И. А. Балакина, Ю. В. Кузина

ФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ГРАММАТИЧЕСКИХ ЯВЛЕНИЙ АНГЛИЙСКОГО ЯЗЫКА И СПЕЦИФИКА ИХ ПЕРЕВОДА

Учебно-методическое пособие

Екатеринбург 2023

Министерство просвещения Российской Федерации
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«Уральский государственный педагогический университет»
Институт иностранных языков
Кафедра английской филологии
и методики преподавания английского языка

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Рецензенты:
Никифорова М. В., канд. филол. наук, доцент кафедры делового иностранного языка, Уральский государственный экономический университет (г. Екатеринбург)
Лихачева Е. В., старший преподаватель кафедры английской филологии и методики преподавания английского языка, Уральский государственный педагогический университет (г. Екатеринбург)

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Учебно-методическое пособие включает теоретические и практические основы перевода, рассмотрены наиболее частые грамматические трудности перевода с английского языка на русский. Пособие предназначено для студентов лингвистических вузов и факультетов, включает теоретический блок, задания и неадаптированные тексты на перевод, которые могут быть использованы на аудиторных занятиях и при самостоятельной подготовке.

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СОДЕРЖАНИЕ

ПОЯСНИТЕЛЬНАЯ ЗАПИСКА

Данное пособие предназначено для студентов лингвистических вузов и факультетов иностранных языков, а также профессионально ориентированных колледжей.

Представленные материалы могут служить помощью в реализации курсов по повышению квалификации преподавательского состава лингвистических специальностей.

В основе теоретического блока дисциплин современной парадигмы лингвистики лежит, в том числе, такое направление как перевод (основы переводческой деятельности, теория и практика перевода), которая включает в себя различные аспекты.

В данном пособии освещены теоретические вопросы, связанные с функциональными особенностями грамматических явлений английского языка, и специфика их перевода с английского языка на русский. После каждой темы предлагаются задания, часть которых были подготовлены составителями, остальные взяты из других источников по переводу.

В практической части данного учебно-методического пособия предлагаются аутентичные тексты для перевода с английского языка на русский для отработки навыков перевода.

Настоящее учебно-методическое пособие может быть использовано для организации аудиторной, коллективной и самостоятельной работы.

ГЛАВА 1. ОСОБЕННОСТИ ПЕРЕВОДА МОДАЛЬНЫХ ГЛАГОЛОВ

Модальные глаголы – это особая группа глаголов, выражающих не действие, а отношение говорящего или его оценку этого действия. Модальные глаголы употребляются только в сочетании со смысловыми глаголами и обозначают возможность, вероятность, необходимость или способность совершить какое-либо действие.

Can, may, must

1. Глагол *can* передает умение, способность, объективную возможность совершить действие + в утвердительной форме выражает предположение.

Перевод: может быть, возможно, мог и т. п.

В вопросительной и отрицательной форме выражает сомнение.

Перевод: неужели, не может быть, чтобы и т. п.

Форма could передает меньшую уверенность. Перевод: может быть.

It could be true but it is advisable to find out first what has really happened there.

Может быть, это и правда, но рекомендуется сначала выяснить, что же в действительности там произошло.

2. Глагол *may* выступает в значении вполне вероятного предположения.

Перевод: может быть, возможно

Форма might указывает на меньшую уверенность, выражает сомнение.

The Chancellor’s measures might help towards an agreement on an incomes policy. But this still has to be proved.

Мероприятия, предложенные министром финансов, может быть, и помогут достичь соглашения по политике доходов. Но это еще нужно доказать.

3. Глагол *must*. Основное значение – долженствование.

В утвердительной форме часто употребляется в значении предположения с большой долей уверенности.

Перевод: должно быть, вероятно, по всей вероятности и т. п.

Перфектная форма инфинитива после must = предположение относится к прошедшему времени.

They must have known about it for a certain time.

Они, должно быть, уже в течение некоторого времени знали об этом.

Should

В функции модального глагола *should*:

1. Выражает долженствование в плане совета или пожелания.

Перевод: следовало бы; нужно; не мешало бы; должен и т. п.

He said that the status of the Greek minority should be viewed in the light of political balance.

Он сказал, что статус меньшинства греческого населения следует рассматривать в свете равновесия политических сил.

2. Подчеркивает эмоцию говорящего (удивление, сожаление, подозрение).

Употребляется в придаточных предложениях, после выражений, обозначающих отношение говорящего к высказыванию. (it is strange that…, it is natural…)

Перевод: личная форма глагола в изъявительном наклонении настоящего или прошедшего времени (прошедшего – если за should следует перфектная форма инфинитива).

It is good that the Government should have recognized the opportunity and the obligations so clearly.

Можно только приветствовать то, что правительство так ясно осознало возможности и свои обязательства.

To be

1. To be + инфинитив имеет модальное значение:

Выражает долженствование, обусловленное договоренностью или планом.

Перевод: глагол должен или глагол в будущем времени.

The Prime Minister is to go to Paris next week.

На следующей неделе премьер-министр должен поехать в Париж.

2. Выражает намерение, желание в условных предложениях.

Перевод: приходится иногда вводить местоимение «мы» в неопределенно-личном значении.

Mass struggle is vital if the elimination of the evils of racial hatred is to be guaranteed.

Совершенно необходимы массовые выступления, если мы хотим, чтобы было уничтожено то зло, которое вызывается расовой дискриминацией.

To be + инфинитив может представлять собой составное сказуемое (to be – глагола-связка, инфинитив – предикатив).

The task of the committee is to find ways for a workable agreement.

Задачей этой комиссии является изыскать пути для практически приемлемого решения.

To have

1. Глагол to have + инфинитив = долженствование, вызванное силой обстоятельств, необходимостью.

Перевод: пришлось, придется.

The negotiations might fail. In that event the Government would have to decide what to do.

Переговоры могут окончиться и неудачей. В таком случае правительству придется решать, что предпринять.

2. To have + сложное дополнение (имя + неличная форма глагола или наречие) передает:

• каузативность (побуждение или содействие осуществлению действия).

Перевод: заставить, устроить, сделать так, чтобы…, и другими лексическими средствами.

We had them beaten this time.

На этот раз мы их одолели.

I would have you to know…

Я хотел бы поставить вас в известность…

They will have him back.

Они заставят его вернуться;

• действие, совершенное по инициативе, побуждению лица, выраженного подлежащим.

The town council has had three houses built.

Городской муниципалитет построил три дома;

• действие, совершенное помимо воли или желания лица, выраженного подлежащим, и направленное на него.

We had a note handed to us.

Нам вручили записку.

Перевод глагола to have представляет трудность, так как в русском языке нет аналогичных грамматических средств для передачи его значений.

При переводе часто приходится пользоваться различными лексическими средствами, которые более точно передают смысл предложения.

Практические задания

Задание 1. Переведите предложения с модальным глаголом should.

1. He said that this was not a temporary problem. Lasting arrangements should be made.

2. The workers who have decided to fight against redundancies and short time in every possible way are absolutely right. They should be backed up by everyone, including those on whom the axe has not yet fallen.

3. The Government should bring together in local discussions the important employers of labor and trade union officials in direct touch with workpeople, and set about creating a sensible pattern out of the present chaotic labor market.

4. The communiqué also said that international disputes, including border and territorial disputes, should be settled by peaceful negotiations, and the use of force was not permissible.

Задание 2. Переведите предложения с модальным глаголом may (might).

1. It is possible that in accordance with this plan, investments may have to be made which do not lead rapidly to a rise in the standard of living.

2. Situations in which America may have to choose between rival policies advocated by her European partners are bound to arise.

3. When the delegates are taken to see the outstanding work of the Road Research Laboratory, and the examples of brilliant design and construction of British technicians and workers, they will be able to compare in their minds eye what might be, with what is.

4. Finally, a new political balance in Europe, based on effective unity, might turn out to be the precondition of disengagement.

Задание 3. Переведите предложения с модальным глаголом to be.

1. The main objective of the conference is to try to bridge the ever widening gap between the developing countries and the industrialized states.

2. The plan is to allow whites and non-whites to compete in one team abroad, but to maintain segregation inside South Africa.

3. But this success must be made the starting point of a new effort if the impetus is to be maintained and still bigger successes won.

4. Now the question is: "Will more resignations follow?" Changes seem inevitable, but no one can say what. But changes there must be if confidence in the board is to be restored and it is to function properly.

