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ЛЕКСИКО-ГРАММАТИЧЕСКИЙ МИНИМУМ ПО АНГЛИЙСКОМУ ЯЗЫКУ

Учебное пособие

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Р е ц е н з е н т ы :

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Учебное пособие составлено в соответствии с программой подготовки аспирантов к сдаче экзамена кандидатского минимума по английскому языку по всем направлениям подготовки. В нем представлены общенаучные темы и лексико-грамматический минимум к ним, нацеленные на совершенствование навыков владения научной письменной и устной речи. Пособие содержит приложение – грамматический справочник.

Предназначено для аудиторной и самостоятельной работы.

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PREFACE

This manual is addressed to graduate students of all specialties. The main objective in learning a foreign language is to achieve a practical proficiency that will allow you to use it in scientific work. In this regard, the aim is the development of communicative skills and skills of different types of speech activity. The manual consists of four sections, which offers texts for work, grammar exercises and speech exercises. The first section is highly communicative in nature and devoted to the study of topics related to postgraduate, other sections contain authentic texts to teach reading and writing scientific papers. In the selection of texts the author has tried to ensure that each text had worn a general scientific nature and was full of vocabulary related to scientific work. Active lexical and grammatical minimum is determined by the topics of the manual. The manual can be used in the study of English language in the classroom under the teacher's guidance, and for self-study and presentation of the content of reading material in oral or written form. The manual materials have been tested in practical sessions in groups of graduate students.

ПРЕДИСЛОВИЕ

Настоящее пособие адресовано аспирантам всех направлений подготовки. Основная задача при изучении иностранного языка – достижение практического владения языком, которое позволит использовать его в научной работе. В этой связи целью пособия является развитие коммуникативных умений и навыков различных видов речевой деятельности. Пособие состоит из четырех разделов, в которых предлагаются тексты для работы, грамматические упражнения и речевые упражнения. Первый раздел носит выраженный коммуникативный характер и посвящен изучению темы, связанной с обучением в аспирантуре, другие разделы содержат аутентичные тексты для обучения чтению и написанию научных трудов. При отборе текстов автор стремились к тому, чтобы каждый текст носил общенаучный характер и был насыщен лексикой, связанной с научной работой. Активный лексический и грамматический минимум определяется темами пособия. Пособие может быть использовано при изучении английского языка как на занятиях под руководством преподавателя, так и для самостоятельного изучения и изложения содержания прочитанного материала в устной или письменной форме. Материалы пособия апробированы на практических занятиях в группах аспирантов.

Unit I. You are a postgraduate student now!

Learn academic and research degrees related vocabulary:

education – образование
higher – высшее образование, высшая школа
further/post-diploma/continuing ~ – последипломное образование
college – колледж
of higher education – колледж
of technology/commerce/art – технологический, коммерческий, художественный колледж
technical – техникум
diploma – диплом
the in higher education – диплом о высшем образовании
department – кафедра, отделение
head of (the) – заведующий кафедрой, руководитель отделения
the of English/the English – кафедра английского языка
correspondence – заочное отделение
fulltime – дневное отделение
syllabus – программа курса
curriculum– учебный план
certificate – удостоверение, сертификат
council – совет
academic – ученый совет
course – курс (теоретический)
compulsory ~ – обязательный курс
optional ~ – факультативный курс/курс по выбору
to take a post-graduate (in) – поступить/учиться в аспирантуре (по)
to design/to tailor a – разработать курс
upgrading – курс повышения квалификации
specialized~ специализированный учебный курс

a taught/a by instruction– практико-ориентированный курс обучения

a research – научно-исследовательский курс обучения

completion of an academic of study – завершение курса научной подготовки

to pursue/conduct research work – вести научно- исследовательскую работу

defence/reading procedure – процедура защиты

panel – группа специалистов

proficiency – умения

attainment of mastery – достижение мастерства

multiple disciplines – разнообразные дисциплины

to fulfill the requirements – выполнять требования

scholarly – свойственный ученым

paper – научная работа (напр., доклад, диссертация, статья)

career advancement – продвижение по карьерной лестнице

to graduate (from) – закончить высшее учебное заведение

a graduate – выпускник

graduation paper – дипломная работа

an undergraduate (student) – студент

postgraduate – последипломный

a student – аспирант

studies – учеба в аспирантуре

full-time study – обучение с отрывом от работы

part-time study – обучение без отрыва от работы

field of study – область исследования

arts student – студент-гуманитарий

Bachelor of Arts (BA) – бакалавр искусств (или гуманитарных наук) (низшая академическая/ученая степень)

Bachelor of Science (BSc) – бакалавр наук (естественных и технических) (низшая академическая/ученая степень)

BA holder – обладатель степени бакалавра

Master of Arts (MA) – магистр гуманитарных наук (вторая академическая степень)

Master of Science (MSc) – магистр наук (естественных и технических) (вторая академическая степень)

Doctor of Philosophy (PhD) – доктор философии (Doctor – высшая академическая/ученая степень по любой отрасли, напр., химии, физике, истории и т. д.)

final examination (finals) – выпускной экзамен (экзамены)

to sit (for) an examination – держать экзамен

comprehensive examination – всесторонний экзамен

examiner – экзаменатор

outside – экзаменатор, приглашенный из другого учебного заведения

small group seminar – групповое семинарское занятие

practical class – практическое занятие

to specialize in a subject – специализироваться по предмету

specialization – специализация

degree – степень

with Honours (Honours degree) – степень с отличием

to "sit" for a ~ – держать экзамен на получение степени

holder – обладатель степени

to confer a ~ – присуждать степень

recipient of the ~ – получатель степени

to confer/award a ~ – присуждать степень

higher ~ – ученая степень магистра или доктора

scholarship – стипендия

fellowship – стипендия, выплачиваемая аспирантам и лицам,

окончившим университет и ведущим при нем научно- исследовательскую работу

to qualify (for) – 1) приобретать какую-либо специальность, 2) получать право (на)

thesis/dissertation – диссертация

(the) doctorate – докторская степень

tutor – преподаватель; куратор; руководитель группы студентов

tutorial – индивидуальное практическое занятие с преподавателем

tuition fees – плата, взимаемая за обучение

to charge fees – взимать плату за обучение

to train – обучать

smb. for a job/profession – готовить кого-либо к профессии

training – подготовка, обучение

well-rounded/well-grounded – всестороннее/основательное обучение

the humanities/liberal arts – гуманитарные науки

a research supervisor/adviser – научный руководитель

to submit a thesis – представлять диссертацию на рассмотрение

available – доступный

availability – доступность

staff – штат

teaching/academic – профессорско-преподавательский со став

meeting – заседание кафедры

room – преподавательская

lecturer – преподаватель

university teacher/ – преподаватель университета

senior – старший преподаватель

credit – зачет, балл; удостоверение о прохождении какого-либо

курса в учебном заведении

motivation – мотивация

variety of reasons – разнообразие причин

to undertake further study – продолжить обучение

to do a degree/to take a post-graduate course / to work towards a

PhD – заниматься в аспирантуре

to develop skills – развить навыки

competition – конкуренция

competitive environment – конкурентная среда

advantage – преимущество

to provide – предоставить преимущество

advantageous – преимущественный

to be to smb – обладать преимуществом

work experience – опыт работ

to put theory into practice – использовать теорию на практике

to succeed academically – достичь успехов в учебе

skill – навык

higher levels – навыки более высокого уровня

to develop – приобрести навыки

problem-solvings – навыки решения проблемных вопросов

to assimilate ideas – воспринимать идеи

to make smb more employable – сделать более привлекательным для приема на работу

to produce a dissertation – написать диссертацию

to benefit (from) – извлечь пользу

to generalize – обобщать

other-worldly– не от мира сего

outdated– устаревший

to treat favourably – относиться с предпочтением

to value – ценить

to specialize in a particular field – специализировать в конкретной области (знаний)

long term aims – долгосрочные цели

to take seriously – серьёзно воспринимать

Speak out on: the education you have got; why postgraduate course; how do you plan to arrange your scientific work. Use the above vocabulary.

Grammar review

Tenses in the Active Voice

I. Use the correct form of the verbs in the Active Voice.

1. Last time we (to decide) that it (to be) useful to hold presentation sessions every other month.
2. Most Universities (to award) honorary degrees, usually at the postgraduate level.
3. Research degrees (to denote) advanced study in a chosen discipline with a view to the pursuit of an academic career.
4. The emphasis on research (to prompt) recently new levels of competition amongst universities.
5. Once the student (to present) a research design acceptable to his or her adviser, the independent research phase (to begin).
6. Her successful reading of the thesis (to lead) to the award of the degree.
7. Research study, whether at Masters or Doctoral level, (to depend) upon the individual supervision of students by a member of the faculty who (to share) their interests.
8. Schools, colleges and universities (to be) the most widely spread methods of formal education and training so far.
9. There (to be) no record of what (to take place) at the latest conference.
10. In South Africa universities doctoral studies (to remain) very much the same over the years.
11. After you (to spend) quite a bit of time with the topic, usually you do not want to write about something that (not to appeal) to you.
12. How much information you (to gather) in order to check the possible value of the "future" of your studies?
13. He (to conduct) the research since he graduated from the University.

II. Translate into Russian paying attention to the language means of time indication.

1. With an ever increasing climate of competition, other countries are emerging as desirable study destinations at the moment.

2. The last decade of the 20th century witnessed a process of swift and irrevocable change leading to the third industrial revolution.

3. Your research topic has been in an interdisciplinary area so far.

4. If a student-supervisor relationship is not working satisfactorily the only proper solution will be the appointment of a new supervisor in future.

5. The expansion of Doctoral Training Centers has also been a positive step of late as has the development of other models of doctoral training.

6. Adults with advanced degrees as a rule earn more than those with less than a high school diploma.

7. We have deeply thought about the possible impact of postgraduate studies on our life.

8. So far policy makers have paid little attention to postgraduate provision, despite the fact that postgraduate education is of enormous value to the UK and will play a crucial role in economic growth.

9. These days the UK delivers 8% of world research output, and is second only to the US in a number of research disciplines.

10. The general principles of project management at postgraduate level do not, however, vary significantly across the academic disciplines.

11. Such factors as the internalization of higher education and the growth in information technology are also influencing the way in which supervisors manage their postgraduate students.

12. They asked a disinterested academic member of staff in a related research area to look over his thesis and make an independent assessment of its quality.

13. Access to education and training for all has not always been the right of all citizens and an obligation for governments.

14. Currently we are witnessing a shortage of PhD degree holders in natural sciences.

15. Mr. Brown had been working in the laboratory for seven years before he got promotion.

III. Translate into English.

1. Как правило, магистерский курс отличается от бакалавриата тем, что он включает большой объем самостоятельной работы.

2. Лишь небольшая часть слушателей уже сдали экзамены на получение степени магистра.

3. В этой стране до сих пор нет единой системы объективной оценки знаний.

4. В последние годы наблюдается повышение роли университетов как крупных исследовательских центров страны.

5. От местных органов власти студенты получают стипендии, которые покрывают стоимость обучения и иногда – стоимость проживания.

6. Он уже выбрал тему диссертационного исследования и представил индивидуальный план работы.

7. На прошлой конференции он сделал очень интересный доклад, который вызвал бурную дискуссию.

8. Поступающие в аспирантуру сдают вступительные экзамены по специальности, иностранному языку и философии.

9. До конференции он ничего не знал о результатах исследования и поэтому не включил их в доклад.

10. На том этапе продолжение исследования было нецелесообразным, поскольку аспирант не сопоставил полученные результаты с предшествующими данными.

11. Написание диссертации состоит из нескольких этапов, и он только что завершил первый.

12. Он пишет первую главу уже семь месяцев и никак не может прийти к ее логическому завершению.

