopterygii include the teleost fishes, which account for more than half (a quarter) of all extant vertebrate species.
5. The less specialized T. longaeva was more flexible in fluctuating conditions and thus had more capabilities for adaptation.

Task 3. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence using the extra word.*

originates	light	occur	undertaken	equipped	findings
accompany	identify				

1. The research, … by the group of prominent scientists, revolutionized our idea about flowering plants.
2. A team leader reported their … at the conference and took part in the discussion.
3. A new laboratory is well-… with modern computers.
4. This discovery may probably throw new … on this mystery.
5. Probably this plant … from Jurassic period.

6. A paleontologist uses different ways to … a fossil.
7. The research group usually carries out some outdoor experiments … that … the lab analysis.

Task 4. *Answer the questions.*

1. What percentage of marine organisms died out 240 million years ago?
2. What is the most important sources of marine fossils from the Middle Triassic in the world?
3. How has a new genus of fossil neopterygians been identified?
4. What is the difference between T. crassidens and T. longaeva?
5. What does the dietary differentiation between the two species indicate?

Task 5 *Put the words in the sentences into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words).*

1) following the great mass extinction event 2) A new study 3) from Middle Triassic sediments 4) 240 million years ago 5) provides new insights into 6) on the shores of Lake Lugano 7) the recovery of biodiversity 8) of fossil fishes 9) at the Permo-Triassic boundary

TEXT 12

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*

Vocabulary

marine life – морская жизнь
permafrost – вечная мерзлота
margin – кромка, край, побережье (океана)
ice wedge - морозобойная трещина
ice core – ледяной керн
ice sheet – ледниковый щит
relic – реликт, остаток
dust particle – частица пыли
volcanic ash – вулканический пепел
air bubbles – воздушные пузырьки
latitude - широта
meltwater – талая вода
underground crack – подземная трещина
algae - водоросли
near-shore region – прибрежный регион
fluctuation – колебание

Driving a wedge into historic gaps of climate science

Hokkaido University researchers and colleagues have found that the Beaufort Sea, on the **margin** of the Arctic Ocean, was not completely frozen over during the coldest summers of the late Ice Age, some 12,800 years ago. Their methodology, using **ice wedges** from the Alaskan permafrost, could help scientists further reconstruct historic sea-ice conditions in the Arctic Ocean, and thus improve forecasts for the future.

Scientists have long studied **ice core samples** from large permanent ice masses in the Antarctic **ice sheet** around the South Pole, and in Greenland near the North Pole. These samples contain **relics** from our climate's distant past, such as **ions, dust particles, sea salts, volcanic ash and air bubbles**, which can give us information on how Earth's climate has changed over thousands and thousands of years.

Now, a research team led by Yoshinori Iizuka of Hokkaido University's Institute of Low Temperature Science has found a way to investigate the geological history of areas near the north Arctic sea, which had previously been difficult using standard methods.

Permafrost is a layer of frozen ground present under the tundra of high northern **latitudes** in areas such as Russia, Canada, and Alaska. It contains massive wedges of ice that form when **meltwater** freezes in **underground cracks**. Iizuka and his team investigated ion concentrations in an ice wedge sample collected near the city of Barrow in northern Alaska. Another group dated this ice wedge back in 2010 to belonging to the late Pleistocene period, which represents the latter end of the last Ice Age some 14,400 to 11,400 years ago.

The team tested the levels of several ions in the ice wedge, including calcium sulphate, sodium, chloride, and bromide. Significantly, they determined that methanesulfonate (MS) ions in the wedge reliably indicated marine life activity, as they originated from oxidized dimethyl sulphide, a compound produced by plankton and ice **algae** attached to seasonal sea ice in the summer.

MS ion concentrations were high in the parts of the wedge representing the coldest periods of the late Pleistocene, from 12,900 to 12,700 years ago. This indicates that, even during these coldest periods of the late Ice Age, the **near-shore region** of the Beaufort Sea near Barrow may not have been completely filled by permanent ice, and that some open water existed in this area during the summers.