5. But now that the campaign is over, there is a clear imperative before us all: to stand together against the common danger if our nation and the world are to avoid even greater catastrophe.

Задание 4. Переведите следующие предложения с модальным глаголом to have.

1. To meet the export requirements the domestic consumption has had to be curtailed.

2. He is not half as worried as the old age pensioners, the housewives and the workers who are having to pay the increased prices.

3. Any other activities of the world organization will be financed by the whole membership only by their unanimous and active support. And even in those rare cases it will be by having the Secretary-General solicit voluntary contributions.

ГЛАВА 2. ФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ИНФИНИТИВА И СПЕЦИФИКА ЕГО ПЕРЕВОДА

Инфинитив – неличная форма глагола, которая называет действие. Инфинитив является основной формой глагола и представляет глагол в словаре. Признаком инфинитива является частица to: to help – помогать, to read – читать. В современном английском языке инфинитив имеет следующие формы:

	Active	Passive
Indefinite	to write	to be written
Continuous	to be writing	–
Perfect	to have written	to have been written
Perfect Continuous	to have been writing	–

Английский инфинитив выполняет в предложении целый ряд функций, многие из которых не характерны для русской неопределенной формы глагола. Способы перевода инфинитива в различных функциях часто представляют определенные трудности из-за существенного различия грамматических средств и структур предложения в английском и русском языках.

1. Подлежащее. Инфинитив в функции подлежащего. Переводится на русский язык неопределенной формой глагола или отглагольным существительным.

To bring to the foreground leaders who will work together to achieve peace will take both parties time.

Выдвижение на передний план лидеров, которые будут сотрудничать в борьбе за мир, потребует времени от обеих партий.

Такие конструкции встречаются редко. Чаще в английском предложении на первом месте в качестве формального подлежащего стоит местоимение it, которое на русский язык не переводится.

2. Предикативный член. Инфинитив в функции предикативного члена, именной части составного сказуемого, не пред-

ставляет трудности при переводе на русский язык. В этих случаях он переводится неопределенной формой глагола или существительным.

The idea is to make Russia a partner in many NATO activities.

Идея в том, чтобы привлечь Россию к участию в решении многих проблем, которые в настоящее время стоят перед НАТО. (из Соколова, Трофимова)

3. Определение.

– Переводится определительным придаточным предложением с модальным глагольным сказуемым, выражающим возможность или долженствование, либо глаголом-сказуемым в будущем времени.

This question will be discussed at the conference shortly to open in Moscow.

Этот вопрос будет обсуждаться на конференции, которая должна вскоре открыться в Москве.

– После the last и порядковых числительных переводится личной формой глагола в том же времени, что и глагол-сказуемое главного предложения.

The secretary general was the first to raise this question. Генеральный секретарь первым поставил этот вопрос.

Если порядковые числительные выполняют другую синтаксическую функцию, то инфинитив может переводиться причастием.

The first person to raise objections was the Minister himself. Первым выступившим с возражениями был сам министр.

– Пассивная форма инфинитива в функции определения сохраняет за собой предлог, с которым употребляется данный глагол, и переводится неопределенно-личным предложением.

There was nothing to be astonished at.

– В отдельных случаях может переводиться причастием, прилагательным или существительным с предлогом.

The shape of things to come is shown by the data obtained by the experts.

О характере предстоящих событий можно судить по данным, полученным специалистами.

– Может быть переведен простым предложением – в зависимости от сочетаемости слов в русском языке. Модальность при переводе передается лексически.

He had no objections to make.

У него не было возражений

– Если определение указывает на назначение предмета – переводится либо определением, либо обстоятельством цели, что зависит от контекста и от сочетаемости слов в русском языке.

Automation is one of the ways to increase production.

Автоматизация – один из способов повысить производительностью.

4. Дополнение. Инфинитив в функции дополнения может переводиться инфинитивом или придаточным предложением.

They want to submit a new proposal.

Они хотят внести новое предложение.

5. Инфинитив в функции обстоятельства результата, следствия, сопутствующего обстоятельства.

Инфинитив в функции обстоятельства результата или следствия после such... (as), enough, so..., too..., only – переводится или инфинитивом, или самостоятельным предложением, вводимым союзом «и».

This question is too difficult to be settled without further consultations.

Этот вопрос слишком сложен, чтобы его можно было разрешить без дальнейших консультаций.

Если в предложении нет вышеупомянутых прилагательных и наречий – переводится в зависимости от сочетаемости слов в русском языке, часто самостоятельным предложением, вводимым союзом «и».

In 1928 he resigned his post never to return to public life.

В 1928 году он ушел в отставку и никогда уже не возвращался к государственной деятельности.

Инфинитив в этой функции представляет трудности при переводе главным образом потому, что он ошибочно может быть принят за обстоятельство цели.

6. Вводный элемент. Инфинитив может быть в предложении вводным элементом.

to tell the truth...	по правде говоря...
to be frank...	если говорить откровенно...
to put it mildly...	мягко выражаясь...

Практические задания

Задание. Переведите следующие предложения с инфинитивом:

1. The lord weighed his sons long and carefully with his eyes.

2. You have five trueborn children," Jon said. "Three sons, two daughters. The direwolf is the sigil of your House. Your children were meant to have these pups, my lord."

3. "You helped me win this damnable throne, now help me hold it. We were meant to rule together."

4. Tall, it was, and gaunt and hard as old bones, with flesh pale as milk. Its armor seemed to change color as it moved; here it was white as new-fallen snow, there black as shadow, everywhere dappled with the deep grey-green of the trees.

5. Then it gets inside you and starts to fill you up, and after a while you don't have the strength to fight it. It's easier just to sit down or go to sleep.

6. A sudden silence descended over the party. The men looked at the antler uneasily, and no one dared to speak. Even Bran could sense their fear, though he did not understand.

7. He put a massive arm around Ned's shoulders. "I had planned to wait a few days to speak to you, but I see now there's no need for it."

8. He had included the girls, included even Rickon, the baby, but not the bastard who bore the surname Snow, the name that custom decreed be given to all those in the north unlucky enough to be born with no name of their own.

9. Branches stirred gently in the wind, scratching at one another with wooden fingers. Will opened his mouth to call down a warning, and the words seemed to freeze in his throat.

10. The broken sword fell from nerveless fingers. Will closed his eyes to pray.

ГЛАВА 3. ФУНКЦИОНАЛЬНЫЕ ОСОБЕННОСТИ ПРИЧАСТИЯ И СПЕЦИФИКА ЕГО ПЕРЕВОДА

Причастие – это неличная форма глагола, которая обладает свойствами глагола, наречия и прилагательного. Причастие настоящего времени (Present Participle) образуется с помощью окончания -ing и описывает кого-то или что-то: e.g. boring book – скучная книга, exciting news – волнующие новости, relaxing atmosphere – расслабляющая обстановка Причастие прошедшего времени (Past Participle) образуется с помощью окончания -ed и обозначает то, как кто-то себя чувствует: e.g. bored student – скучающий студент, excited speaker – взволнованный спикер, feel relaxed – чувствовать себя расслабленным.

Причастие в функции определения

Чаще переводится причастием настоящего или прошедшего времени, либо придаточным определительным предложением.

The data obtained are being carefully analyzed and studied.

Полученные данные тщательно анализируются и изучаются.

It is necessary to review some of the arguments put forward by those opposing the idea of such talks.

Необходимо пересмотреть некоторые доводы, выдвинутые теми, кто выступает против идеи ведения таких переговоров.

Причастие II страдательного залога не всегда можно перевести на русский язык страдательным причастием, тогда оно переводится определительным придаточным предложением или передается лексически.

Tomorrow morning the ‘Right to Life’ campaign supported by nine religious peace organizations will hold a silent procession.

Завтра утром кампания «Право на жизнь», которую поддерживают девять религиозных сообществ, организует молчаливую процессию.

Причастие в функции обстоятельства

1. Переводится деепричастным оборотом, придаточным или самостоятельным предложением либо иным способом, в зависимости от сочетаемости слов в русском языке.

Commenting last night on the plan he warned the Ministry of the critical situation which might develop.

Комментируя вчера вечером этот план, он предупредил министерство о том, что может создаться критическое положение.

2. Причастие II (иногда причастие I), в зависимости от союза, за которым оно следует, может передавать:

с союзом if или unless – значение обстоятельства условия;

после союза though – значение обстоятельства уступки.

Такие обороты переводятся на русский язык придаточными предложениями.