13. Насколько мне известно, результаты его диссертации привели к серьезному открытию.

14. Аспирантам иногда трудно сформулировать свои идеи из-за недостатка теоретических знаний.

15. Аспирант потратил очень много времени, прежде чем получил конкретные результаты.

IV. To do and its functions:

1) semantic verb
2) auxiliary verb
3) the substitute (is translated as the substituted word)
4) emphasizes the meaning of action expressed by the predicate, is used before the semantic verb and can be translated with words действительно, все же.
5) is used in inversion (it is … that + do)

Remember the following:
as it does (as they do) –фактически, в действительности
in doing so – при этом
to do away (with) – уничтожить, покончить с
to do without – обходиться без
to have to do with – иметь отношение к
to have much to do with – иметь много общего с
to have nothing to do with – не иметь ничего общего с

V. Translate into Russian paying attention to functions of to do:

1. It doesn't do to be only too curious or inquisitive in research work.

2. The book does not simply discuss what you must do, but gives you effective tools for how to do it.

3. Every force does its own job no matter how many other forces are acting.

4. The fact that the theory does not fail in some other cases is irrelevant.

5. It should be noted that it does indeed lead to problems to be solved urgently.

6. People would agree that education has something to do with economic growth.

7. The difficulty has nothing to do with these changes.

8. More education does not necessarily mean faster growth. In general, however, it probably does.

9. The first argument relies as it does on these assumptions.

10. The labour market does not work perfectly.

11. It cannot be done satisfactorily in conditions of time and resource deficit.

12. We have eliminated all the drawbacks of the machine design. Only then did it work perfectly.

13. The investigation does, however, illustrate two basic approaches to the problem.

14. We do not possess any accurate understanding of cause and effect. Nor do we know how to evaluate the performance of the system.

15. These effects can be done away with with the help of the new model.

VI. Study the following widely used compound prepositions. Translate the sentences with them:

apart/aside from – помимо, за исключением
as to –относительно, что касается
according to - согласно
because of – из-за, вследствие, благодаря
by means of – при помощи, посредством
by virtue of – благодаря, в силу, посредством
due to – из-за, благодаря, вследствие

in accordance with – в соответствии с
in addition to – кроме, в дополнение к
in relation to – относительно, что касается
in spite of / despite – несмотря на
in view of - ввиду
owing to - из-за, благодаря
thanks to - благодаря
with respect to – по отношению к, относительно

1. In view of the great importance of this subject, a separate chapter will be devoted to it.

2. Apart from these implications, some experiments with interactive systems are noteworthy.

3. Aside from this suggestion, however, there is no other information available about these mechanisms.

4. You can never have a revolution in order to establish a democracy. You must have a democracy in order to have a revolution (G. Chesterton).

5. You will be punished or rewarded according to whether you have led a virtuous or sinful life.

6. As to the thesis it holds more generalization of the problem.

7. In spite of the complexity of the structure, the theoretical results may be considered highly satisfactory.

8. In view of this fact I decided to place much greater emphasis on general principles.

VII. Emphatic Means

Study the following emphatic means and their translation:

Auxiliary *do*.

The above law does hold.
Вышеупомянутый закон действительно работает.
I do hope you will make the right decision.

Я действительно надеюсь, что ты примешь правильное решение.

Inversion:

Relevant for this theory was the following point.

Для этой теории значимым был следующий момент.

Perhaps nowhere have been achieved better results as in this field of science.

Вероятно, нигде не были достигнуты лучшие результаты, чем в этой области науки.

Nor should we forget the importance of this discovery.

Не должны мы забывать и важность этого открытия.

А также мы не должны забывать важность этого открытия.

Double negation:

Not until X made his famous discovery did scientists realize the importance of this law.

Только тогда, когда X сделал свое знаменитое открытие, ученые поняли важность этого закона.

The case is not improbable.

Этот случай весьма (вполне) вероятен.

Cleft sentences ("Cleft" means divided. In a cleft sentence information which could be given in one clause is divided into two parts, each with its own verb):

It is these results of the research that are most important for us.

Именно эти результаты исследования чрезвычайно важны для нас.

It was not until last night that Susan received an invitation to the conference.

Только вчера Сьюзан получила приглашение на конференцию.

It was Richard who was sent to England to study.

Именно Ричарда отправили в Англию учиться.

A. Start the sentence with the suggested words.

1. I've never heard of such a good University course. – Never have I …

2. I had hardly received the results of the first experiment, when new requirements were put forward for the second one. – Hardly had I …

3. It may seem strange, but I don't enjoy conducting out my research. – Strange as it …

4. I have never met a more disorganized student. – Never have I …

5. Although it may seem difficult, it is not impossible. – Difficult as it …

6. In this very paper new data on the subject are presented. – It is in this paper …

7. You must not reveal your secret results in any circumstances. – In any circumstances …

8. When I completed my research I realized how much had been done. – Not until …

9. This theory may be satisfactory in many respects but it is far from being probable. – Satisfactory as this theory …

10. For that reason the present book is both timely and appropriate. – It is for that reason …

11. The results of any research work can be presented in different forms. – Whatever the results …

12. Although it is hard but we must finish this research. – Hard as …

13. These results may seem controversial, but they are still valuable. – Controversial as …

14. You can't have read the same book. – It can't have been …

15. The facts were not all made public until later. – Only later …

B. Translate into Russian paying attention to the language means of emphatic use.

1. It is the academic staff's responsibility to monitor the progress of the research that ensures the students' mastery of the appropriate research skills.

2. The advances of modern sciences are seen to be not inconsiderable.

3. If you suffer a mental block, have lost confidence, or if anything at all is interfering with your work, do let your family know.

4. It is the supervisor's expertise that helps conduct the research in the right direction.

5. Not only should a doctoral dissertation be of a high quality, but it should also make a significant contribution to a particular field.

6. The statistics do, however, indicate that only 50% of researchers complete their doctorates.

7. It was the University of Bologna in Italy that first conferred the degree of Doctor in the late 12th century.

8. Perhaps never was the invention mentioned above shared by so many scientists all over the world.

9. Nowhere can we see such rapid progress as in computer science.

10. Strange as it may seem, the debate on the subject went far beyond its original bounds.

11. It was not until the 5th century that the first universities were founded in Byzantium.

12. Whoever may the author have been he should have dwelt on this problem.

13. It is the three-level hierarchy of degrees that is gradually replacing the two-stage system which is still used in some countries.

14. It was because I answered confidently at the interview that I got the job.

15. Not until I got the final results did I realize how much had been done.

C. Translate into English.

1. Именно с научным руководителем аспирант определяет сроки работы над каждой частью диссертации.

2. Кто бы ни высказал замечания по моему исследованию во время обсуждения, я буду внимательно относиться к каждому из них.

3. Всякий раз, когда возникает проблема, обращайтесь к научному руководителю.

4. Хотя эти замечания и противоречивы, они должны быть проанализированы.

5. Именно научные факты характеризуются объективностью, достоверностью и точностью.

6. Он действительно просмотрел и изучил абсолютно все виды источников, которые имеют отношение к исследуемой в диссертации научной проблеме.

7. Не должны молодые ученые игнорировать и возможность отстаивать свою собственную позицию.

8. А также мы не должны забывать и о других методах анализа фактического материала.

9. Именно в архивах он нашел необходимые документы по изучаемой проблематике.

10. Только после того, как диссертант выступил на нескольких научных симпозиумах, он приобрел опыт публичного выступления.

11. Я действительно знаю, как добиться хорошего результата.

12. Как ни трудно, ты должен завершить теоретическую часть как можно быстрее.

13. Хотя результаты исследования спорны, они все-таки представляют определенный научный интерес.

14. Только после того, как он завершил экспериментальную часть, работа была представлена на обсуждение.

15. Какой бы сложной ни была научно-исследовательская работа, в конечном итоге она всегда приносит удовлетворение.

WHY POSTGRADUATE STUDY?

Speak out on the following:

What is your personal motivation for taking a post-graduate course? Is it only because it helps in future career development? Sum up all pros and cons. The text below provides you with extensive information worth thinking about and will help you find the right answer.

Read the text below and answer the following questions:

What are the main motives for undertaking study for PhD degree?

What is your motivation for taking a post-graduate course?

Is there a difference between studying for a research degree and studying for an undergraduate degree?

What qualities should a post-graduate student possess and develop?

What are the benefits of having a postgraduate qualification in relation to future employment?

Do you think that most employers will appreciate the skills that you bring after your postgraduate course?

Do you think that you will have any definite opportunities for a career promotion?

Are you going to deepen your research experience and enroll for studies for another degree?

Career Prospects

Postgraduate study is undertaken for a variety of reasons but usually with some career aim in mind. Just getting a university degree isn't enough nowadays, many undergraduates feel an extra qualification is a way to distinguish themselves from a large number of job-hunters. A higher degree can open new options to them when entering the same job market as an undergraduate. Employers are increasingly looking for graduates who can demonstrate both breadth and depth of subject knowledge.

To find the right career for you, you need to think about the occupations and jobs available – the skills, qualifications, experience and aptitudes you need and whether they are right for you. Postgraduate study is fundamental to the development of higher level skills. The process of achieving a research degree develops an enquiring mind, independence of thought, problem-solving abilities, an ability to work autonomously and the ability to assimilate, articulate and defend new ideas. The benefits of post-graduate education are obvious: development of key skills, the chance to put theory into practice, greater understanding of career choices, valuable career contacts for the future.

Postgraduates are among the most intelligent students. They tend to be people who have succeeded academically and employers are taking postgraduates much more seriously. Having organized their own studies, postgraduates can be good project managers, experts in analysis, and capable of working through complex processes without being intimidated.

A postgraduate qualification from the KSAU will provide an excellent route to better career prospects. Students from KSAU are employed not only in the agrarian sector of the Krasnodar Territory, but all over the country and abroad as well. The University's graduates benefit from the tradition of strong ties with business,

agriculture and industry. The KSAU's high quality facilities and teaching and its interdisciplinary approach to research will enable trainees to make the most of research and learning opportunities available whilst studying for a scientific degree. All students here receive appropriate and relevant preparation, training and support for their development. They are helped to publish their research findings, complete a doctoral thesis and to develop a range of knowledge, understanding and skills necessary for their future employment.

The current postgraduates are surely busier than their predecessors. Not only are they working to finish their dissertations within the three-year period of their awards but engaged in other activities entirely appropriate to their stage of career: they often do teaching, attend conferences and meetings, make research trips. The postgraduates are taught to make practical progress in the number of key areas of academic endeavor, with a view to having a significant body of experience by the time they complete their degrees. They will have had experience in delivering their material in a public forum, and will have made an attempt to develop their presentation skills.

Employment opportunities demand well developed language skills. The course of a foreign language will provide language training opportunities for all students whatever course they are taking.

Students working towards a PhD have already completed a Master's degree. It is crucial that learners considering this option have a deep interest in their subject and a commitment to producing a piece of original research despite the pressure to complete the dissertation on time and have a certain number of publications. It is equally important that they have a research topic which is both interesting to them, and viable in the context of a research degree. Whatever career path a postgraduate chooses most employers are sure to value the skills he has developed while doing a degree.

Discuss with your group-mates the issue of…

• motivating reasons for doing a post-graduate course (to undertake further studies, career plans, to make more employable, to provide advantage, to stand out of the crowd, to enjoy the subject);

• qualities a young researcher must possess to be a success (to enjoy problem solving, creative abilities, industrious, patient, inquisitive mind, a high level of intellectual ability, a high degree of organizational ability and time management, to work in a library);

• career prospects for post-graduates (better career prospects, a key role, to make a person more employable, to put theory into practice, to benefit from, specific skills).