The team concludes in their study in the journal Earth and Planetary Science Letters that further studies of MS, bromide and sodium concentrations in other permafrost ice wedges could help scientists reconstruct past Arctic sea-ice conditions. In addition, according to Dr. Iizuka, "Understanding the mechanisms behind **fluctuations** in the Arctic sea ice provides a useful foundation for developing future strategies related to the Arctic region."

https://www.sciencedaily.com/releases/2019/04/190411101735.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence. using the extra word.*

permafrost	fluctuations	marine life	volcanic ash
algae	meltwater	air bubbles	

1. Periodic … in sea level are called tides
2. … is the plants, animals and other organisms that live in the salt water of the sea or ocean.
3. Most … is located in and around the Arctic and Antarctic regions.
4. After the eruption … covered many kilometers.
5. As soon as Lake Baikal develops an ice cover, when the ice is still very thin, … appear beneath the ice.
6. … provide the food base for most marine food chains.
7. Heavy rainfall and … are obvious contributing factors to floods.

Task 3. *Answer the questions.*

1. When are the coldest summers of the late Ice Age dated?
2. How can Hokkaido University researchers and colleagues' methodology, help scientists?

3. What kind of relics do ice core samples contain?

4. Why did scientists determine that methanesulfonate (MS) ions in the wedge reliably indicated marine life activity?

5. What does the team conclude in their study in the journal?

Task 5. *Put the words in the sentences into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words).*

1) Evidence
of historic marine life
present
ancient changes
scientists
reconstruct
in the ice cover
is helping
in Alaskan permafrost
over the Arctic Ocean

TEXT 13

Task 1. *Read the text, find the following words and phrases in the text and give the context in which they are used.*
Vocabulary

seafloor – морское дно
fault zone – зона сбросовых нарушений
slump – оползень
sediment – осадочная порода, отложение
revealed details – открывшиеся подробности
offshore – прибрежный, находящийся на некотором расстоянии от берега
rupture – раскалывать
onshore faults – сдвиг береговой части
brittle – хрупкий
upper plate – верхняя плита
troubling sign – тревожный знак
rubble – валун, обломочная россыпь
rubble field – прибрежный навал льда, поле валунов
landslide – оползень, обвал
steep – крутой, обрывистый
shake loose – раскачивать, расшатывать
pockmarks – оспины, выбоины, щербины

seep out - проникать, распространяться

Salish seafloor mapping identifies earthquake and tsunami risks

These tsunamis might be directed toward the islands of San Juan Archipelago, Vancouver Island and low coastal areas of the United States including Bellingham, Washington.

Extensive seismic mapping of the seafloor by Canadian and U.S. scientists has **revealed details** of the extent and surrounding features of the Devils Mountain Fault Zone running south of the Archipelago, as well as the newly mapped Skipjack Island Fault Zone at its northern edge, said H. Gary Greene of Moss Landing Marine Laboratories. Both of the faults extend more than 55 kilometers (~34 miles) **offshore**, but might have the potential to **rupture** over 125 kilometers (~78 miles) if connected to **onshore faults**.

The faults are similar to the east-west trending faults under the cities of Seattle and Tacoma, lying in the **brittle upper plate** of the Cascadia Subduction Zone. Deformation of sediments along the Devils Mountain and Skipjack faults indicates that they were active at least 10,000 years ago, Greene said. Although there have not been any large recorded earthquakes along these faults, he said the similar Seattle and Tacoma fault zones have produced magnitude 6 to 7 earthquakes in the past.

The new seafloor mapping holds a few **troubling signs** for what might happen if an earthquake of that magnitude does occur along the Skipjack Island fault, in particular. For instance, Greene and his colleagues have identified an **underwater rubble field** from a past **landslide** along the **steep** northeastern face of Orcas Island near the Skipjack fault. A Skipjack earthquake could **shake loose** the massive **rubble blocks** here, he said, "and generate an impact tsunami from this material."

The researchers also saw evidence of previous ground failure -- slumps and slides of sediment -- along the southern edge of the Canadian Fraser River Delta, which lies just north of the Skipjack Island fault zone. If an earthquake led to a

massive slide of river delta sediments, the resulting tsunami might affect both the islands of the San Juan Archipelago and the Washington state coast.

Greene also noted that the sediments lining Bellingham Bay have "just a tremendous amount of **pockmarks**, which indicate that methane is **seeping out** of the seafloor and has in the past." The gas might further destabilize sediment in the region.

Together, the faults and seafloor features suggest that seismologists should keep a close eye on the potential local tsunami risks in the central Salish Sea. "We have the two faults here, we know that they have moved fairly recently, and that they are in the upper plate of the Cascadia Subduction Zone, an unstable area that we know can fail," Greene said.