If given the opportunity, this industry will rapidly develop.

Если этой отрасли промышленности предоставить благоприятные возможности, она будет быстро развиваться.

Причастные конструкции
Объектный причастный оборот

Объектный причастный оборот = существительное в общем падеже или местоимения в косвенном падеже + причастие (имя + причастие), выступающее в функции сложного дополнения.

Переводится на русский язык придаточным предложением с союзами «как», «что» или «чтобы».

They spent last Friday listening to the Minister telling the trade union leaders that it is right for workers to hold back on wage claims.

В прошлую пятницу они весь день слушали, как министр говорил профсоюзным лидерам, что рабочие правильно сделают, если воздержатся от требований о повышении заработной платы.

Каузативный (или побудительный) оборот

Объектный причастный оборот (have/get + имя + причастие) + to have/to get = *каузативная, или побудительная, конструкция*.

Она означает, что действие совершается не лицом, обозначенным подлежащим предложения, а кем-то другим за него или для него.

В русском языке ее перевод представляет значительную трудность, конкретное значение этой конструкции зависит от контекста и может быть весьма разнообразным.

We must treat this as a national emergency issue and must get this decision reversed.

Мы должны рассматривать это как вопрос чрезвычайного значения для страны и должны добиваться, чтобы это решение было изменено.

Абсолютная причастная конструкция (независимый причастный оборот)

Абсолютная причастная конструкция (независимый причастный оборот) = причастие + существительное в общем падеже, которое является субъектом действия, выраженного причастием.

Такая конструкция может выполнять в предложении функцию обстоятельства времени, причины, условия или сопутствующего обстоятельства.

Препозитивный независимый причастный оборот (причастный оборот, стоящий перед главным составом предложения) может иметь как временно́е, так и причинное значение.

В функции обстоятельства условия этот оборот выступает обычно, когда предложение относится к будущему времени; на русский язык переводится придаточным предложением.

Whole cities being razed to the ground during the war, the building of houses was priority number one.

Так как во время войны целые города были стерты с лица земли, строительство домов стало первоочередной задачей.

Значение сопутствующего обстоятельства эта конструкция имеет, когда она стоит после главного состава предложения.

Переводится на русский язык самостоятельным простым предложением или простым предложением с союзами «а», «и» или «причем», входящим в состав сложносочиненного предложения.

The cargo was badly damaged by the fire, the owners suffering great losses.

Груз был сильно поврежден пожаром, и владельцы понесли большие потери.

Причастия в функции союзов и предлогов

Причастия в функции союзов вводят условные, причинно-следственные и уступительные придаточные предложения.

На русский язык они переводятся:

provided, granted (granting) – при условии, принимая во внимание

supposing, assuming – если, допустим, предположим, что…

seeing – поскольку, принимая во внимание, учитывая, ввиду того, что…

A wider association of this kind would be feasible, provided that the methods adopted are in line with those proposed at the conference.

Более широкая ассоциация такого рода была бы возможна при условии, что принятые методы будут соответствовать методам, предложенным на конференции.

Причастия в функции предлогов

Стоят перед существительными и переводятся на русский язык:

given – при наличии

failing – при отсутствии

regarding, considering, respecting – относительно

pending – до, в ожидании

following – вслед за

Given good will on the part of other states, this proposal of Russia could be carried into effect without any further delay.

При наличии доброй воли со стороны других государств это предложение России можно было бы осуществить без дальнейшего промедления.

Практические задания

Задание 1. Переведите следующие предложения:

1. A circular giving details of the conference refers to the recent disastrous election results which were brought about because thousands of people did not think it was worth voting.

2. He said that the strike movement may turn into a national strike bringing about the downfall of the dictatorship.

3. Unfortunately the point of view of this politician is becoming increasingly widespread in the Western press. This is why it seems

expedient to review some of the arguments put forward by those opposing the idea of such talks.

4. Considering the complexity of the problem, the decision was reached at a rather early date.

5. Coupled with his reluctance to discuss this question this presents a major obstacle to any kind of agreement.

6. Moreover, this would also determine the agenda of the meeting referred to in a general way by him.

7. Taken in the early stages, these drugs prevent infirmity. Used systematically, they slowly but surely lead to cure.

Переведите следующие предложения:

8. He declared that at the next sitting of the peace conference the proposal should be made to conclude peace, all theoretical questions being excluded.

9. Exports of bananas were negligible, all shipments going to the Bahamas Islands.

10. As there is a natural limit to the capacity of consumption of necessities of life (food, etc.), particular attention must be paid to industrialization, consumption prospects in this sphere being particularly unlimited for a long time to come.

11. Stupendous storms of terrifying proportions can rage in these unreported areas, with no one knowing of them until the effects of the atmospheric disturbances they cause are felt in local weather days later.

12. If he had not been forced to maneuver the craft to avoid a boulder-filled crater, he would have touched down with almost two minutes of fuel remaining.

13. Objections to this plan, supposing there is any, should be reported to the committee at once.

14. Assuming the hearty cooperation of all the members, it is reasonable to expect that the celebration will be successful.

15. Prospects are bright for a big expansion of trade between these two countries, following the signing of a new three-year trade agreement.

16. These tremendous, complex tasks can be carried out given planned development of the national economy and correct leadership of the national economic development.

ТЕКСТЫ ДЛЯ ПЕРЕВОДА

Текст 1

What's in a name: probiotics

Probiotics, probably the best-known of the three players, are defined by the International Scientific Association for Probiotics and Prebiotics (ISAPP), as "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host." In this case, *you* are the host, the person who consumes them. And the "live microorganisms" are usually bacteria that have a health-promoting effect. Given that there are good bacteria and bad bacteria in the human body, the goal is to ingest probiotics that keep the bad ones in check.

Besides promoting general gut health, consuming food rich in probiotics can improve irritable bowel syndrome and antibiotic-related diarrhea, prevent traveler's diarrhea, produce vitamins and increase nutrient absorption, and decrease the risk of common infections. In fact, when consumed regularly, probiotics have been found to reduce the occurrence of upper respiratory tract infections (like the common cold), according to research in a 2022 issue of *The Cochrane Database of Systematic Reviews.*

Many different types of beneficial bacteria are considered probiotics. The most common ones include *Lactobacillus* and *Bifidobacterium,* of which there are dozens of strains. "You have to match what it is you're concerned about with the probiotic you should use," says Gregor Reid, a microbiologist and distinguished professor emeritus at Western University in London, Ontario. In other words, if you consume a strain shown to improve constipation and you're taking it in the hope that it will reduce your blood sugar, you're likely to be disappointed, Reid says. (A knowledgeable health-care professional can make specific recommendations about which strains to consume.)

Some foods, such as yogurt, kefir, kimchee, and fermented soybeans and kombucha naturally contain probiotics, Rosales says. But here's where things get complicated: Not all fermented foods or yogurts contain probiotics, Reid says. As a consumer, a good starting point is to look for the phrase "contains live and active cultures" on the label; it's even better if specific strains of bacteria are listed, because then you'll know you're getting the right stuff.

In other instances, specific strains of probiotics are added to various "functional foods" – which are defined as having benefits, beyond simply providing nutrients, thanks to the addition of other ingredients. Such foods include beverages, yogurts, and cereals; probiotics are also available as supplements.

"The challenge with probiotics is they have to arrive *live* and well in your gut to have a health benefit," Rosales explains. "That's why we're seeing them in supplements."

When choosing functional foods or supplements that contain probiotics, Reid recommends consulting the website USProbioticGuide.com, which is designed to help health-care professionals make decisions about probiotic therapy for patients; there, you'll find information about specific food products and supplements, the probiotic strains they contain, the health conditions they target, and how to use them

(https://www.nationalgeographic.com)

Текст 2

What's in melatonin – and is it giving you nightmares?

The dosing in these popular over-the-counter sleep supplements can vary wildly from what's printed on the label, which can result in side effects. Here's how to use it safely.

As many as one in three U.S. adults aren't getting the seven to eight hours of sleep they need. Whether it's a bombardment of stressful headlines, endless scrolling on a blue-light screen, or working

into (or through) the night, our circadian rhythms are easily thrown off by modern life.

To fall and stay asleep, over six million American adults are turning to melatonin supplements, sold over the counter at pharmacies and grocery stores across the country.

Many of these users report side effects like nightmares. What's causing them? And what's in the melatonin tablets, liquids, and sprays we're taking?

Melatonin and vivid dreams?