Unit II. Reading science

I. Study the list below, choose the reason you read science and say at what stages of your career these are relevant.

Science reading can help me to
be well informed in my and related fields of science.
get ideas for research.
keep up with developments in my field.
find work I want to…..
check out the competition.
find out what is happening in related areas.
find someone I can correspond with about my work.
find someone I would like to work with.
study examples of articles to see how they are written.
read the work of the actual authors, not summaries or reviews.

II. According to present understanding of your situation mark the following as T (True) or F (False). Compare your opinion with the classmates.

____ Reading science in English is very difficult for me.

____ Knowledge of the basics of English does not solve the problem.

____ Most science writers consider their readers have the same background.

____ The less terms there is in science writing, the easier it is to read.

____ Science is incomprehensible for non-specialists.

III. Read the following and decide if it confirms your opinion about how difficult it is to understand scientific articles. Share your opinion with the class.

The Growing Inaccessibility of Science

There is plenty of evidence that large areas of scientific literature are becoming incomprehensible to all but a few initiates. Is really so? There is an objective way of looking at the matter. It is a method for measuring text difficulty. The data are taken from articles describing research in four categories of publication: general science (Nature, Science and Scientific American); ten professional journals in astronomy, biology, chemistry, geology and physics: scientific textbooks for introductory college courses; and popular science magazines.

In a nutshell, the analyses confirm impressions that research papers are written for specialists.

In measuring the difficulty in a piece of writing each sample text is assigned a difficulty scale score based on its choice of words from full English lexicon.

For 125 years, between 1845 and 1970, the use of vocabulary in Scientific American was at or slightly below the level of a mod-

ern newspaper; indeed Scientific American, for its 75 years, was a weekly newspaper of technology and science. Its language began to resemble that used in professional science journals after 1970. Interestingly, when the difficulty of the average article approached 15, there was a decline of over 125,000 subscribers, implying that many readers found texts written at those levels too opaque. When the level of Scientific American later dropped towards 10, there was a coincident increase in subscribers.

Note the new words you have come across in the text. List those that you will probably use again and explain to the class how and why you might use them.

(From Moya Brennan. Science education and Training. Heinle Publishers, 1995)

IV. Below is an outline of a three-page article entitled "An economic analysis of split application of organo-mineral fertilizer on okra in humid forest zone of Nigeria" from the *Journal of Food, Agriculture and Environment.* Scan the headings and explain which section you would read first and why.

Journal	*Food, Agriculture and Environment*
Title	An economic analysis of split application of organo-mineral fertilizer on okra in humid forest zone of Nigeria
Authors' names	
Authors' affiliation	
Abstract	
Key words	
Introduction	
Headings and subheadings, e.g.: Materials and methods	
Results	
Discussion	
Conclusions	
References	

Illustrations and captions, e.g.: Table 1. Cost of production of okra under various time of application of organc based fertilizer (Naira per hectare) Table 2. An economic analysis of split applica tion of combination of organic and inorganic fertilizer in okra.

V. Compare outlines of two articles. Work on your own and then as a class.

1. Skim through a couple of articles in your journal and choose one to outline (you may use Supplement 15 for this purpose).
2. Write the outline on a piece of paper to display on the whiteboard.
3. As a class, review the range of similarities and differences in the formats of the articles.
4. Discuss the form and function of other headings, such as Acknowledgements and the Received/Submitted date.
5. Explain which articles you think are more accessible and why.

VI. Study an article from one of the journals. Where is the newsworthy information contained, at the beginning or at the end?

VII. Study the body of an article from your journal.

1. The traditional sections are an Introduction, Literature Review, Methods, Results, then the Discussion. How closely does your article follow this pattern? If not, why not?
2. From the Introduction give the background to the area of research. Mention what research has been done so far. State how their research will solve that problem.

3. Compare the organization of Conclusions with you group and discuss any pattern organization.

4. Choose an article or journal to present to the class. Discuss the language, the research focus, the headlines and sections, and the audience. Use the following framework for your presentation:

My article/journal is…

I choose this article/journal because…

Briefly, this is what is covered in this article/journal. First,…

These are the key words used…

The people who will probably read this article/journal are…

It is easy/difficult to understand because…

I would recommend this for these reasons…

VIII. Discuss the following:

1. "Prestige science is done in English." Is this statement chauvinistic, elastic, or simply an observation that English has become a standard for communication?

2. It is important for ordinary people to understand the work of a scientist. What is your opinion on the accessibility of science to general public? What examples are there in your field that science "is created by technology and creates it"? Is there a "relationship between scientific thought and other forms of thought"?

3. Is scientific writing impersonal and factual? Can one find examples of polite disagreement and humor in journal articles?

IX. Read the following text to yourself and decide whether it is science, popular science, or a joke.

A Woman As Seen By A Chemist

Symbol: Wo

Accepted atomic weight: 120

Physical properties: Boils at nothing and freezes in a minute. Melts when properly treated. Very bitter if not used well.

Occurrence: Found wherever man exists.

Chemical properties: Possesses great affinity for gold, silver, platinum and precious stones. Violent reaction if left alone. Able to absorb great amounts of food matter. Turns green when placed beside a better looking specimen.

Uses: Very ornamental, useful as a tonic in acceleration of low spirits, and as an equalizer in the distribution of wealth. It is probably the most effective income reducer known.

Caution: Highly explosive in inexperienced hands.

Translate the text into Russian, indicating the words and word combinations which are to be found in serious scientific writing, but are used figuratively here.

X. Read the following text and answer the question contained in the title.

How to Find the Main Idea of the Paragraph

First, remember that in the majority of paragraphs the first sentence expresses the main idea.

Second, read the first sentence of the paragraph to understand it is so that you'll be able to relate it to everything else in the paragraph – or for that matter, in the entire selection.

Third, skip to the last two or three sentences in the paragraph.

Fourth, read these last sentences rapidly. If one says the same thing as the first sentence of the paragraph, you'll know the first sentence contains the main idea. If one expresses a different idea, you'll suspect that it, and nor the first sentence of the paragraph is the topic sentence. And if these last sentences of the paragraph are clearly supporting details of the idea in the first sentence, you'll know that the first sentence of the paragraph is the key one.

When doubt remains, there is a fifth step. Since a paragraph is about something – follow the dominant noun from first to last. Pick it up at or near the beginning and see it through its repetitions,

as well as through its transformations into pronouns and synonyms. Doing this will lead you to the main idea, or convince you that the first sentence was, after all, the topic sentence.

In fact, we offer this procedure not so you spend a lot of time locating the main idea, but so you can do it quickly. On any occasion, don't use any more of the steps than necessary, often only the first two will be required. You are really aiming to see the structure or organization of the paragraph. A later aim will be comprehension of all the writer's material in the paragraph. Then you'll read more slowly, and more carefully.

Grammar review

Multi-word verbs
(common verbs that combine with 'particles' like *at, away, down, in, off, on, up,* and so on)

1. Without an object
The truck *broke down* on the freeway.

2. With an object – separable
(adverb particles can go before or after noun objects)
Could you *switch off* the computer?
Could you *switch* the computer *off*?
But:
The particle cannot be used before a pronoun
Could you *switch* it *off*?
Not: Could you switch off it?

If the noun phrase is long, it is very unusual to separate the verb
and particle.
We've *narrowed* the number of choices *down* to three.
Not: We've narrowed the number of choices down that we think are feasible to three.

3. With an object – inseparable
(preposition that follows the verb goes before the object)
I'm *counting on* your support.

4. With an adverb particle and a preposition
They are trying to *back out of* our agreement.

I. Translate the following into Russian:

1. Neither of our opponents would give in.
2. Our policy is never to turn away from a customer.
3. She has thought up a new title for our article.
4. A number of reasons can account for the changes in our experiments.
5. He came in for a meeting with her supervisor.
6. I was completely taken in by your report.
7. I tried to fix up the date of the conference.
8. When he asked a lot of questions I couldn't understand what he was getting at.
9. He turned up very timely for us to finish the work.
10. We have carried out all the experiments in the research laboratory.

II. Match the sentence halves.

1. I'm trying to make up … .
2. The advertising agency is trying to think up … .
3. They've decided to wind up their operations … .
4. It is difficult to keep up … .
5. The final chapter sums up … .
6. They need more facts to back up … .
7. To set up our own business … .
8. He's been away from the meeting, so he needs to catch up … .
9. The lawyer has drawn up … .

10. I can't work up … .
11. Did the insurance company pay up … ?
12. If the statistical agency refuses to give necessary data to us … .
13. How long did it take you … ?
14. Can you help me … .

a) to clear up the mess
b) the time I lost being sick
c) we need some capital
d) after all that argument
e) a brilliant new slogan
f) the terms of the contract
g) with all the latest developments
h) in Africa and relocate
i) their arguments
j) with what's being on
k) to save up for a new car
l) the results of the research
m) any enthusiasm for the idea
n) it'll mess up all our plans

Tenses in the Passive Voice

Study and analyze the following translation tips:

1. The researcher's findings are dealt with in the present article.

В данной статье рассматриваются выводы исследователя.

2. Information from encyclopedia is always relied on in scientific circles.

На информацию из энциклопедии всегда полагаются в научных кругах.

3. The article mentioned above is often referred to by young researchers.

На статью, упомянутую выше, часто ссылаются молодые ученые.

4. This author is much spoken of.

Об этом авторе много говорят.

5. The report was followed by lots of questions.

За докладом последовало множество вопросов.

6. These terms will be insisted upon.

На этих условиях будут настаивать.

I. Use the right tense and the Passive Voice in the following sentences:

1. A new theory (to discuss) already.
2. The experiments (to finish) two weeks ago.
3. This idea (to put) forward in the near future.
4. We expect his findings (not to criticize) at the forthcoming conference.
5. At present a new technique (to develop).
6. Projects (to supervise) by the teacher, but only in a general way; the actual work (to do) by the students themselves.
7. An interesting phenomenon just (to register) by a young scientist.
8. The result of this experiment (to publish) in his latest article.
9. A new discovery (to speak) much about.
10. Lately the problem (to approach) by many researchers.
11. Special attention (to draw) to the latest findings.
12. Apparent errors in the analysis (to deal with) in the report.
13. The article gives examples of different methods which (to use) over the years.
14. In Europe degrees (to harmonise) through the Bologna process, which (to base) on the three-level hierarchy (Bachelor, Master, Doctor).

II. Complete the following sentences with the verbs in the Passive Voice:

1. They wrote a report in a terrible hurry. The report …
2. The clerk finally found the necessary notes. The notes …
3. We will produce the results of the experiment at the exhibition. 4. The results …
5. They are noting down all information in important lectures. All information …
6. They improved the memo to the committee to make it easier to understand. The memo …
7. They haven't included the mailing address in the letter. The mailing address …
8. We will make our suggestions in writing. Suggestions …
9. The suppliers will make further modifications to the machine. Further modifications …
10. He realized he had achieved better results when he started working harder. Better results …
11. The organizers of the meeting supplied all relevant information in advance. All relevant information …
12. Postgraduates are entering the same job market as undergraduates. The same job market …
13. He has already completed a Master's degree and is currently working towards a PhD. Master's degree …
14. The supervisor guides reading and research of students admitted to work for scientific degree. Students …
15. They have advised me to contact the member of the staff with the appropriate interests to talk about possible projects. I …

III. Differentiate between Ved forms: Simple Past, Perfect or Passive voice:

1. This problem was first identified some thirty years ago.
2. A group of scientists suggested this idea at the conference.