Although Greene, Vaughn Barrie of the Geological Survey of Canada, and other colleagues have identified some of the potential causes of tsunami between the Devils Mountain and Skipjack Fault Zones, the next step would be to model in detail how the tsunami might occur. "Modeling could help us establish the volume of the material that would fail, and that would give us a better idea of the potential magnitude of the tsunami," he said.

https://www.sciencedaily.com/releases/2019/04/190424125113.htm

Task 2. *Fill in the gaps with suitable words from the box. There is one extra word. Then translate the sentences into Russian. Make up your own sentence using the extra word.*

fault zone	slumps	revealed details	troubling sign	rupture
shake loose	rubble field	pockmarks		

1. Since ancient times strange animals' behavior has been considered as a … of natural disasters.
2. The area is not suitable for building because of …
3. Cold seeps and … are sites where low-temperature fluids escape from the seabed.
4. New … have demonstrated the drawbacks of the project.
5. This policy has a danger to … the war.

6. An earthquake … is the extent of slip that occurs during an earthquake in the Earth's crust.

7. Extensive … are frequently observed, especially in greywhite ice.

Task 3. *Answer the questions.*

1. Where might tsunamis be directed?
2. What are troubling signs in the new seafloor mapping?
3. What do pockmarks in the sediments lining Bellingham Bay indicate?
4. What kind of evidence of previous ground failure did the researchers see?
5. What would be the next step of the project?

Task 4. *Put the words in the sentences into the correct order to make up an abstract for the text. Then make the summary of the text (70-100 words).*

of the Pacific Northwest
that might lead to
that could trigger
by two active fault zones
tsunamis.
the central Salish Sea
is bounded
rockfalls and slumps of sediment

TEXT 14

These tasks are additional and should be done by those students, who missed more than 50% of lessons or want to gain more grades.

Task 1. *Translate 2000 characters.*
Task 2. *Make an abstract of the text.*
Task 3. *Make up 15 questions to the text in a form of a plan.*
Task 4. *Answering these 15 question make a summary of the text (200-250 words).*
Task 5. *Make a glossary for the text (50-100 WORDS)*
Task 6. *Make a multimedia presentation to the text and present it using your summary (5 minutes)*

Transitioning old oil rigs into permanent reefs

Offshore oil platforms have an immense presence, physically, financially and environmentally. Some 6,000 rigs pump petroleum and natural gas worldwide. But as they extract hydrocarbons from deep beneath the sea, these structures undergo a transformation invisible from above the waves. The ocean claims the platforms' enormous substructures and converts them into vertical reefs, home to millions of individual plants and animals.

While decommissioning a platform is a tall order, a growing number have found new purpose as human-made reefs. Now, researchers at UC Santa Barbara have published a comprehensive study of the history, ecology and pragmatics of rigs-to-reefs efforts in the journal Ocean and Coastal Management.

In addition to assembling information from across a large corpus of work, the scientists hope the study will help inform California residents and policymakers as they decide what to do with platforms slated for retirement off its coast.

"California citizens are going to have to make decisions about the continued existence of vast marine life under the platforms, and they should be informed decisions," said Ann Scarborough Bull, a researcher at UC Santa Barbara's Marine Science Institute (MSI) and the paper's lead author. This issue will return time and again across the world as platforms age and existing oil fields wind down production.

Scarborough Bull served for nearly 30 years as an environmental analyst and researcher in the Department of the Interior's Minerals Management Service, now the Bureau of Ocean Energy Management. She joined UC Santa Barbara after retiring as the agency's chief of environmental sciences for the West Coast.

In 2017, organizers of an industry summit on oil well decommissioning invited Scarborough Bull to speak on the science behind transitioning platforms into permanent reefs. At the time, she found that literature on the topic was rudimentary and fragmented. After joining the university, Bull decided to compile the scattered information into a seminal article, to which she added the results of her own extensive research.

"As far as we know, the paper is the first of its kind," said research biologist Milton Love, also at MSI, who co-authored the study with Scarborough Bull.

An Ecological Oddity

There's little doubt that the petroleum coming from these platforms has a negative impact on the environment. And the possibility for destructive oil spills always exists when oil production and water mix. The risks may be minimized if the work is done properly, but the consequences of an accident are still quite high. "Oil spills are terrible events," said Scarborough Bull, "and if you put in a platform and you drill and produce oil, you always have some level of risk."