Usually, side effects of melatonin include drowsiness and headaches, but experiencing vivid dreams and nightmares is certainly not uncommon, says Dr. Suzie Bertisch, assistant professor of medicine at Harvard Medical School and clinical director of behavioral sleep medicine at Brigham and Women's Hospital.

Dr. Kin Yuen, a sleep medicine specialist at the University of California San Francisco, says higher doses of melatonin make dreams (and nightmares) more vivid and make us more likely to remember them after waking.

(How COVID-19 can affect your sleep.)

One theory is that because melatonin increases time spent in REM cycles (when we dream), nightmares have a higher chance of appearing. Taking melatonin to help sleep when you're experiencing emotional distress also presents a conundrum: are resulting nightmares a product of the melatonin, or the distress that caused poor sleep in the first place?

Currently, the reason many melatonin users experience nightmares remains unconfirmed. However, the fact that melatonin is widely available and doesn't require a prescription in the U.S. and Canada – though it's regulated in Australia, New Zealand, and most of Europe – may hold a partial answer.

Unpredictable product

Because melatonin is sold as a supplement, like vitamins, and not a medication, its regulation is limited. As a result, the amount of

melatonin in a supplement can vary wildly, and may contain dangerous contaminants.

A landmark study that looked at 31 different melatonin supplements found melatonin content often varied greatly from the listed amount. One supplement had 478 percent more melatonin than what was listed on the label, another supplement had 83 percent less.

(*How our body clock rules our lives*.)

Almost one in three supplements tested also contained significant levels of serotonin, which can act in opposition to the supplement's intended effect. Serotonin is associated with wakefulness and inhibition of REM sleep.

Serotonin is also strictly regulated and cannot be purchased over the counter. If someone taking another medication like an SSRI antidepressant took serotonin-contaminated melatonin, it could lead to serotonin overdose. Researchers urged manufacturers to identify where the serotonin was being introduced to their product – the origin of these contaminations are still unknown.

Medical-grade melatonin can be prescribed by a doctor and may help patients take a more pure, predictable dose.

How to use melatonin safely?

Because the contents of melatonin supplements vary, Bertisch says there's little data on the real world use of melatonin supplements over time. She says it's generally safe for short term use in adults, like for getting over jet lag.

But kids' use of melatonin supplements concern both Bertisch and Yuen. Bertisch says many parents are administering melatonin to their kids, but data on how this active hormone affects minors is very limited, especially over time. One theory is that melatonin supplements could affect fertility, though again, research is minimal at this point.

Melatonin is secreted naturally in people of all ages to signal us to wind down for bed, so changing habits like limiting screen time

at night could be safer and more helpful than taking melatonin supplements.

(*What is sundowning*?)

Between 2012 and 2021, reports to U.S. poison control centers of children ingesting melatonin increased 530 percent, and melatonin became the most frequently ingested substance among children in 2020. Over 4,000 of the reported ingestions led to hospitalizations.

In September, The American Academy of Sleep Medicine urged parents to beware of melatonin gummies and chewable tablets on the market that can be easily administered to kids. They said this could lead to a melatonin overdose, which can manifest as headaches, dizziness and irritability.

Experts agree parents should check with a doctor before administering melatonin to kids. Also, given the lack of research on extended use, be careful about using melatonin long term, even if you're an adult

(https://www.nationalgeographic.com)

Текст 3

Catch a glimpse of a rare planetary alignment – before it's too late

Don't worry if you missed the peak evening to view the spectacular line-up of planets. Here's how to see them for the rest of the week.

Look to the cosmos around sunset this week for a glimpse of five major planets – Mercury, Jupiter, Venus, Uranus and Mars – lining up with the moon.

Even if you missed the peak alignment on Tuesday evening, experts say there's still time to catch this lineup of Earth's neighbors. Here's what you need to know about what causes this phenomenon, how rare it is, and – most critically – how to see it.

How to see it?

Andrew Fazekas, the Night Sky Guy and lead author of the National Geographic *Stargazer's Atlas*, tells Nat Geo that the five planets will appear in a diagonal line in the southwest sky on Wednesday, March 29.

If you grab a pair of binoculars, you'll see Mercury and Jupiter hanging very low in the western sky. As you follow the diagonal line higher and to the west, you'll see the bright point of light that is Venus, followed by a faint green light that marks Uranus. At the highest point in the southwest, he says, "is the ruddy-colored Mars, easy to find with naked-eyes."

(*Here are 11 other spectacular night sky events to see in 2023*.)

The Southern Hemisphere will also have a view of the planetary alignment, but Fazekas says it will really be tilted toward the northwestern sky.

All five planets should be visible for the rest of the week. By next week, however, Jupiter will continue to sink toward the horizon while Mercury will rise up and become easier to see without binoculars.

Why does it happen and how rare is it?

It's not that unusual to see groups of planets line up in the night sky from time to time, according to the Associated Press. The planets in our solar system are constantly in orbit around the sun – and sometimes those orbits happen to line them up on the same side of the sun from the Earth's perspective. That's when we see an alignment.

Last summer, in fact, brought an even rarer alignment of all the major planets in the solar system – including five easily spotted with the naked eye. Earth won't see such a spectacular celestial show again until 2040.

The good news is, however, that there are many more awe-inspiring night sky events ahead of us in 2023 – from the Lyrids me-

teor shower in late April to an otherworldly ring of fire eclipse in mid-October. Stay tuned (https://www.nationalgeographic.com).

Текст 4

Why are these orcas killing sharks and removing their livers?

When sevengill shark carcasses with pectoral tears and missing livers began washing up on the South African coast, questions abounded. Then a marine biologist found something: orca tooth impressions.

When 19 shark carcasses washed up on the beach just outside her home in Cape Town, South Africa, last month, Alison Towner knew right away who had killed them.

The sevengill sharks – predators in their own right – were all found in the same condition: missing their livers, which had been sucked out through a clean tear in their shoulders. The rest of their organs remained intact.

Such near-surgical precision is the hallmark of a pair of orcas known as Port and Starboard, who have been extracting livers from sevengills and great white sharks since at least 2015. Easily spotted thanks to their dorsal fins, which bend right and left (hence their names Starboard and Port), the two male orcas were seen in the area two days prior.

"My reaction was just, 'Here we go again,'" says Towner, a shark biologist and Ph.D. candidate at Rhodes University in South Africa. "There's no stopping this."

Undoubtedly the biggest mystery surrounding Port and Starboard is whether their hunting behavior is unique. Orcas, which live worldwide, display a wide range of diets and behaviors, including eating sharks, whose organs – especially their livers – are high in fat.

But scientists have never before documented orcas performing this kind of consistent, surgical predation on sharks. What's more, their observations suggest that the orca pair are showing others how

to remove shark livers – possibly an intriguing example of culture in the animal kingdom.

Shark killers.

Located on the southwestern coast of South Africa, False Bay is normally teeming with sevengill sharks, with scuba divers spotting as many as 70 in a single dive. But on November 9, 2015, divers noticed something peculiar: The sharks had abandoned the dive area virtually overnight.

Then, carcasses of several sevengill sharks appeared on the seabed with the same clean tears in their bodies. The divers took photographs and shared them with Towner and other researchers, who debated whether the deaths were the result of fishing or an animal attack.

Orcas were one possibility. While rare in the region, they had been spotted in the False Bay area since 2009 – but until that time, they were only known to eat marine mammals, such as Cape fur seals. *(See 13 of Nat Geo's favorite photos of orcas.)*

"It was on everybody's mind: Could it be?" says Towner, who studies great white shark movements. "Never in my wildest dreams did I expect it to unfold the way it has."

When, in April 2016, five more sevengill shark carcasses washed up on shore with pectoral tears and missing livers, Alison Kock, a marine biologist at South African National Parks, and her team conducted necropsies. The tears matched the photos taken in November 2015. And she found something that they overlooked in the photographs: orca tooth impressions.

The finding became the first recorded instance of orcas killing sevengill sharks in the area, and the first recorded instance of orcas carefully tearing the pectoral girdle to access the liver and leaving the rest of the shark. Though there are earlier records of orcas eating shark livers, researchers called the South African phenomenon "a novel and specialized technique."

“It’s not like they’re tearing the back of the shark open. They’re going exactly where the liver starts. It’s incredible,” says Towner.

Then, in 2017, five great white sharks washed up on shore in nearby Gansbaai, also without their livers. Kock suspected Port and Starboard, which were orcas already known to live in the area, but it wasn’t until May 2022 that drone video footage confirmed the pair were hunting great whites.