3. At once the idea was suggested to apply it to practical research.

4. The laboratory has an analyzed all possibilities to obtain the results as soon as possible.

5. Though some of them were tested experimentally, the results were not generally accepted and the idea was postponed.

6. Then a new model was proposed which has been recently modified.

7. Now it is used in many practical situations.

8. The postgraduates of our group assisted me in presenting the results of my research.

9. At the closing session they decided to advance a new idea.

10. During the talks they gave a presentation of the new methods they used in calculations.

11. The presence of foreign particles in the substance caused several problems.

12. With their new approach they obtained a strong acid.

13. They cited several observations to illustrate the difficulties.

IV. Consider the ambiguity of Ved forms in sentences and then translate the following sentences.

… N … Ved …Ved (Prep.) …

… N … Ved …Ved (Prep.) … N

The hypothesis proposed agreed with the experimental observation.

For some time scientists remained interested in the methodology.

… N … Ved (Prep.) … Ved (Prep.) … N

The institute installed modernized equipment.

The equipment installed modernized our laboratory too.

1. The method applied increased the accuracy of the results.

2. The researcher theoretically predicted complicated interaction between the components involved in the process.
3. At that time the problem presented increased danger of radioactive contamination and encountered opposition at most laboratories concerned.
4. The discovery followed by further experimental work stimulated research in this area.
5. The hypothesis concerned synthesized materials and did not apply to natural products.
6. The crystal produced revealed cracked faces.
7. The discovery followed by further experimental work stimulated research in this area.
8. The heads of the laboratories were asked questions formulated by a group of biologists.
9. The scientist's eloquence substituted for logical argumentation in defending an "extreme" viewpoint failed to win the audience over.
10. The subjects dealt with under this topic aroused a heated discussion.
11. The model suggested described adequately the peculiarities studied by Professor N.
12. Last month our laboratory developed a new technique required for experimental studies of the two-phase system.
13. The technique allowed us to obtain results predicted by theory.
14. The results obtained disagreed with earlier data obtained at our laboratory.

V. Translate into Russian paying attention to tense and voice forms of the verbs.

1. These data are often referred to.

2. A doctoral degree is awarded for the creation of original piece of research.

3. In pre-literate societies, education was achieved orally, and through observation and imitation.

4. Postgraduate level for professional advancement is being developed now.

5. Until recently, the issue of whether there is fair access to postgraduate study has been neglected.

6. New supervision arrangements to supplement the conventional single-supervisor structure have been established.

7. Although both taught and research courses are partly subsidized by government, higher education institutions recover most of the costs of provision via tuition fees.

8. A murky piece of writing is usually set aside by the reviewers.

9. There is no doubt that in the course of further development of this science the new method will be extensively made use of.

10. This inaccurate method has been done away with.

11. By the end of the term the results of this research will have been discussed.

12. None of the data on this problem were published in the latest journal.

13. The list of abbreviations is referred to in the preamble.

14. The report was commented on at the seminar.

15. A well-written paper will stand a better chance of being accepted.

16. A truly murky piece of writing is usually read by only the closest colleagues of the author.

VI. Study the verbs with or without a prepositional complement in Russian and in English. Translate the following sentences paying attention to these verbs in Passive.

to affect - влиять (на); to account for - объяснять, учитывать;

to answer - отвечать (на); to agree upon – договариваться (о);

to approach - подойти (к); to call for – требовать, призывать (к);

to attend - присутствовать (на); to deal with – иметь дело (с), рассматривать;

to consult - консультировать- to refer to – ссылаться (на), ся (у, с); упоминать;

to enjoy - получать удовольст- to refer to as – называть(-ся); (от), пользовать- to rely on/upon – полагаться ся (на);

to follow - следовать, следить to substitute for – вводить, (за); подставлять (вместо);

to influence - влиять (на); to think of – думать (о);

to join - присоединяться (к) to think of as – считать.

to watch- наблюдать (за); to touch on/upon – затрагивать, касаться

1. He is easily influenced by his teacher's ideas.

2. This method has been referred to in our earlier work.

3. The conference was attended by all first-year students.

4. The distribution of plants is greatly affected by climatic conditions.

5. As is shown this instrument cannot be relied upon.

6. The lecture was followed by a heated discussion.

7. The obtained data cannot be accounted for by the existing theory.

8. This theory has been referred to as the "big bang" theory.

9. The university students are offered a curriculum of study which is followed by state examination, reading their diploma project and the award of a degree.

10. The best treatment of this disease is being agreed upon now.

11. The laboratory assistants were consulted prior to this operation.

12. Rapid development of chemical technology has been called for by the needs of national economy development.

13. For details the reader is referred to the material in Supplement.

14. The problem of terminology was touched upon in the previous chapter.

VII. Translate into English paying special attention to the tense forms of the verbs.

1. Никакого решения до сих пор не было найдено.
2. О недавнем выступлении этого ученого много говорят в научных кругах.
3. Здесь не затрагивали проблему терминологии.
4. Было предложено обсудить проблему на конференции.
5. В этой главе речь идет об особенности нового научного метода.
6. На какого автора ты будешь ссылаться, чтобы доказать твое понимание проблемы?
7. За лекцией последовал ряд секционных заседаний, на которых рассматривались наиболее дискуссионные вопросы.
8. Новый подход к определению данного явления рассматривался в последнем номере журнала.
9. Происходящие изменения нелегко объяснить.
10. Требуется более точный подход к анализу данного явления.
11. Было обнаружено, что полученные результаты противоречат предыдущим.
12. Конференции будет предшествовать пятидневный эксперимент.
13. Новая программа только что была запущена.
14. Чтобы избежать ненужных ошибок, статью необходимо тщательно отредактировать.
15. Их поддержит Координационный Совет с представителем от каждой организации.
16. Тем, кто интересуется условиями вступления в эту организацию, будут даны исчерпывающие ответы.
17. Аннотация должна начинаться с обоснования проблемы.

Unit III. WRITING RESEARCH PAPERS

Study the following vocabulary before reading the following text:

prepare a paper for submission – подача, представление
finesse – тонкость, утонченность, искусность
article/ paper/ piece of writing/ publication – статья
well-written – хорошо написанная статья
murky and poorly presented ~ неясная и плохо представленная статья
reviewer – рецензент, критик
accept – принимать
revision – пересмотр, изменение, доработка
make an effort – предпринять попытку
decipher – расшифровывать, разбирать, разгадывать
the benefit is not worth the effort – овчинка выделки не стоит
quote – цитировать
cite – ссылаться, упоминать
to keep reader in mind – учитывать читателя
convey information – передавать информацию
lucid – ясный, четкий, понятный
level of expertise – уровень знаний
title – название, заголовок
abstract – резюме, аннотация
meaningful – содержательный, значимый
teaser – головоломка
impact – воздействие, влияние
rationale – обоснование, основная причина
adhere to – придерживаться
spell out – изложить, разъяснять
reject – отвергать, отказывать
irritate – раздражать
error – ошибка

to eliminate ~s – устранить ошибки
spelling ~ – орфографические ошибки
punctuation ~ – ошибки пунктуации
grammatical ~ грамматические ошибки
accuracy – точность
references – ссылки
reference list – список цитированной литературы
sloppy manuscript – неудачная рукопись
responsibility rests solely with the author – ответственность лежит исключительно на авторе
introduction – введение
captions for the tables and figures – подписи под таблицами и схемами
label – маркировать, помечать, обозначать, назвать
concise – лаконичный, краткий, четкий
believe it or not – верьте или нет
eliminate – устранять, ликвидировать, исключать
frequently – часто

Read the text and answer the questions below

Become a More Successful Author

The "Suggestions for Contributors" pages that appear in this journal from time to time give the bare essentials of preparing a paper for submission. This new section will also appear from time to time with suggestions that go beyond the basics and help authors prepare their papers with finesse.

Scientific journals have but one purpose, to transmit information from writers to readers. If a paper already conveys the facts of the research, why should its author be concerned about finesse? There are basically two reasons. First, because a well-written paper will be more readily understood by the reviewers. This means the paper, will stand a better chance of being accepted and will be published in less time with fewer revisions. Second, because the

readers of the journal are more likely to read and understand a well-written paper than they will a murky and poorly presented one.

The reviewers and readers of this (and every other) journal are busy people. They probably want to read your paper, but they also have their own research to conduct and their own papers to write. On top of that, they have other demands on their professional and personal time. When faced with a murky piece of writing, these reviewers and readers will make an honest effort to read it. If they cannot decipher the paper immediately they probably will set it aside until they have more time to devote to it. But after a couple more tries at reading the article they are likely to decide that the benefit is not worth the effort. The author and his or her closest colleagues will be the only people who read a truly murky piece of writing. If the paper is written somewhat better a few more scientists in the field, and perhaps a few more in a closely related field, will read it.

A truly outstanding piece of writing will be widely read, widely quoted and cited, and will bring great rewards to its author. In short, the time spent on producing a truly outstanding paper will be rewarded by higher acceptance percentages from journals and by greater recognition and acclaim from one's peers. The secret of producing an outstanding piece of writing is to always keep the reader in mind. Authors who keep readers in mind convey their information more lucidly than authors who write only for themselves. The scientist who has the attitude, "Why should I worry about how this is presented; everybody knows what I mean," is incorrect; everybody does not know. The person whose native language is not English may not know; the student who is only beginning to approach the author's level of expertise in the subject area may not know; and other scientists in similar but separate fields may not know. The thoughtful scientist-writer keeps these people in mind.

Title

A good title will attract readers who might not otherwise read the paper; a poor title will hide the paper's contents from even the most interested. That's why the specifications call for six to 12 words, no abbreviations---ever, and no Latin names if an English name is available. Begin with the key words, not with a low impact phrase such as"Effect of..."or"Influence of..." Eliminate ambiguous words.

Abstract

The abstract should be meaningful by itself, not a teaser. It will be read by 50 to 500 times more people than the full paper. Therefore, the abstract should convey information itself, not just promise it. Never use such phrases as"... are described" or "... will be presented" in an abstract. Instead, describe them, present them. Always begin the abstract with rationale and objective statements; never jump directly into the materials and methods. When a person reads an abstract that begins, "The effect of chemical A on plant B was studied..." that person has the perfect right to ask, "why was it studied?"

General Suggestions

Adhere to the style spelled out for ASA-CSSA-SSSA journals. If you don't, reviewers might think you wrote the paper for another journal and sent it to us after it was rejected there. This is not the best attitude for a reviewer to have as he or she begins to read your paper. An irritated reviewer is no better than a negatively disposed reviewer. What irritates reviewers? Unnecessary errors. Edit your paper carefully to eliminate spelling, punctuation, and grammatical errors. Even after you are finished and you know the paper is perfect, lay it aside for a few days and then read it again. Check the accuracy of your references scrupulously. You wouldn't be-

lieve how many papers arrive at a reviewer's desk with incorrect dates, titles, and author names in reference lists; or one year of publication or spelling of the author's name in the reference list and another in the text citation. Scientific editors and Headquarters editors are not supposed to rewrite a poorly written or sloppy manuscript; that responsibility rests solely with the author. If you have difficulty writing scientific English, consult a colleague who you know writes well, or seek the services of a professional editor who will help you for a fee. We can provide names and addresses of Tri-Society members who have volunteered to help authors whose first language is not English.

Writing the Paper

Organize your paper so that it answers four basic questions:

1. What did I set out to do and why? Introduction.
2. How did I do it? Materials and Methods.
3. What did I learn? Results.
4. What does it mean and how does it relate to what else is known?

Discussion and Conclusions

(and Summary also, if the paper warrants one).

In the introduction, discuss only work that is directly related to the work you are describing. Don't cite every paper written on the subject; cite only the most important ones or key review papers. Three or four citations (never more than six) are plenty to corroborate a statement. Avoid repetition; don't repeat the abstract in the introduction or the introduction in the discussion, if you give a botanical name, chemical name, or a soil description in the abstract, don't repeat it in the text. It is necessary to repeat some of the information from the text in the captions for the tables and figures, because readers generally study the tables and figures before they

read the text. In the text, refer to tables and figures, but don't repeat them.