However, these hulking structures, rising hundreds of feet from the ocean floor, provide a unique habitat. The complex shape of the rig's support creates a 3-dimensional reef for animals to colonize and live near. And the rig's open construction allows currents to pass through, bringing nutrients.

"We say, 'oh, we'll turn these platforms into reefs,'" said Love, "but as far as the marine life is concerned, they already are reefs."

In 2014, Scarborough Bull and Love collaborated with colleagues at Occidental College to assess the biological productivity of oil rigs off the coast of California. Using standard models and metrics, the team compared the platforms to all the other habitats they could find information on. The results of the study were staggering. "Platforms off of California, as far as fish were concerned, were the most productive habitats in the world," recalled Love.

"More productive than coral reefs, more productive than Chesapeake Bay," he continued. "Now does that mean that they are truly the most productive? Well, we don't know. But based on the world literature at that time, they were the most productive habitat."

Perspectives on rigs-to-reefs efforts vary across country and ideology. Those with a preservationist mindset want to restore the site to its original condition. The European Union currently follows this policy and all decommissioned platforms in the EU must be removed completely. Meanwhile the practice of reefing old platforms is now routine in the Gulf of Mexico. As of 2016, over 11 percent of

decommissioned platforms in the U.S. portion of the gulf were transitioned into permanent reefs, according to Scarborough Bull. The region currently has over 500 rig-reefs, not including those that are still part of active platforms.

The oil companies stand to benefit from reefing old platforms, but some conservationists, fishermen and state governments have also found reason to support this trend. "In the Gulf of Mexico, when you go fishing, you motor up to a platform and tie directly to it," said Scarborough Bull, who spent 12 years in the region. "There's a different societal thinking about the use and usefulness of parts of platforms that you don't have in California."

A Daunting Task

Decommissioning a platform typically involves its complete removal from the seafloor, then hauling it away for disposal or scrap. It's a pricy proposition. The most recent estimate for removing all platforms off of the California coast totals $8 billion, Scarborough Bull said. Modifying the platforms to serve as permanent reefs cuts these costs significantly, especially those associated with hauling, cleaning and disposing of the support structure on shore, which will have thousands of tons of sea-life clinging to it by the time it reaches retirement.

To convert the lower portion of the platform into a permanent reef, the structure must be free of any hydrocarbons or other hazardous materials described in any federal, state or local law, ordinance, rule, regulation, order, decree or requirement. Yet this is still a far cheaper venture than total removal. And the savings don't merely benefit the oil company, which foots 100 percent of the decommissioning cost. Coastal states that have rigs-to-reefs laws require that the company share with the state a portion of the money it will save if a platform is reefed rather than removed; often 50 percent of the cost savings, explained Scarborough Bull.

What's more, the reef and nearby surrounding waters belong to the state and fall under its jurisdiction, even if the platform had been in federal water before it was retired. Twenty-three platforms slated for decommission off the California

coast are in federal waters and one, Platform Holly, is in state waters, but deep enough to be considered for reefing.

The state assumes title and responsibility for the site once the reef is established, which includes taking the proper steps to prevent the reef from becoming a shipping hazard. This involves recording the location on charts and installing buoys to warn of any navigational hazards, depending on how close the reef comes to the surface. The study discusses these practical considerations at length, important factors when deciding how to retire old platforms.

"Decisions are going to have to be made about more and more of these structures," said Love. "We want everyone to have the same facts as they go into the process so decisions can be made on a rational basis."

TEXT 15

These tasks are additional and should be done by those students, who missed more than 50% of lessons or want to gain more grades.

Task 1. *Translate the following text into Russian.*
Task 2. *Make an abstract of the text.*
Task 3. *Make up 10 questions to the text in a form of a plan.*
Task 4. *Answering these 10 questions make a summary of the text (100-150 words).*
Task 5. *Make a glossary for the text (30-50 WORDS)*
Task 6. *Make a multimedia presentation to the text and present it using your summary (5 minutes)*

Microplastic throughout Monterey Bay

Many people have heard of the "Great Pacific Garbage Patch," a vast area of ocean between California and Hawaii where ocean currents concentrate plastic pollution. However, it turns out there may also be a lot of plastic far below the ocean's surface.