Evidence of culture?

Little is known about the animals, such as their ages or where they came from, says Simon Elwen, a killer whale researcher and head of the South Africa-based conservation nonprofit Sea Search.

Their bent dorsal fins, a relatively unusual trait that could be due to diet, injury, or genetics, make “them so unusual and captivating,” Elwen says. “You have these two highly identifiable individuals.”

It’s also uncommon for two males to travel together, he adds – but there could be a reason why.

Elwen’s colleague A. R. Hoelzel, a molecular ecologist at Durham University in the U.K., has sequenced the two orcas’ genomes and found preliminary evidence that they’re related – possibly brothers. *(Read how orcas can also take down blue whales, the largest animal on Earth.)*

But why hunt sharks and target their livers? Some experts hypothesize that Port and Starboard are part of a subgroup, or “ecotype,” of orcas that frequent the open ocean, but that this duo simply moved closer to shore, perhaps due to fishing depleting their normal food sources.

Another theory is that Port and Starboard, independently or along with their subgroup, have developed this new behavior in order to save their teeth, which wear down when orcas bite into sharks’ rough skin. A white shark liver is large enough to provide a full meal, without the work or the wear that comes with tearing the shark apart.

Orcas around South Africa are difficult to study due to their transient nature, and because researchers rely heavily on whale watchers and citizen scientists to report sightings, much of the data is "opportunistic," Elwen says.

But the video footage could be a key piece of evidence, since it shows Starboard performing the shark-liver technique in the presence of four other orcas. Many species of whales and dolphins – orcas are the largest dolphin species – exhibit signs of culture, for example passing on certain dialects, hunting strategies, or other behaviors to the next generation. Culture is a relatively exclusive club in the animal kingdom, usually displayed by other social species with long lives and big brains, such as crows and great apes.

Regardless of whether Port and Starboard are the inventors of this shark-eating behavior, "it's likely the behavior will spread," Elwen says.

Bad news for sharks

And that could spell disaster for shark species, most of which are already declining, Towner says. Sevengill sharks are gone from the region, as are great whites, which has led to a collapse in Cape Town's shark-cage tourism industry – not to mention a lack of animals for Towner to study.

Unregulated overfishing poses a much greater threat to shark populations than Port and Starboard, Towner notes, but the predators have added pressure to fish already in trouble.

The absence of sevengills and great whites, apex predators, may have a ripple effect throughout the ecosystem of coastal South Africa, she adds. For instance, it's possible prey species, such as seals and fish, may increase in number. Other shark species, such as the copper shark, are already moving in to occupy the top spot, according to her research. *(Read how reef sharks are in major decline worldwide.)*

"Twenty years of stability, and then two killer whales appeared and boom, all hell breaks loose," Elwen says of the drop in shark populations.

Some on social media have expressed frustration about how the orcas have impacted local businesses, particularly great white tourism. For her part, Towner approaches the situation with a combination of fascination and hopelessness.

"I wish there was a golden nugget of hope we could give," Towner says. "It's a reflection of how delicate the balance of nature is, and if that's to be perturbed in any way, then the ramifications can be profound" (https://www.nationalgeographic.com).

Текст 5

They're destructive, there are 5 million of them – and they're sacred
In India, wayward cattle are trampling crops, spreading disease, and causing car accidents. They're also venerated

Across India, farmers are becoming their own night security guards – patrolling their harvest and checking on fences or trenches surrounding their land. But their enemies aren't robbers. They're stray cattle – and there are more than five million of them.

"A herd can destroy the whole crop in just one hour," says Anjani Dixit, district head of Rashtriya Kisan Mazdoor Sangathan, a farmer association in the northern state of Uttar Pradesh. Cattle can also become aggressive when threatened: Dixit says the horned animals fatally gored two men in his village.

Stray livestock, which gather at garbage dumps and weave through traffic, lead to thousands of road accidents each year; between 2018 and 2022, they caused more than 900 human deaths in the northern state of Haryana. In some states, authorities even paste glow-in-the-dark stickers on the animals to warn drivers at night.

How did India get here? Many livestock owners abandon male calves soon after they're born, keeping the females, which provide valuable milk and calves. In years past, farmers would deploy the males to plough their fields and use their dung as manure. But nearly every farmer now uses tractors, while manure has been replaced with chemical fertilizers, says Krishna Chauhan, a veterinary officer in Uttar Pradesh's capital Lucknow.

"The utility of the male calf has become almost zero," he adds. In addition to setting the male calves free, farmers also starve male calves to death or, on big cattle operations, let the animals overeat until they die, says Chauhan. Sometimes, old and unproductive females also become strays.

Compounding the problem, cow slaughter is banned in most states because Hindus – who make up the dominant religion in India – consider the animal sacred. The state-run Animal Welfare Board of India even wanted to rebrand Valentine's Day this year as "Cow Hug Day."

"It is a bit ironic that, supposedly, we [Indians] are cow lovers and we have the worst animal welfare problem," says Navneet Dhand, associate professor in veterinary biostatistics and epidemiology at the University of Sydney. For instance, many stray cattle are in poor health, with a gaunt appearance and infected wounds from being hit by vehicles.

Fortunately, there are several new solutions in the works, from selecting female calves through artificial insemination to keeping cows on sanctuaries, experts say.

Sick cows a serious problem.

A stray cow is problematic enough; a stray sick cow presents another challenge entirely.

"There is no compensation for culling [diseased cows], so [farmers] will either sell them off to another farmer, which leads to spreading infections, or they will abandon them on the streets," says Dhand.

Cattle can spread zoonotic diseases such as brucellosis to people, which can cause flu-like symptoms. Stray cattle likely helped fuel an outbreak of lumpy skin disease, a virus that ravaged over two million domestic animals in several Indian states in 2022.

While local laws allow veterinarians to euthanize sick cows, research suggests that it is culturally problematic and rarely happens. In recent years, cows have become a sensitive political topic, with Hindu mobs lynching people on suspicion of possessing beef or smuggling cows. As a result, veterinarians are scared to recommend euthanization, says Dhand.

A few years ago, Uttar Pradesh introduced mandatory ear tags for cattle, which would ideally lead to nabbing the owners who deserted them. But it didn't work.

"Cattle owners would rip the tag off along with the animal's ear," says Chauhan.

However, the farmers don't deserve all the blame, says Dhand, as many of them see the animals as family members. The biggest problem is a lack of clear guidelines for handling unwanted cattle, he adds.

"We need to give farmers some options. They are running a business in the end."

Game-changing technology?

Ranjit Singh, who owns over a hundred cattle on his dairy farm in Punjab, a state in northern India, says unproductive animals quickly become a "burden." He also admits that abandoning them is morally wrong.

That's why, to minimize the chances of male calves being born, he's been using sex-sorted semen to artificially inseminate his cows. It's a technique that guarantees the birth of a desired sex by up to 95 percent. India's government has called it a "game changer." But the imported technology is expensive – as much as a hundred times costlier than using conventional semen.

In December, the government of Kerala in southern India launched a scheme to distribute sexed semen at subsidized rates with the promise of a refund in case of failure. Several states have announced similar discounts.

India's National Dairy Development Board is also working on its own, cheaper technology for sex-sorting semen. Deep Nagaraj, a representative from their facility in Tamil Nadu, says that the Indian semen technology should hit the market in about three years.

Yet there's another limitation, says Chauhan, the veterinarian: Sexed semen has a low conception rate. A dose of sexed semen contains two million sperm, as compared with 20 million in regular semen. If farmers don't see a return on their investment, they're skeptical of shelling out extra cash. "It's a big deal if I can convince even one out of 10 farmers to buy sexed semen," says Chauhan.

'A gold ornament'.

In the meantime, India is witnessing a boom in gaushalas – or cow shelters – run by the government or religious institutions who care for abandoned cattle throughout their lives. There are more than 5,000 gaushalas in India, and in Uttar Pradesh, the government has announced the creation of a 130-acre cow sanctuary, as large as nearly a hundred football fields.

The Indian government is also promoting a "gaushala economy" – turning cow dung and urine collected from such facilities into useful products. According to Ayurveda, or traditional Indian medicine, cow dung and urine have beneficial properties. Though there is almost no scientific evidence that is true, such products have become more popular recently in India.