Don't mix fact and opinion; when you include opinion or speculation, clearly label it as such. Be concise, don't ramble. Short, concise papers are more likely to be accepted than long, rambling papers (and will cost less to publish).

Constructing the Sentence

Scientific writing contains far too much use of passive voice; let's start moving away from it, as we tried to do in this piece. Regardless of what anybody tells you, it's okay to use first person in scientific literature. You don't have to say "the research was conducted," you may say "we conducted the research." With very few exceptions, don't write sentences that require use of the word" respectively"; they are extremely difficult to read. Too many sentences in our journals are constructed in this manner: "Water contents were 92, 128, and 280 g kg -I for samples 5, 6, and 18, respectively." It is much easier to read and decipher, "Water contents were 92 kg ha-t for Sample 5, 128 for Sample 6, and 280 for Sample 18." Believe it or not, we actually received a manuscript with the following sentence: "Planting was done on 20, 25, 28, and 3 of May, May, May, and June in 1985, 1986, 1987, and 1988, respectively."

Word Use

You can eliminate some words without changing the meaning of a sentence. The word "located" is a good example; it can be eliminated from almost every sentence without any loss in meaning. "The plots were located near Ames, IA." is better as, "The plots were near Ames, IA." Both sentences convey exactly the same meaning; the word "located" adds nothing. Similarly, the word "that" is unnecessary in many sentences. Here are three other words that can be deleted: prior history (all history is prior) careful

examination, careful study (would you do it any other way?) very (the only time this word contributes anything is in certain negative sentences, "It isn't very effective.")

The following four phrases, which frequently appear in scientific literature, could be eliminated and never missed: it is shown that it is a fact that; it is emphasized that it is known that. And have you ever noticed, there is no such thing as rain in our journals? Whenever it rains it is always a "rainfall event" or even a "precipitation event."

Other words are used to mean things they never were supposed to mean. A good example is the word "over"; it means "above," but authors use it incorrectly to mean such things as:

Correct word(s)	*Incorrect use of"over"*
with, during	growth over time, happened over the week-end
onto	fertilizer was spread over the field
more than,>	took over 70 samples, yield increased by over 10%
from, across	pooled over three locations
of	two replications over six dilutions
with	changes in concentration over time
to	traffic applied over 100% of the soil
across	sampling was stratified over soil taxonomic groups, drove over the field
through	accumulated over the years
here	came over after work

Such words as "parameter, ... following," "facility," and many more are grossly misused in scientific literature. Time does not have points, so there can be no such thing as a "point in time." Instead of saying "at this point in time," simply say, "at this time."

Here is a list of long words and phrases and a comparable shorter way to say the same thing:

Instead of	*Use*
appears to be -	seems
in the absence of	without
higher in comparison to	more than
was found to be	was
in the event that	if
small number of	few
was variable	varied
approximately	about,
at the present time	now
establish	set up, prove, show
identify	find, name, show
in a timely manner	promptly
necessitate	cause, need
operate	run, work

Conclusion

Scientific writing is not difficult, but it also is not nearly as easy as some would think. Practically any scientist can write well enough to get by and be understood by a few. If you want to do more than this, take time for additional input, study, and practice. You could find a far higher percentage of your papers being accepted, or at least have your papers accepted more quickly, than they have been until now. Who knows, you might even become one of those rare scientists who write well enough to have an impact far outside your field of study, regardless of how narrow that field might be.

(Inspired by a paper in the journal Neurology, and developed for the Tri-Societies by an ad-hoc committee of all the editors-in-chief and editors, plus Headquarters staff editors. Contributors included G.H. Heichel, D.E. Kissel, C.W. Stuber, G.A. Peterson,

J.L.Hatfield, R.G. Hoeft, R.J. Wagenet, T.J. Logan, W.A. Anderson, and W.R. Luellen.)
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1. Have you any publications?
2. Did you experience any difficulties in writing your paper? What were they?
3. Has your piece of writing ever been rejected? If so, what revisions it needed to be accepted?
4. Do you use many abbreviations in your paper? What is the rule for using them?
5. How do you structure your paper?
6. What language means do you use to differentiate between fact and opinion?
7. Are the hints of the article useful for you? What of them were not used by you?

Grammar review

Infinitive and Infinitive Constructions

Translation tips:

Functions:

1. To live is to struggle.
Жить значит бороться.
2. To live here, we should find a job first.
Чтобы жить здесь, нам следует сначала найти работу.
3. This method is not reliable enough to give the desired results.
Этот метод недостаточно надежен, чтобы дать желаемые результаты.
4. The discussion was prolonged so as to give the floor to all participants of the dispute.

Дискуссия была продлена с тем, чтобы дать слово всем участникам диспута.

5. The difficulty will be to report on the obtained data.

Трудность будет заключаться в том, чтобы сделать отчет по полученным данным.

6. The report to be presented next is very important.

Доклад, который будет представлен следующим, очень важен.

7. She was the last to finish laboratory tests.

Она последней закончила лабораторные испытания.

8. There are many evidences to support his theory.

Существует много свидетельств, которые подтверждают его теорию.

Constructions:

1. For the experiment to be continued new reagents should be used.

Для того, продолжить эксперимент, следует использовать новые реактивы.

2. It is for you to decide what working schedule is the most effective.

Именно вам решать, какой график работы наиболее эффективный.

3. It is necessary for the report to be delivered in English.

Необходимо, чтобы доклад был представлен на английском.

4. We know our laboratory to get new equipment.

Мы знаем, что наша лаборатория приобрела новое оборудование.

5. We know you to take part in the world symposium.

Мы знаем, что вы приняли участие во всемирном симпозиуме.

6. This research is known to be highly appreciated by the scholars and engineers.

Известно, что это исследование высоко оценили ученые и инженеры.

Это исследование, как известно, высоко оценили ученые и инженеры.

7. He seems to know the real motives of the crime well.

По-видимому, он хорошо знает реальные мотивы преступления.

8. They are unlikely to have time enough to get ready their presentation for in the conference.

Вряд ли у них будет достаточно времени, чтобы подготовить свою презентацию для конференции.

9. These urgent problems are likely to be widely discussed at the symposium.

Вероятно, что эти насущные проблемы будут широко обсуждаться на симпозиуме.

10. His plans have never been thought to be so far-going.

Никогда не думали, что его планы настолько далеко идущие.

11. There seems to be some disagreement in terms in definition between the scholars.

По-видимому, существует некоторое разногласие по поводу определений терминов между учеными.

I. Translate into Russian.

1. Students often work in teams to investigate emerging issues and compare the results.

2. To become a good writer you need to read and write a lot.

3. It is such a small error as to be easily neglected.

4. More sport complexes have been built to respond to the greatly increased demand for healthy generation.

5. These robbery witnesses were the last to be interviewed so as to get the full picture of the crime.

6. To encourage a broad-ranging discussion, the lecturer handed out the list of topics to be proposed.

7. Use advanced technologies to obtain more precise data for your research.

8. Use is to be made of the data obtained.

9. The use of too many factors does not seem to be desirable, since it is likely to obscure the fundamentally important points.

10. The problem is how these data represent the results to be applied in practice.

11. Qualification of a research assistant requires you to critically investigate and show a comprehensive understanding of appropriate research methods.

12. He does not appear to be able to speak in public.

13. In written tests students were expected to show their knowledge of the studied subjects.

14. These measures appear to be efficient in the prevention of small crimes.

15. Practically any scientist can write well enough to be understood.

16. They are unlikely to help you as they also have their own research to conduct.

17. It is not an easy matter for a reader to make an effort to decipher an unreadable article.

18. The murky piece of writing will probably be set aside until they have more time to devote to it.

II. Translate into English.

1. Это работа довольно легко выполняется.

2. Представить свою диссертацию к защите своевременно – задача каждого аспиранта.

3. Этот метод был слишком узок, чтобы распространять его на другие исследования.

4. Особое внимание уделяется подготовке исследователей с целью изучения вопросов современного сельскохозяйственного производства.

5. Научную статью довольно сложно написать без соответствующих навыков.

6. Результаты исследования оказались противоречивыми.

7. Нас обязали сдать книги после окончания сессии.

8. Этот метод требует верифицировать полученные данные разными способами.

9. Научные руководители ожидают, что аспиранты продемонстрируют навыки научного поиска.

10. Вероятно, более убедительные результаты должны быть получены в последующих экспериментах.

11. Ожидалось, что результаты будут использованы в новой монографии.

12. Подтвердить впервые полученные данные, значит получить ответы на поставленные вопросы.

13. Чтобы получить желаемые результаты , часто приходится экспериментировать в разных лабораториях.

14. Сообщалось, что их усилия привели к важным научным результатам.

If clauses

If I
Translation tips

1. They'll understand you right, if you explain it to them.

Они поймут тебя правильно, если ты им это объяснишь.

2. If you are going to attend the conference in America, you'll need a visa.

Если ты собираешься участвовать в конференции в Америке, тебе понадобится виза.

3. You can't get into the laboratory unless you have a pass-card.

Вы не попадете в лабораторию, если у вас нет пропуска.

4. I'll have a word with your supervisor, if you try hard and finish your test.

Я поговорю с вашим руководителем, если вы очень постараетесь и завершите тест.

5. I won't object to participation in seminar, if I get the results on time.

Я не буду возражать против участия в семинаре, если получу результаты в назначенное время.

6. Unless we hurry, we'll miss the train.

Если мы не поторопимся, мы опоздаем на поезд.

7. They will come to see our work unless they have problems with their experiment.

Они придут посмотреть нашу работу, если у них не будет проблем с опытом.

I. Complete the following sentences:

1. If you don't start your experiment, ….
2. If you read much on this problem, ….
3. If you forget to warn them about the changes in the agenda, ….
4. If you are too late with substantiation of your problem, ….
5. If you aren't careful with the new method, ….
6. They will past their tests if ….
7. Your eyes will get tired if ....
8. He won't come to the discussion, if ….
9. The laboratory team will lose their leader, if ….
10. The boss won't notice anything unless ….
11. He'll fail his exam unless ….
12. She'll forget to bring the materials unless ….
13. They'll make many mistakes unless ….
14. They won't accept our invitation unless ….
15. We'll have a meeting tomorrow unless ….

II. Supply the correct form of the infinitives in brackets:

1. If he (to speak) slowly they (to understand) him.

2. If you (to make coffee) I (to boil) water.

3. He (to pass) his exam unless he (to read) more in addition to the program.

4. One must be very careful in the laboratory unless one (to want) trouble.

5. If we (to do) our work late, we (to be punished).

6. Please, don't sign any documents unless they (to be checked) carefully.

7. They (to pay) him unless he (to finish) his work.

8. If we (to hurry), we'll get the best seats in the hall.

9. What we (to do) if we (to fail) our field experiments?

10. Someone may get into the laboratory if he (to forget) to lock the doors.

III. Write new sentences with similar meaning. Begin with the given words.

1. Except for the last experiment all the results would have been quite satisfactory. If it were not for …

2. The reagents were expired. Otherwise, we would have started laboratory tests then. If it were …

3. Everything was quiet except for the sound of siren. But for …

4. All preparations are purchased beforehand. Otherwise we could not have used them on our farm. Were it …

5. It is only because he's a good specialist that anybody pays any attention to him. If it wasn't for ….

6. His work would have been complete except for his last report. If it were …

7. They would probably be using on their old equipment if the administration hadn't bought the new one. Were it …

8. There would have been far more mistakes in his work without the help of his supervisor. If it were …

9. The new information is reported on monthly. Otherwise we could not have processed it timely. Were it …

10. New technologies become available quickly. Otherwise we would not have kept up with the times. If it had …

If II
Translation tips.

If I were you, I would adhere to this theory.