A newly-published study in *Scientific Reports* shows that plastic debris less than 5 millimeters across, known as microplastic, is common from the surface to the seafloor. It may also be entering marine food webs, both at the surface and in

the deep. Finally, the study suggests that most of this microplastic is coming from consumer products.

This is the first study to look systematically at microplastic, with repeated sampling at the same locations and a range of depths, from just beneath the ocean surface to depths of 1,000 meters.

The study in California's Monterey Bay National Marine Sanctuary also found that small ocean animals are consuming microplastic, which introduces the particles into food webs from near-surface waters down to the deep seafloor.

"Our findings buttress a growing body of scientific evidence pointing to the waters and animals of the deep sea, Earth's largest habitat, as the biggest repository of small plastic debris," said Anela Choy, the lead author of the paper.

"Our study demonstrates a link between microplastics distributed across the water column and entry of this foreign material into marine food webs by important marine animals, such as pelagic crabs and giant larvaceans."

The groundbreaking research was a joint effort by the Monterey Bay Aquarium Research Institute (MBARI) and Monterey Bay Aquarium. Choy conducted the research while a postdoctoral fellow at MBARI. She is currently an assistant professor at Scripps Institution of Oceanography at the University of California San Diego.

Kakani Katija, an MBARI engineer on the team, added, "This research shows how we can leverage scientific, engineering and conservation expertise to develop new technology that provides powerful insights into how humans are impacting the ocean."

Microplastic is pervasive from the surface to the seafloor

Using MBARI's underwater robots, equipped with sampling devices designed specifically for this project, the researchers filtered plastic particles out of seawater on multiple occasions at two different locations and at various depths -- from five to 1,000 meters below the surface of Monterey Bay, California. Some samples were collected just offshore of Moss Landing Harbor, but the majority

were collected about 25 kilometers from shore, in the deep waters of Monterey Canyon.

The results surprised the team. They found nearly identical concentrations of microplastic particles near the surface and in the deepest waters surveyed. Perhaps more startling, they found roughly four times the concentration of microplastic particles in the midwater range (200 to 600 meters down) than in waters near the surface.

Microplastic was discovered in all animals sampled

In addition to sampling the water, the researchers also looked at concentrations of microplastic particles in specimens of two marine species that filter-feed in the water column: pelagic red crabs and giant larvaceans. The team found microplastic in all of the animal specimens they surveyed.

Pelagic red crabs and tadpole-like giant larvaceans are critical parts of ocean food webs. Pelagic red crabs are commonly found in large numbers near the ocean's surface, where they are consumed by many species of fishes, including tunas. Larvaceans create large mucus filters that collect organic material -- and microplastic -- then discard those filters, which are consumed by other animals as they sink to the ocean floor.

More microplastic in samples originated from consumer products than fishing gear

Equipped with a microscope and a laboratory technique called Raman spectroscopy, researchers from Arizona State University contributed to the study. The most abundant plastics found -- polyethylene terephthalate (PET), polyamide, and polycarbonate -- are commonly used in consumer products, including food and beverage packaging such as single-use drink bottles and to-go containers. Most of the microplastic particles the researchers discovered were highly weathered, suggesting that they had been in the environment for months or years.

Even though Monterey Bay is home to commercial fisheries, the researchers found very few particles of polypropylene or other plastics commonly used in local

fishing gear. The researchers also detected more microplastic particles offshore than nearshore.

"This suggests that most of the particles did not originate from local fishing gear," explained Kyle Van Houtan, chief scientist at Monterey Bay Aquarium and one of the study's co-authors. "It also suggests that at least some of the microplastic was transported into the area by ocean currents."

This finding could indicate that plastic is widely distributed in the deep ocean, and may even be concentrated there.

Bruce Robison, a senior scientist at MBARI and co-author on the paper, noted: "These results are intriguing and show the need for similar deep-water surveys in other locations, so we can find out how widespread the problem is."

Van Houtan further explained the significance of the study and pointed to a possible solution. "The ubiquitous presence of plastic pollution throughout the water column points to source reduction -- making and using less plastic in the first place -- as one of the most effective means of solving this issue," he said.

"It may be virtually impossible to remove existing microplastic from the deep sea," he continued. "But when we slow the flow of plastic from land, we can help prevent the increasing accumulation of plastic in our global ocean."