Vallabh Kathiria, a politician from the national ruling Bharatiya Janata Party and former chairman of a government agency to promote and protect cows, told *National Geographic* he envisions a future in which "people see a stray cow on the road and feel like they've found a gold ornament." In his view, the key is changing people's perception of stray cattle from burden to opportunity.

Текст 6

The Many Effects of Flooding

Floods can be destructive to humans and the natural environment, but they also help to drive biodiversity and are essential to the functioning of many ecosystems.

It is hardly surprising that rivers have been an important part of human history: They provide food, freshwater, and fertile land for growing crops. While water is essential to life, it can be a destructive force too. When rivers flood, the effects can be catastrophic.

Flooding is one of the most common types of natural disaster, and the results are often fatal. The Central China flood of 1931, for example, was one of the worst flooding events in recorded history. The Yangtze and Huai Rivers broke their banks, killing as many as several million people. The aftermath was devastating; deadly waterborne diseases like dysentery and cholera spread quickly, and those who survived faced the threat of starvation.

The human cost of flooding can be large, but events like this have a big impact on the natural world too, and the effects are not always negative. In fact, some ecosystems rely on seasonal flooding to drive ecological processes.

Floods Can Harm Wildlife

Flooding can have a negative effect on wildlife, causing drowning, disease proliferation, and habitat destruction. In 2012, hundreds of animals, including many vulnerable one-horned rhinos *(Rhinoceros unicornis)*, were killed in floods that swamped Kaziranga National Park in the Indian state of Assam. Unpredictable floods can be harmful even to aquatic life. For example, fish can be displaced and their nests destroyed.

Floods Cause Sedimentation and Erosion

Floodwater can also alter the landscape, for instance, by eroding riverbanks and causing them to collapse. As floodwater carries material from the eroded banks, it suspends sediment in the water, which

can degrade water quality and lead to harmful blooms of algae. Suspended sediment eventually settles out of the water in a process called sedimentation, which can clog riverbeds and streams, smother aquatic organisms, and destroy habitats. Erosion and sedimentation have a more negative impact on ecosystems that are already degraded or heavily modified.

Floods Carry Contamination

Floodwater can be contaminated with pollutants such as agricultural pesticides, industrial chemicals, debris, and sewage. If contaminated floodwater enters the ocean it can affect water quality and disrupt delicate ecosystems, such as coral reefs. In February 2019, marine biologists feared for the safety of the Great Barrier Reef off the coast of Queensland, a state in Australia, after it was inundated with polluted floodwater.

Floods Spread Diseases

Floods are the leading cause of weather-related infectious disease outbreaks. Flooding events increase the chance of spreading waterborne diseases, such as hepatitis A and cholera. Receding floodwater can create stagnant pools of water, which provide the perfect breeding ground for mosquitoes, which can transmit malaria and other diseases. Flood events also lead to an increase in some forms of zoonosis, such as leptospirosis.

Floods Carry Nutrients

While floods bring hazards, they also bring nutrients and essential components for life. Seasonal floods can renew ecosystems, providing life-giving waters in more ways than one. Floods transport vital nutrients, such as nitrogen, phosphorus, and organic material, to the surrounding land. When the water recedes, it leaves sediment and nutrients behind on the floodplain. This rich, natural fertilizer improves soil quality and has a positive effect on plant growth, thus increasing productivity in the ecosystem. Ancient civilizations first arose along the deltas of seasonally flooded rivers,

such as the Nile in Egypt, because they provided fertile soil for farmland.

Floods Recharge Groundwater

Floods can replenish underground water sources. Floodwater gets absorbed into the ground then percolates through layers of soil and rock, eventually reaching underground aquifers. These aquifers supply clean freshwater to springs, wells, lakes, and rivers. Ecosystems rely heavily on groundwater during dry spells when it may be the only supply of freshwater available. A good supply of groundwater has a positive impact on soil health and leads to more productive crop and pasture lands.

Floods Can Trigger Breeding Events and Migrations

Floods can trigger breeding events, migrations, and dispersal in some species. In 2016, thousands of water birds flocked to the Macquarie Marshes in the Australian state of New South Wales. Flooding had filled their wetland habitat for the first time in years, triggering a mass breeding event.

In Cambodia, monsoon rains cause an annual flood pulse on the Mekong River that prompts migrations for some animals. The floodwaters cause the Tonle Sap river, which connects the Mekong River to Tonle Sap lake, to reverse its flow, filling the lake. When floodwater enters the lake, it triggers fish migrations, supporting one of the world's most productive fisheries.

Floods Can Boost Fish Stocks

Small seasonal floods can be beneficial to native fish stocks and can help those fish outcompete invasive species that are not adapted to the river's cycles. Sediment deposited on riverbeds during floods can provide a nursery site for small fish. Nutrients carried by floodwater can support aquatic food webs by boosting productivity.

Floods Bring Life to Wetlands

Wetlands are an extremely important ecosystem; approximately 40 percent of the world's species rely on them. They filter water, mitigate flooding, and act as a carbon sink. The Okavango Delta in

Botswana is a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site and one of the world's largest, most important wetland habitats. The river captures rainfall from far to the north in the highlands of Angola. This causes a flood pulse that replenishes the wetlands at the height of the dry season, providing a lush oasis in the Kalahari Desert. National Geographic Explorer Steve Boyes, with a team of scientists and Explorers, has participated in a series of expeditions to trace the Okavango from source to sand to protect the waters of this unique habitat.

Floods are a force of nature, and their consequences, both positive and negative, are strongly felt by affected ecosystems. Floods can be destructive to humans and the natural environment, but they also help to drive biodiversity and are essential to the functioning of many ecosystems. Whether you regard floods as good or bad, one thing is for certain: The world would be a very different place without them.

Текст 7

People and Invasive Species

Invasive species – organisms not native to a particular area – are one of the leading causes of global biodiversity loss, and humans are the reason why.

Invasive species are one of the leading causes of global biodiversity loss. They can damage native habitats, spread diseases, cause extinctions, and leave massive cleanup bills in their wake. But what exactly are they?

An invasive species is commonly defined as any living organism not native to an area that causes economic or environmental harm, or is damaging to human health. It is worth noting that not all introduced species are invasive. In fact, they can sometimes be beneficial. For example, some of the world's ubiquitous foods like potatoes and tomatoes come from plants that were introduced to the rest of the

world from the Americas. An introduced species is only considered invasive if it causes harm.

Invasive species are usually generalists: species able to survive in a variety of environmental conditions and exploit broad ecological niches. When introduced to a new environment, they can quickly outcompete native species for resources, such as food and water. They often lack predators, competitors, or parasites in their new home, so populations can grow rapidly without natural enemies to keep them in check. In many cases, native species have not evolved natural defenses against the new invader, making them easy prey.

Human Influence

Invasive species are almost always spread by human activity. The increase of activities such as tourism and trade have meant people and goods can move all over the planet, and they often take invasive species with them, accidentally or intentionally. Early explorers were responsible for the introduction of many invasive species, such as dogs *(Canis familiaris)*, cats *(Felis catus)*, pigs, and rats. Norway rats *(Rattus norvegicus)*, also called brown rats, originated in China and spread throughout the Pacific Islands during the 18th century by stowing away on ships. They damage ecosystems by eating native species and spreading deadly diseases. The invasive feral pigs found on the United States islands of Hawai'i are thought to be descended from domesticated pigs *(Sus domesticus)* that early Polynesian settlers brought with them for food. Feral pigs dig up large areas of vegetation, spread invasive plant species, and contribute to soil erosion.

In some cases, government officials have encouraged the introduction of invasive species. For example, the Asian plant kudzu (*Pueraria montana* var. *lobata*) was introduced to the United States during the 1876 World's Fair in Philadelphia, Pennsylvania. It gained popularity in the southern U.S. in the 1930s, when government officials encouraged people to plant the fast-growing vine in an effort to prevent soil erosion. But the kudzu quickly grew out of control, earning it the moniker "the vine that ate the South."

Other times, invasive species were introduced as ill-advised attempts at biocontrol. For example, the cane toad *(Bufo marinus)*, native to South and Central America, was introduced to Australia in the 1930s as a means of controlling pests in sugar cane plantations. Unfortunately, the plan backfired, and the cane toads became a pest themselves. The oversized toad is famously toxic and can be deadly to predators who try to eat it.

Today, we have a better understanding of the repercussions of moving plants and animals outside of their natural habitats and take measures to prevent spreading organisms beyond their ecosystems. Nonetheless, we continue to spread invasive species around the globe through trade and travel at an alarming rate.