Если бы я был на вашем месте, я бы придерживался этой теории.

Should you see the Chairman of our Council, ask him to put our report on the agenda.

Если вы увидите Председателя Совета, попросите его поставить наш отчет на повестку.

In case I had these reagents journal, I should use the in my work.

Если бы у меня были эти реактивы, я бы использовал их в своей работе.

Had my supervisor had time yesterday, he would have commented on my article.

Если бы у моего руководителя вчера было время, он бы прокомментировал мою статью.

If the postgraduate had been given opportunity, the work might have been finished.

Если бы аспиранту дали возможность, работа, вероятно, была бы закончена.

If the results are to be discussed at the seminar, they should be processed in time.

Если результаты должны быть обсуждены на семинаре, их нужно вовремя обработать.

Suppose the experiment is fulfilled, what are the further steps?

Предположим, что эксперимент выполнен, каковы следующие шаги?

But for the mistakes, your paper would have been included in the conference proceedings.

Если бы не ошибки, ваш доклад был бы включен в сборник материалов конференции.

Provided the problem of the research is urgent, one can work hard at it and finish it quickly.

При условии, что тема исследования насущна, можно работать над ней усердно и завершить ее быстро.

I. Translate into Russian.

1. If you are not interested in the result, you will find it hard to fulfill the work to the end.
2. It would have been better if he had performed the experiment himself.
3. If the material is not what you expect, it is better to fulfill more experiments rather than quit your work.
4. Should you be truly creative, look at what other scientists are doing, and then do something different.
5. If you had done the experiment, you would have changed your view about the problem in question.
6. Provided you can make correct predictions, you will not only read with more understanding but you will be able to avoid rereading the text.
7. The postgraduate would have known he was wrong if the lecturer had told him about it right after the lecture.
8. The supervisor can make a powerful contribution to the success of the project if his emotional relationship can be made constructive and supportive.

9. If you can afford it, attend an international conference where specialists in your field discuss urgent problems.

10. If you feel like starting your postgraduate studies, you should understand that you will have no time to waste.

11. In case some part of work is taking much longer than originally estimated, then something needs to be reconsidered.

12. Provided the technology and social structure of a culture is relatively simple, education is simple.

13. If I had been asked for help, I would have helped.

II. Translate into English.

1. На вашем месте я бы никогда не взялся за эту сложнейшую проблему.

2. Если бы компьютерные технологии не были так разработаны, то исследования в области нанотехнологий не достигло бы такого прогресса.

3. Следует обратиться к многочисленным научным исследованиям в вашей области, если вы хотите дать обоснование вашей теме исследования.

4. Автор будет удовлетворен, если содержание книги окажется полезным студентам.

5. Если бы аспирант работал усерднее, статьи были бы опубликованы в срок.

6. Если статья готова и одобрена научным руководителем, ее читает рецензент.

7. Если западная компания придерживается принципа «продвижение изнутри», то получить приличную должность в такой фирме со стороны невозможно.

8. Если карьеру нельзя построить в рамках одной компании, делайте ее в другом месте.

9. Что бы ты делал, если бы не поступил в аспирантуру?

10. Если бы не экспериментальные данные, в это трудно было бы поверить.

11. Если бы эксперимент был тщательно продуман, многие проблемы можно было бы избежать.

12. В случае отрицательного результата, не следует прекращать работу.

13. Будь конференция в нашем вузе, многие аспиранты смогли бы принять в ней участие.

14. Так много времени не было бы потеряно, если бы тема была обсуждена сразу. На вашем месте я бы поднял этот вопрос на прошлом собрании.

Partriciple

Translation tips

I.

They were watching the moving particles.

Они наблюдали за движущимися частицами.

The substance being investigated contained some admixtures.

Исследуемое вещество содержало некоторые примеси.

The book referred to in this paper was published last year.

Книга, на которую ссылаются в этой статье, была опубликована в прошлом году.

The interested reader will read this article to the end.

Заинтересованный читатель дочитает эту статью до конца.

When carrying out the experiment the scientist noticed the evaporation of the substance.

При выполнении эксперимента ученый обратил внимание на испарение вещества.

When heated to 100 degrees water boils.

При нагревании до 100 градусов вода кипит.

Unless heated this substance does not melt.

Если не нагреть, это вещество не плавится.

Given the weight and the specific gravity of a body, you can calculate its volume.

Учитывая вес и удельный вес тела, можно вычислить его объем.

When calculating the weight of a body we have to multiply its specific gravity by its volume.

При вычислении веса тела мы должны умножить его удельный вес на его объем.

Unless otherwise stated the values used are taken in the decimal system.

Если не указано иное, используемые значения берутся в десятичной системе.

Independent participial construction

My colleague being away, I had to take the decision myself.

Так как мой коллега отсутствовал, мне пришлось самому принять решение.

Weather permitting, the scientist will proceed with his observation.

Если погода позволит, ученый продолжит свои наблюдения.

The signal given, the rocket starts immediately.

Когда (как только) дается сигнал, ракета сразу взлетает.

The astronomer proceeded with his observation, the sky having cleared.

Астроном продолжил наблюдения после того, как (так ка) небо прояснилось.

There being many people in the conference hall, we could not enter it.

Так как в конференц-зале было много народу, мы не могли войти.

The sodium atom has eleven electrons, the eleventh one occupying a position outside of the second shell.

У атома натрия 11 электронов, причем одиннадцатый занимает положение за пределами второй оболочки.

We continued our work, with our laboratory assistants helping us.

Мы продолжили свою работу, а (и) наши лаборанты помогали нам.

PI + as it does(did)
PII + as it is (was)

This subject is rather complicated, belonging as it does to theoretical physics.

Этот предмет довольно сложен, поскольку он относится к теоретической физике.

The article, published as it was in a small magazine, remained unknown for a long time.

Поскольку статья была напечатана в небольшом журнале, она оставалась неизвестной в течение долгого времени.

Objective with Participle Construction

They watched the temperature gradually rising.
Они следили, как постепенно повышалась температура.
I heard your name mentioned.
Я слышал, как упоминали ваше имя.
We consider matter as being built of atoms.
Мы считаем, что материя состоит из атомов.

Subjunctive with Participle Construction

Protons were observed leaving various elements.

Наблюдали, как протоны вылетают из различных элементов.

Substances are defined as having a definite invariant composition.

Определено, что вещества имеют определенный неизменный состав.

have + N +PII

The device has the lens shifted.

У прибора линза смещена.

I. Remember the following conjunctions and word combinations:

once	когда; раз
though	хотя, хотя и
even though	даже если
unless	если … не
until	пока … не
whenever	когда; всякий раз, когда
Whether	ли
while, whilst	когда; в то время как
unless otherwise (specifically)	если не оговорено особо
stated (indicated, specified)	
except where otherwise (specially)	кроме тех случаев, которые оговорены
stated (indicated, specified)	особо
when exposed to	при действии
as compared	по сравнению
compared	по сравнению
as contrasted	в противоположность
as opposed	в противоположность

II. Remember the following word combinations with participles as an introductory part of the sentence:

As emphasized above …	как подчеркивалось выше …
As pointed out previously …	как уже упоминалось …
As stated earlier …	как указывалось ранее …
Roughly speaking …	как установлено ранее …
Generally speaking …	грубо говоря …
Strictly speaking …	вообще говоря …
Broadly considered …	в широком смысле …, вообще...
Put another way …	иначе говоря…, др. словами…
Putting it another way …	иначе говоря…, др. словами…

III. Translate into Russian paying attention to participles and their functions and constructions with participles.

1. Taken together, these effects, occurring as they do in rapid succession, provide a simple interpretation of the production of showers.

2. Other factors being equal, maximum stability, that is, maximum binding energy per nucleon, is found for nuclei with equal numbers of protons and neutrons.

3. There exist various kinds of light, each corresponding to some definite “colour”.

4. The first step towards intimate understanding of a chemical reaction is to determine the formulae of the compounds involved.

5. Diffusion of gases or liquids through porous membranes results in separation, the lighter isotopes diffusing more rapidly.

6. Any body persists in its state of rest or uniform motion in a straight line, unless acted on by some force.

7. As stated before, the greater the binding energy, the more stable the nucleus.

8. This difficulty has been overcome by the postgraduate, the principle involved being illustrated by Figure 12.

9. Once formed, a crack spreads due to stress concentration at its ends.

10. Except where specially mentioned all the data are based on experimental materials.

11. When freshly prepared this substance is colourless.

12. The ten naturally radioactive elements referred to above have altogether over 40 isotopes.

13. Unless otherwise stated we shall consider only the results of the last conference.

14. The resistance drops when exposed to light.

15. The acceleration of a body is proportional to the force causing it.

16. Having obtained the necessary equipment we can proceed with our experiment.

17. The condition of having no more than one functional group attached to a polymer is not met in this case.

18. The problem appeared solved when several discoveries were made.

19. All matter should be regarded as built up of atoms.

20. One can imagine prehistoric man ascribing all sorts of magical properties to this marvelous yellow stone we call amber.

21. At the date too remote we find the Egyptians well acquainted with manufacture of glass

22. Inserted in the circuit thus created is an instrument, called a galvanometer.

23. Included in this table are the figures calculated on grain production in this farm.

24. As emphasized above these elements are strongly radioactive when isolated in a pure state.

25. Roughly speaking, collisions hardly alter electrons' energies.

26. As already stated the greater these forces are, the greater is the elasticity of their body.

27. Giving as they did so much information about the behavior of planets, these experiments can be hardly overestimated.

28. The explanation given is by no means exhaustive, ignoring as it does the social factor.

29. The electricity is carried exclusively by the electrons, the atomic nuclei remaining stationary.

30. There being no atmosphere, the lunar surface is exposed to direct sunlight.

31. Other things being equal, we should bear in mind large amounts of elements to be more prominent.

32. Other liquids being too light, a barometer uses mercury.

33. Silver being very expensive, we only rarely use it as a conductor.

34. Acids react with oxides of all the metals, a salt and water being formed.

35. Having translated the paper he decided to write down a summary.

36. When translating some new texts he used to write out all new words.

37. Except where otherwise stated, we use the method developed in our laboratory.

38. Stated in a simple form the hypothesis runs as follows.

39. Seen in this context, the range of applicability of the method may be assessed.

40. Having evaluated the data we shall next turn to their interpretation.

41. The reader should take into consideration the data already referred to.

42. Following these early discoveries, a great many alloys have been discovered.

43. The procedure followed by this investigator was proposed by our laboratory.

44. The substance affected by a magnetic field was a metal.

45. The terms insisted upon are difficult to fulfill.

46. The data referred to in this paper are quite reliable.

47. The laboratory joined by us was then engaged in field research.

48. Cooling following heating the substance gave good results.

49. The paper on grains productivity in our region following the report on soil fertility was presented by the head of our research team.

50. Our laboratory joined by Moscow colleagues made up a group of 20 researchers.

IV. Translate into English.

1. Грубо говоря, жидкость, имеющая свободную поверхность – это та, на поверхности которой абсолютно отсутствует давление.

2. Это означает, что программа должна быть гибкой и разнообразной, делая возможным исследование абсолютно новых отраслей.

3. Строго говоря, это разделение можно оправдать, учитывая несовершенство технологии.

4. Более или менее насыщенные вещества формируются в зависимости от температуры реакции.

5. Однако, технические условия потребления энергии для прибора могут быть вводящими в заблуждение.

6. Исключив все другие типы землетрясений, у нас остается один тип – тектонический.

7. Когда новая технология была разработана, урожай повысился.

8. Попутешествовав по Западной Европе, он понял необходимость привлечения зарубежных специалистов в Московскую империю.

9. Исследовав некоторые сложности присущие этому подходу, нам следует далее рассмотреть другие.