For example, the brown tree snake *(Boiga irregularis)*, native to Australia and Indonesia, has caused the extinction of endemic bird species in the South Pacific U.S. territory of Guam as well as widespread power outages by climbing electrical lines. It is thought to have arrived there in the 1950s by hitching a ride in military aircraft and cargo. In Hawai'i, officials are on high alert to stop the brown tree snake from spreading to the islands. If it were to gain a foothold in Hawai'i, this inconspicuous-looking serpent could cause over a billion dollars in damages each year.

Meanwhile, in the U.S. Florida Everglades, Burmese pythons *(Python bivittatus)* are causing trouble after being released into the wild by irresponsible pet owners. Burmese pythons make popular pets, but they grow to be incredibly large, prompting owners to release them into the wild. The Burmese python has no natural predators in Florida, so populations thrived, even interbreeding with local snakes to form a super-resilient hybrid. They prey on local birds, mammals, and even alligators.

Similarly, species of lionfish, native to the South Pacific and Indian Ocean, have quickly spread throughout the Atlantic, Gulf of Mexico, and Caribbean. Urban legend has it that the invasion started in 1992, when Hurricane Andrew smashed a beachside aquarium on

the coast of Florida, spilling its contents into the sea. It is more likely, however, that there have been a number of separate introduction events that have caused the spread of lionfish outside of their native waters. As their name suggests, lionfish are fierce predators who prey on native fish species. They cause economic damage to fisheries and put coral reef ecosystems at risk.

What Can Be Done?

When it comes to invasive species, prevention is the best cure. Most countries have strict rules about what can and cannot be brought across their borders, but education is also important. National Geographic Explorer Erin Taylor Spencer founded the Invasive Species Initiative, a digital storytelling platform that highlights some of the grassroots campaigns working to tackle invasive species all over the world. Some innovative approaches include turning invasive plants into paper and serving invasive fish species as a delicacy (complete with the catchy slogan, "If you can't beat 'em, eat 'em").

Whether by accident or design, human activities have been the leading cause of invasive species introductions throughout history. But thanks to projects like the Invasive Species Initiative, we can also be part of the solution. So next time you are in Florida, why not try a lionfish fillet? And whatever you do, do not release your pet Burmese python into the wild.

Текст 8

Plate Tectonics and Natural Disasters

Natural disasters like earthquakes and tsunamis are linked to plate tectonics, the grinding movement of pieces of Earth's crust.

Earth's surface may look solid – after all, we walk on it and construct buildings on it – but in fact it is a constantly moving puzzle of interlocking pieces. These pieces, known as tectonic plates, are giant sections of Earth's crust whose edges interact with one another by either colliding or moving apart. The plates of the lithosphere

float on top of the malleable asthenosphere in Earth's interior. The movement of these plates is called plate tectonics, and scientists have studied this field since the 1950s. While the movement of tectonic plates is usually slow – typically just a few centimeters per year – plate tectonics are linked to several kinds of natural disasters, namely earthquakes, volcanoes, and tsunamis.

On the afternoon of March 11, 2011, a large earthquake struck off the northeastern coast of Japan. This event, which would prove to be deadly, was caused by a specific type of plate movement: subduction. Subduction occurs when one tectonic plate – the one that is older and denser – sinks or is pulled under another tectonic plate. This process does not proceed smoothly, however – tectonic plates can shift and grind against each other, snagging on each other due to friction. Once plates overcome this friction and move past each other, the energy released leads to earthquakes. Near Japan, the Pacific Plate is subducting under the North American Plate. Although it may seem impossible, parts of Japan actually sit above a portion of the North American Plate.

In the 2011 Tohoku Earthquake – so named for the part of northeastern Japan that was struck hardest by the quake – a submerged section of the North American plate jolted upward in the Japan Trench. This undersea valley is located roughly 130 kilometers (81 miles) from the main island of Japan. The magnitude 9.0 earthquake produced by the upward movement of this plate – one of the most powerful quakes in recorded history – hoisted a wall of seawater.

That huge upwelling of water created a series of waves – a tsunami – that moved outward in all directions from the earthquake's epicenter, both toward and away from Japan. The waves moved at speeds of up to 800 kilometers (500 miles) per hour, roughly the speed of a jet airliner. When those waves rolled up on the eastern shore of Japan, the tallest measured more than 10 meters (33 feet) high. The waves that rushed toward the east eventually struck Ha-

wai'i and then the western coast of the United States, though with much less force.

The tsunami that hit Japan was far higher than the seawalls that had been built to protect the Japanese coastline from such inundations. The water rushed inland in a great flood, carrying with it ships, sweeping away cars, and destroying buildings. About 20,000 people were killed. Images captured on the day of the earthquake, as well as the days that followed, revealed a shattered landscape full of debris. The environmental impact of the 2011 earthquake and tsunami has been enormous; researchers studying soil samples have detected pollution from industrial chemicals and pesticides that leaked from the wreckage. That is not surprising given the amount of destruction caused by the disaster: oil refineries in flames, sewer and gas lines broken, and chemical plants damaged.

The tsunami also crippled the Fukushima Daiichi Nuclear Power Plant near Sendai, Japan. Ocean waves caused flooding that cut off the plant's electrical power, making it impossible to cool the plant's nuclear reactors. As a consequence, three of the plant's four reactors overheated, causing the uranium fuel rods to liquefy. The melted rods burned through the steel walls meant to contain them, releasing uranium and other radioactive materials into the air and sea. The airborne radioactive particles blanketed houses, crops, and schools. Over 100,000 people were forced to evacuate from their homes. The Japanese government expected to spend the equivalent of more than 200 billion U.S. dollars (and perhaps as much as 600 billion dollars) cleaning up radioactive contamination and dismantling the power station, a task that could take 30 years or more. A lot has been accomplished already, however: 1,500 fuel rods from the Fukushima Daiichi Nuclear Power Plant have been removed and radioactive topsoil and vegetation from the surrounding area have been placed in bags for long-term storage.

This earthquake also had far-reaching effects: tsunamis rolled up on distant shorelines in places as far away as Chile, and the in-

tense ground shaking might have even changed the rotation rate of Earth, shortening the length of the day by about 1.8 microseconds.

Earthquakes and tsunamis are powerful natural disasters capable of wreaking extreme havoc. For that reason, scientists are interested in being able to predict when and where these events will occur. By installing sensors capable of measuring ground movements, researchers can monitor earthquakes, even tiny ones, worldwide. This data allows scientists to assemble global maps of earthquakes to look for patterns in their locations. Researchers have also placed buoys in the ocean to detect tsunami waves traveling toward land. Detecting a tsunami before it floods a shoreline and issuing an alert can save many lives.

Текст 9

What is aquaculture? It may be the solution to overfishing

From seaweed to shellfish, this fast-growing industry is ensuring that humans have enough protein for our diets. Here's what to know about aquaculture.

Fishermen and farmers alike are taking to the waters to produce protein to feed the world – from finfish to shellfish to seaweed.

Aquaculture, sometimes called aquafarming, is the breeding, raising, growing, and harvesting of aquatic organisms in fresh and salt water for human consumption and conservation alike – and the nuances of what it entails are vast.

Dating back more than 4,000 years, aquaculture gradually expanded from China to the rest of the world, and has gained most of its popularity in the 21st century. Today, it's the fastest growing industry for producing protein, one of the basic building blocks of our diet.

Plus, over 50 percent of the world's seafood comes from aquaculture.

“The debate is over,” says Daniel Benetti, the director of aquaculture at the University of Miami. “It's here to stay. It's already mainstream.”

As overfishing threatens the world’s waters and the species that rely on them, aquaculture may be the solution to keep fishermen at sea and food on our tables. And there are many different types of aquaculture. Here’s what you need to know.

Algae (seaweed) aquaculture

Although Asia is the world’s largest producer of algae, these farms are gaining traction across the world as our understanding of its nutritious value grows.

(*Is it time to start eating algae?*)

Seaweed, a type of algae, is also particularly easy to grow as it doesn’t require much attention beyond a little TLC. Sugar kelp, the most commonly cultivated seaweed in the U.S., is grown mainly on longlines, or horizontal ropes, studded with spores that are submerged several feet below the water’s surface. It’s a fast growing, annual crop and has a two-month harvesting window.

When it’s ready, farmers harvest the seaweed by pulling up the longlines and cutting it off. Sugar kelp is mostly sold fresh and directly to restaurants.