10. Характерные особенности компонентов, рассмотренные до настоящего времени, можно представить в следующей схеме.

11. Недавние переговоры привели к соглашению, которое было только что подписано.

12. Основанная на пошаговой схеме, программа охватывает различные области исследования.

13. Полученные данные перевешивают те, которые были получены прежде.

14. Как указано, эти сходства и различия буду рассмотрены детально.

15. Иначе говоря, целью настоящей работы является привлечение внимания ко все еще открытым вопросам этой теории.

16. Было представлено несколько подходов к этой проблеме, при этом вытекающие из этого исследования теории распадаются на две категории.

17. Все образцы пород, до сих пор исследованные, являются в какой-то мере радиоактивными, при этом радиоактивность сопровождается выделением теплоты.

18. Как только были открыты богатые месторождения железной руды, мы начали строить завод.

19. Когда вопрос о представлении информации будет решен, основной вопрос строительства становится одним из логических.

20. Если рассматривать (рассматривая) гидролиз реакцией первого порядка, можно заключить некоторые выводы.

21. Этот случай нельзя считать благоприятным.

22. Эксперимент, который проводится, представляет большой интерес.

23. Этот метод, о котором сообщалось, что он дает хорошие результаты, широко используется.

24. Химик склонен считать появление этого вещества как знак окончания реакции.

25. Только вещества, которые можно считать смесями, имеют пониженную точку плавления (таяния).

Unit IV. Sustainable agriculture

I. Read the text below using the following words and word combinations:

sustainable agriculture – устойчивое сельское хозяйство
prevent – предотвращать, не допускать
downstream resources – перерабатываемые ресурсы
extend intergenerationally – простираются между поколениями
agroforestry - агролесничество
woody perennials - древесные многолетники
land management unit - управление земельными ресурсами
mixed farming - смешанное сельское хозяйство
diversify risk - диверсифицировать риск
single-crop production – моно растениеводство
multiple cropping – выращивание более одного урожая в год
double cropping – выращивание двух культур в год в одном культурообороте
relay cropping – эстафетное выращивание (вторая культура закладывается до уборки первой
crop rotation - севооборот
replenishment - пополнение
increased human encroachment upon wilderness areas - увличение посягательств человека на пустынные районы
interdependence rule applies - действет правило заимозависимости
perverse and adverse effects - порочные и неблагоприятные по следствия
reverse effects - обратный эффект
legitimate and protected property rights - законные и охраняемые имущественные права

de-growth - анти-рост (экономический), деградация
to date - на сегодняшний день
to allow for - учитывать
resource depletion - истощение ресурсов
waste by-production - отходы производства
a set of well-defined and harmonised indicators - набор четко определенных и согласованных показателей

Sustainable agriculture

Sustainable agriculture may be defined as consisting of environmentally friendly methods of farming that allow the production of crops or livestock without damage to human or natural systems. More specifically, it might be said to include preventing adverse effects to soil, water, biodiversity, surrounding or downstream resources – as well as to those working or living on the farm or in neighboring areas. Furthermore, the concept of sustainable agriculture extends intergenerationally, relating to passing on a conserved or improved natural resource, biotic, and economic base instead of one which has been depleted or polluted.

Elements of sustainable agriculture

•Agroforestry

According to the World Agroforestry Centre, agroforestry is a collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions between woody and non-woody components in agroforestry.

•**Mixed Farming**

Many farmers in tropical & temperate countries survive by managing a mix of different crops or animals. The best known form of mixing occurs probably where crop residues are used to feed the animals and the excreta from animals are used as nutrients for the crop. Other forms of mixing takes place where grazing under fruit trees keeps the grass short or where manure from pigs is used to feed the fish. Mixed farming exists in many forms depending on external and internal factors. External factors are: Weather Patterns, Market Prices, Political Stability and Technological Development. Internal factors relate to Local Soil Characteristics, Composition of family and Farmer's Ingenuity. Mixed Farming provides farmers with a) an opportunity to diversify risk from single-crop production; (b) to use labour more efficiently; (c) to have a source of cash for purchasing farm inputs; (d) to add value to crop or crop by-product; (e) combining crops and livestocks.

•**Multiple Cropping**

The process of growing two or more crops in the same piece of land, during the same season is called Multiple Cropping. It can be rightly called a form of polyculture. It can be – (a) Double Cropping (the practice where the second crop is planted after the first has been harvested); (b) Relay Cropping (the practice where a second crop is started along with the first one, before it is harvested).

•**Crop Rotation**

The process of growing two or more dissimilar or unrelated crops in the same piece of land in different seasons is known as Crop Rotation. This process could be adopted as it comes with a series of benefits like – (a) avoid the build-up of pests that often occurs when one species is continuously cropped; (b) the tradition-

al element of crop rotation is the replenishment of nitrogen through the use of green manure in sequence with cereals and other crops; (c) Crop rotation can also improve soil structure and fertility by alternating deep-rooted and shallow-rooted plants; (d) it is a component of polyculture.

Criticisms

Deforestation and increased road-building in the Amazon Rainforest are a significant concern because of increased human encroachment upon wilderness areas, increased resource extraction and further threats to biodiversity.

The concept of "Sustainable Development" raises several critiques at different levels.

Some view the notion of sustainable development as dangerous because the consequences have unknown effects. They consider that in economy like in ecology, the interdependence rule applies. Isolated actions are impossible. A policy which is not carefully enough thought will carry along various perverse and adverse effects for the ecology as much as for the economy. Many suggestions to save our environment and to promote a model of 'sustainable development' risk indeed leading to reverse effects.

Against this notion, they are proponents of private property to impel the producers and the consumers to save the natural resources. According to them the improvement of environment quality depends on the market economy and the existence of legitimate and protected property rights. They enable the effective practice of personal responsibility and the development of mechanisms to protect the environment. The state can in this context “create conditions which encourage the people to save the environment.”

Sylvie Brunel, French geographer and specialist of the Third World, develops in A qui profite le développement durable (Who benefits from sustainable development?) (2008) a critique of the basis of sustainable development, with its binary vision of the world, can be compared to the Christian vision of Good and Evil,

an idealized nature where the human being is an animal like the others or even an alien. Nature – as Rousseau thought – is better than the human being. It is a parasite, harmful for the nature. But the human is the one who protects the biodiversity, where normally only the strong survive.

Moreover, she thinks that the core ideas of sustainable development are a hidden form of protectionism by developed countries impeding the development of the other countries. For Sylvie Brunel, sustainable development serves as a pretext for protectionism and "I have the feeling that sustainable development is perfectly helping out capitalism".

"De-growth"

The proponents of the de-growth consider that the term of sustainable development is an oxymoron. According to them, on a planet where 20% of the population consumes 80% of the natural resources, a sustainable development cannot be possible for this 20%: "According to the origin of the concept of sustainable development, a development which meets the needs of the present without compromising the ability of future generations to meet their own needs, the right term for the developed countries should be a sustainable de-growth".

For several decades, theorists of steady state economy and ecological economy have been positing that reduction in population growth or even negative population growth is required for the human community not to destroy its planetary support systems, i.e., to date, increases in efficiency of production and consumption have not been sufficient, when applied to existing trends in population and resource depletion and waste by-production, to allow for projections of future sustainability.

In 2007 a report for the U.S. Environmental Protection Agency stated: “While much discussion and effort has gone into sustainability indicators, none of the resulting systems clearly tells us whether our society is sustainable. At best, they can tell us that we

are heading in the wrong direction, or that our current activities are not sustainable. More often, they simply draw our attention to the existence of problems, doing little to tell us the origin of those problems and nothing to tell us how to solve them."[53] Nevertheless a majority of authors assume that a set of well-defined and harmonized indicators is the only way to make sustainability tangible. Those indicators are expected to be identified and adjusted through empirical observations (trial and error).

II. Give your opinion on:

1. What is 'sustainable agriculture'?
2. Name the elements of sustainable agriculture.
3. Are any elements of sustainable agriculture employed in our agrarian region? If yes, which of them?
4. Is the concept of 'sustainable development' flawless? If yes, what makes it exceptionable?
5. What do the proponents of de-growth have against the concept of 'sustainable development'?

Grammar review

Connecting ideas in a sentence and between sentences

Thought connectors often (but not always) go at the beginning of the sentence:

There was no electricity in the building. As a result the lab assistants had to be sent home. (or: The lab assistants had to be sent home as a result).

В здании не было электричества. В результате лаборантов пришлось отправить домой. (или: Лаборантов пришлось отправить домой в результате).

While I was waiting, I read a newspaper.
Пока я ждал, я читал газету.

Other thought connectors (conjunctions) are used to connect clauses within a single sentence:

I'll be wearing a casque so that to protect by head at the construction site.
Я надену каску с тем, чтобы защитить голову на строительной площадке.

You can do it via calculation; however, this is not the only way.
Вы можете сделать это посредством расчетов; однако, это не единственный способ.

Revise the following thought connectors used for:

a) addition
also, moreover, in addition (to), besides, as well as;

b) contrast
however, nevertheless;

c) contrast and comparison
on the other hand, by contrast, on the contrary, conversely, in spite of/despite;
d) result and conclusion
thus, therefore, hence, consequently;

e) alternatives
alternatively, otherwise, instead

f) rephrasing and correcting
in other words, or rather, at least;

g) 'main point' linkers
by the way, incidentally;

h) reality
in fact, indeed, actually, as a matter of fact;

i) exemplification and summation
for example, for instance, all in all, in short;

j) organization and narrative linkers
firstly, at first, finally, at last;

k) reason
because of, as a result of, owing to/due to;

l) concession
although, though, nevertheless, nonetheless;

m) clarification
namely, such as, including, especially.

I. In the following sentences choose the correct alternative.

1. Your article is badly organized and contains spelling mistakes. *Though/Nevertheless*, it has some interesting ideas.
2. To the east the cereals on experimental fields were left standing, *while/in contrast to* the west they were cleaned as they heavily suffered from hail.
3. The course taught me a lot about reading science. *Even though/Even so*, there is still a lot I need to learn.
4. I felt uneasy about leaving the project *even so/even though* I knew I had made the right decision.
5. I had expected our team to be happy with the news. *Instead/Although* tears came to our eyes.

6. Herbs are usually grown in temperate climates, *whereas/on the other hand* spices are mainly from tropical areas.

7. We were very short of reagents *so/ as a consequence* we had to wait for two weeks until they are purchased.

8. She wrote the sentences on the whiteboard *while/at the same* time the students copied them into their books.

9. They switched the light on, but it was still dark in the room. *As/Meanwhile* the daylight faded quickly.

10. *Previously/Before* I went to the North, I had never seen polar lights.

11. Modern farming methods have destroyed the habitat of many birds. *As a result/So* that their numbers are in decline.\

12. I'll have to buy some instruments *unless/if not* I can borrow them form the neighboring laboratory.

13. I first met Professor Smith in 1980. *At that time/when* he was a postgraduate.

14. *At first/At last*, the proposal was viewed with suspicion but after much deliberation it was finally accepted.

15. *Finally/First* of all you should make up your mind on your future career.

16. *Therefore/Instead* I feel that it is difficult to explain the discrepancy between the dates.

Ving as Gerund

Translation tips:

Reading books is useful.
Чтение книг полезною
Читать книги полезно.

I like reading.
Я люблю читать.
Я люблю чтение.

He insisted on taking part in the conference.
Он настаивал на участии в конференции.

On coming home he always has a rest.
По приходе домой он всегда отдыхает.
Приходя домой он всегда отдыхает.

The author reports having applied a new method.
Автор сообщает о том, что он применил новый метод.

Excuse our coming late.
Простите наше опоздание.
Простите нас за то, что мы опоздали.

I am not surprised at his being awarded the prize.
Я не удивлен, что ему дали премию.