Experts say there’s little disadvantage to seaweed farming. “Seaweed farming, and all marine aquaculture, produces far less carbon emissions when compared to terrestrial farming and livestock production,” says Anoushka Concepcion, an assistant extension educator in marine aquaculture at the University of Connecticut.

Shellfish aquaculture

Whether it’s oysters, clams, or mussels, aquaculture helps ensure there’s plenty of fresh shellfish available to us to eat – and they help keep our oceans clean.

Farmers obtain shellfish seedlings from a hatchery, which is where the shellfish are bred from sperm to larvae to a plantable size. Once in a farm, shellfish, like seaweed, don’t require farmers to pro-

vide any food or fertilizer beyond what the ocean naturally offers. Farmers do, however, use different methods to grow each type of shellfish.

(*Your love for fresh oysters can help the planet*.)

Mussels: Most grow mussels at the top of the water on ropes that hang down from a floating barge or structure. The lines are covered with mussel seed and then placed in the water, where they'll grow to market size in about two years.

Oysters: Some farmers cultivate oysters in bags or cages that float at the top of the water, while others string lines below the water's surface, almost like a suspended clothesline hung with oyster bags. These shellfish can also be grown uncaged or in bags on the sea floor.

Clams: Clams are exclusively bottom-cultured creatures, meaning they'll burrow themselves on the water's floor, either loose or in bags.

In places like Florida, shellfish farms help clean harmful algal blooms, or red tides, from the water. While humans can't eat the shellfish when a bloom is present, eventually the clam will filter the toxins from the water and through its body, becoming clean again to eat.

(*What is a red tide – and how does it affect humans?*)

Oysters and mussels are also just generally good for ocean health. Depending on how big and happy they are, they can filter up to 50 gallons of water a day, removing nitrogen from waters, ergo cleaning them as they eat, according to the National Oceanic and Atmospheric Administration.

Finfish aquaculture

Finfish is the most complicated of all aquaculture farming. From salmon to catfish to tilapia, farmers need to be able to control an environment as much as possible to raise healthy fish.

Most of these fish come from hatcheries: artificial breeding facilities where the fish are hatched and raised until they're fingerlings (the size of a finger). They're then transferred to a farm where they'll

continue to grow until harvested. Depending on what the fish needs to grow, the farm may raise them in warm or cold water and fresh or salt water – and either onshore, on the coast, or in the ocean.

Onshore, there are two main types of farms: earthen ponds and recirculating aquaculture systems.

Earthen ponds are natural ponds, which are equipped with paddles to help circulate the water, keeping it fresh and moving. In Alabama, Arkansas, and Mississippi, for example, these ponds can produce up to 10,000 pounds of catfish per acre, according to Anita Kelly, an aquaculture professor at Auburn University – although they're vulnerable to threats from birds, snakes, turtles, and alligators that feast on these ready available fish.

Recirculating aquaculture systems are essentially industrial warehouses where sea water is pumped into filters that feed pools that house the fish. The wastewater is re-filtered, recycled, and re-used within the tanks.

Coastal farms, meanwhile, mainly use floating net pens, which are the image most commonly associated with aquaculture; from above, these cages look like water-based crop circles.

Finally, an offshore farm is any farm that's established in strong and deep waters, Benetti says. These are the most labor-intensive forms of aquaculture—which is part of the reason why there's only one in the United States, in Hawaii. They also require innovative processes to run: Farmers use spherical cages that look like floating metal orbs of netted fish. Although they can be moored or unmoored, they're usually connected to a feed barge with a tube that pumps food to the fish.

The future of aquaculture

As aquaculture continues to expand, so do its innovations. In 2022, China, the leading producer of finfish aquaculture, launched the world's first aquaculture ship. The ship has 15 tanks – each the size of two standard swimming pools – and is expected to produce about 3,700 tons of fish annually. Because the ship is mobile, the

water for the fish is constantly exchanged with the sea, reducing the risk of disease and water pollution.

And environmentalists keep a close eye on the water quality surrounding net pens, where they say excess feed and condensed fish waste pose a danger of polluting nearby ecosystems.

To reduce that risk, some farms are looking to combine forces. In Norway, for example, one farm is growing salmon and kelp in the hopes that the kelp will absorb nitrogen and other nutrients expelled by the net pens to keep the waters clean.

As the aquaculture industry continues to grow at a rapid rate, experimentation is also ongoing. Environmentalists and farmers alike hope these new innovations and techniques will help feed our growing population, and perhaps even save our oceans.

Текст 10

Walking the Appian Way: a stroll through time on Rome's ancient road

In the southern suburbs of Rome, it's possible to walk along ancient cobbles in the footsteps of Roman gladiators, Imperious noblewoman and stars of La Dolce Vita.

The woman across the street is glaring at me. Maybe its because I'm staring at her. Maybe it's because I'm scruffy – jeans and a messy ponytail compared to her perfect hair and clothes that are the epitome of Italian chic. Or maybe it's because that striking gaze – one that says, 'Who do you think you are?' – is her pathway to immortality.

It's one that's served her well for nearly 2,000 years. In around the year 40 AD, Lucia Rabiria Demaris was sculpted like this for her tombstone. A bas relief, she hovers above the Appian Way next to her husband, whose furrowed row and pursed lips give him a quizzical air. Little is known about the pair, who are thought to be freed slaves.

They're replicas – the originals sit in the museum of Palazzo Massimo delle Terme in central Rome. And they're nothing special, really – walk along the Via Appia Antica, or Appian Way, and you'll come face to face with the past at every step. Running southeast to Brindisi, the 360-mile road was begun in 312 to connect Rome to the eastern reaches of its empire. Though much of it has been covered up over the centuries, an 11-mile stretch remains as the Parco Archeologico dell'Appia Antica, leading from the imposing gateway of the Porta San Sebastiano in the southern suburbs of Rome. You can still walk the original road, over Roman basalt paving stones, the grooves worn by carriage wheels still visible beneath your feet. Graves had to be outside the city walls in ancient times and the many tombs that were built along the Appian Way still stand.

You don't have to walk the whole stretch to get a feel for it – those basalt stones are tough on the feet, after all. I manage 2,5 miles in a day, making slow progress as there's so much to see. I start at the Catacombs of St Sebastian. Rome's famous for its subterranean tombs, sculpted from the soft rock, and here, below the church of the same name, there's a labyrinth of low tunnels to navigate, with coffin-shaped slots and mausoleums housing earlier cremations, their facades carved to look like houses. Upstairs, near the relics of the Christian martyr Saint Sebastian, is the last work of 17th-century sculptor Gian Lorenzo Bernini – a wild-haired bust of Jesus in milk-white marble.

That's the lure of the Appia Antica – it's a space where time seems to melt. You're wandering through Ancient Rome, but here's Bernini, a burst of baroque. Southwards, past the villa of fourth-century Emperor Maxentius, is the medieval Castrum Caetani, a fortified hamlet. It's wrapped around the mausoleum of Celia Metella – a Roman noblewoman from the first century BC, whose tomb stands at 35ft high, clad in gleaming travertine limestone.

Further on, another era emerges. Walking past tombs, I hear the tinkle of bells. It's sheep, the bells around their necks clanking as

they graze in the neighbouring field. Now its the 1960s – this is where Anita Ekberg in *La Dolce Vita* drives through a flock of sheep, pursued by journalists. Nearby, the gateway to a modern villa hides behind a squat mausoleum. The recycling bins sit neatly beside the dead.

Further on, as I stumble on basalt slabs beneath tall umbrella pine trees, I pass what looks like a temple, its marble columns setting the stage for the brick building behind it. In fact, its a *nymphaeum* – a fancy water feature belonging to the Emperor Commodus. Behind it's the emperor's Villa dei Quintili. I walk through a field that was once a stadium to explore the runs, wandering through corridors and past a little amphitheatre where Commodus once trained gladiators. It's my last stop – as I climb down the hill, the sun is setting behind the arches of the villa.

Returning to the suburbs, it's like suddenly being back in the 21st century. Cars roar past on a dual carriageway, and a bus waits at a stop where another stylish Roman woman looks me up and down as we climb onboard. I think of Lucia Rabiria Demaris and smile as she glares

(https://www.nationalgeographic.com/)

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И. А. Балакина, Ю. В. Кузина

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Уральский государственный педагогический университет.
620091 Екатеринбург, пр-т Космонавтов, 26.
E-mail: uspu@uspu.ru