Remember:

a) after the following verbs Gerund is used as a direct object.

avoid	избегать, стараться не делать
begin	начинать
continue	продолжать
finish	заканчивать
give up	бросать, отказываться от
go on	продолжать
enjoy	получать удовольствие от, нравиться
excuse	извинять
intend	собираться, намереваться
keep/keep on	продолжать
like	любить, нравиться
prefer	предпочитать
prevent	мешать, препятствовать, предотвра-

	щать
regret	сожалеть
resist	сопротивляться, устоять против
start	начинать
stop	прекращать
try	пытаться, делать попытку
withstand	противостоять

b) after the following word combinations Gerund is used:

(I) cannot help	(я) не могу не
it is worth/ it is worth while	стоит
it is no good/ it is no use	не стоит, бесполезно, нет смысла

c) after the following verbs and verb combinations with prepositions Gerund is used as a prepositional object:

account for	объяснять
aid in	способствовать
aim at	стремиться, ставить целью
be alike in	быть похожим
be capable of	быть способным, мочь
credit smb with smth	приписывать (кому-либо что-либо)
depend on/upon	зависеть от, полагаться на
differ in	отличаться по (каким-либо свойствам)
be fond of	любить, нравиться
insist on/upon	настаивать на
be interested in	интересоваться
keep from	мешать
object to	возражать
prevent from	мешать, препятствовать

rely on/upon	полагаться на
be responsible for	объяснять, являться причиной
result from	являться результатом/следствием, проистекать
result in	давать в результате, приводить к
be similar in (posses	походить по (каким-либо свойствам)
sing some properties	
succeed in	удаваться, добиваться, научиться
think of	думать о, представлять себе

в) after the following Nouns Gerund is used as an attribute:

ability	способность
advantage	преимущество
chance	возможность
merit	достоинство
necessity	необходимость
possibility	возможность
probability	вероятность
reason	причина, основание
way	способ

I. Translate into Russian.

1. Falling is a case of motion at constant acceleration.
2. Measuring resistance is necessary in many experiments.
3. Dividing the total charge by number of ions in the cloud gives the charge of each ion.
4. It is worth while discussing the phenomenon.
5. There are some more points worth mentioning.
6. It is no use searching for another approach to our problem.
7. It is no good arguing about the issue that has not yet been discussed in our team.

8. The motor developed by our research team went on running.

9. We cannot help acknowledging the importance of this statement.

10. Would you mind answering one more question?

11. As we have already decided on the case it was not worth mentioning.

12. Despite of acute discussion he went on demonstrating his slides.

13. The new phenomenon being discovered we had to give up experimenting.

14. The device stopped working as the coil was short-circuited.

15. We avoid using old electric instruments for they have a high power-consumption.

16. The ability of a solid to resist being altered in shape is termed rigidity.

17. Excuse my interrupting you but the time of lecture is over.

18. He reports having observed new phenomenon in the space.

19. We must aim at obtaining accurate results.

20. He thinks of trying another approach to his problem.

21. The efficiency of the process resulted in increasing the yield.

22. Some plants are capable of fixing nitrogen with the help of certain bacteria.

23. They insisted on being sent to the conference.

24. In making observations extreme care is necessary to avoid errors.

25. Upon being heated to a high temperature many metallic compounds are decomposed.

26. Metals cannot be dissolved without being changed into new substances.

27. The device has the merit of being suitable for many purposes.

28. The possibility of man being able to reach the moon was seriously discussed at that time.

Gerundial Constructions

Translation tips:

Dr. Smith's being late was very strange.

Опоздание доктора Смита (то, что доктор Смит опаздывал) было странным.

This depends on the results of two experiments being equal.

Это зависит от того, что результаты двух экспериментов одинаковы (зависит от одинаковости результатов).

These substances are alike in having high melting points.

Эти вещества сходны тем, что они имеют высокие точки плавления.

In spite of not having university education some scientists made their great discoveries.

Несмотря на отсутствие университетского образования, некоторые ученые сделали свои великие открытия.

Remember the following prepositions after which Gerund is usually used:

on account of	из-за
apart/aside from	помимо, кроме
in addition to	кроме, вдобавок
besides	кроме
because of	из-за, вследствие
despite / in spite of	несмотря на
due to	благодаря, вследствие
except (for)	кроме, за исключением

instead of	вместо
owing to / thanks	благодаря
through	из-за, благодаря
with the object to /with the view to	с целью
save	кроме

I. Translate paying attention to Gerundial Constructions

1. Combustion may be incomplete owing to insufficient oxygen being present.

2. Postgraduates investigated the possibility of these crops being fertilized with combined manures.

3. The inability of phosphorus atoms, because of their large radius, to establish triple bonds among themselves results in the phosphorus molecules having a very different structure from the nitrogen molecule.

4. The molecules of this substance because of their being reactive combine with one another.

5. This scientist's having discovered the new phenomenon enabled him to isolate new elements.

6. Besides being important for industry oxygen is also very important for medicine.

7. In addition to depending on the acceleration, force also depends upon the mass of the object.

8. Besides being soluble in acids the substance is easily soluble in alkalis.

9. Oxygen is an active element of the atmosphere, and in addition to being essential for the maintenance of life it is also essential for combustion.

10. Aside from being one of the few known third-order gas reactions the reaction of NO and O2 is also one whose rate decreases with increase in temperature.

11. They objected to your data being published before all the experiments were completed.

12. Some of the problems not being solved, our group had difficulties in proceeding with the work.

13. His colleagues working hard on the problem enabled them to come to a definite conclusion.

Test 1.

I. Choose the correct verb form:

1. Last time we (decides/decided/will decide) to make presentations every month.

2. Research degrees (denotes/denoted/denote) advanced studying a chosen discipline.

3. Her successful reading of the thesis (lead/will lead/have lead) to the award of degree.

4. Research study (depend/depends/will depend) upon the individual supervision of students by a member of the faculty.

5. So far the most widely spread methods of formal education (were/ are/will be) school colleges and universities.

6. There (is/was/will be) no record of what (takes place/took place/will take place) in the laboratory.

7. How much information you (have gathered/had gathered/will have gathered) in order to check the results?

II. Choose the correct translation of the sentences:

1. It doesn't do to be only too curious or inquisitive in research work. (Это не делает тебя очень любопытным или любознательным в исследовательской работе. /Быть только очень любопытным или любознательным в исследовательской работе недостаточно.)

2. It should be noted that it does indeed lead to problems to be solved urgently. (Следует отметить, что это действительно ве-

дет к проблемам, которые нужно срочно решать./Следует отметить, что это привело к проблемам, которые нужно решать.)

3. The difficulty has nothing to do with these changes. Трудность ничего не имеет по отношению к эти изменениям./Трудность никак не связана с этими изменениями.)

4. It cannot be done satisfactorily in conditions of time and resource deficit. (Это не может делать работу удовлетворительной в условиях нехватки времени и ресурса./ Это невозможно сделать удовлетворительно в условиях нехватки времени и ресурса.)

5. The investigation does, however, illustrate two basic approaches to the problem. (Исследование, однако, иллюстрирует 2 основных подхода к проблеме./ Исследование все же иллюстрирует 2 иллюстрирует 2 основных подхода к проблеме.)

6. We do not possess any accurate understanding of cause and effect. Nor do we know how to evaluate the performance of the system. (Мы не имеем точного понимания причин и следствия. Мы не знаем, как оценить работу системы./ Мы не имеем точного понимания причин и следствия. Не знаем мы и того, как оценить работу системы.)

7. These effects can be done away with with the help of the new model. (Эти эффекты можно сделать с помощью новой модели./ С этими эффектами можно покончить сделать с помощью новой модели.)

III. Choose the correct compound preposition for each sentence: in view of, aside from, apart from, in spite of, as to, according to.

1. … the great importance of this subject, a separate chapter will be devoted to it.

2. … these implications, some experiments with interactive systems are noteworthy.

3. … this suggestion, however, there is no other information available about these mechanisms.

4. You will be punished or rewarded … whether you have led a virtuous or sinful life.

5. … the thesis it holds more generalization of the problem.

6. … the complexity of the structure, the theoretical results may be considered highly satisfactory.

IV. Translate the following sentences into English.

1. Только тогда, когда он сделал свое знаменитое открытие, ученые поняли важность этого закона.

2. Этот случай весьма (вполне) вероятен.

3. Именно эти результаты исследования чрезвычайно важны для нас.

4. Только вчера Сьюзан получила приглашение на конферен-цию.

5. Именно Ричарда отправили в Англию учиться.

6. Никогда прежде не слышал я о таком интересном университетском курсе.

7. Каким бы странным это не показалось, но я не получаю удовлетворения от своего исследования.

Test 2.

I. Match the sentence halves.

1. I'm trying to make up … .
2. The advertising agency is trying to think up … .
3. It is difficult to keep up … .
5. The final chapter sums up … .
6. They need more facts to back up … .
7. He's been away from the meeting, so he needs to catch up … .
8. The lawyer has drawn up … .
9. I can't work up … .

10. How long did it take you … ?

a) to clear up the mess
b) the time I lost being sick
c) we need some capital
d) after all that argument
e) a brilliant new slogan
f) the terms of the contract
g) with all the latest developments
h) in Africa and relocate
i) their arguments
j) with what's being on
k) to save up for a new car
l) the results of the research
m) any enthusiasm for the idea
n) it'll mess up all our plans

II. In which of the following sentences Passive Voice is used? Name the Passives.

1. Mathematics is loved by many, disliked by a few, admired and respected by all.
2. They modified the treatment of this theory.
3. The initiative was supported by everybody.
4. The laboratory tried the machine under severe conditions.
5. This stage was preceded by careful study of the results.
6. This requirement must be met.
7. They knew little about subsequent negotiations except that they didn't reach any agreement.
8. The intellect is involved into action.
9. Such acts are forbidden by law.
10. The importance of this phenomenon was underestimated.

III. Which of the sentences below have incorrect translations? Correct them.

1. Not every experiment can be relied upon.
   Не на каждый эксперимент можно положиться.
2. Many questions were answered correctly.
   Много вопросов было задано корректно.
3. Feudalism as a system was followed by capitalism.
   Феодализм – это система, которая следует из капитализма.
4. The development of physics was greatly influenced by the discovery of radioactivity.
   Развитие физики очень сильно повлияло на открытие радиоактивности.
5. These conditions, however, will be objected to by other scientists.
   Против этих условий, однако, будут возражать другие ученые.
6. This work is often referred to in special literature.
   Эта работа часто представлена в специальной литературе.
7. Wood is much experimented upon and worked at in research institutes.
   Древесину часто используют в экспериментах и в работе в исследовательских институтах.

Test 3.

I. Choose the incorrect translation of the sentences below. Make a correct translation.

1. To think otherwise would be a mistake.
   Думать иначе было бы ошибкой.
2. To speak would sometimes do more harm than good.

Говорить было бы больше вреда, чем добра.

3. We try to minimize the old disadvantages.
Мы старались минимизировать старые недостатки.
4. Lean to walk before you run.
Чтобы учить ходить, прежде вы бежите.
5. To live long it is necessary to live slowly.
Чтобы долго жить необходимо жить неспешно.
6. Some people are too proud to admit that they are wrong.
Некоторые люди слишком горды и признают, что они ошиблись.
7. There are many considerations to be taken into account in determining space velocity.
Есть много соображений, которые необходимо принять во внимание при определении космической скорости.
8. To sum up, we shall present the table.
Суммировать – значит представить таблицу.
9. To begin with, no general method will be given here.
Для начала, никакого общего метода здесь не будет дано.

II. Complex Object or Complex Subject?

1. They did not want us to continue research.
2. We expect the scientist to be involved in the work.
3. We want them to attend the conference.
4. We heard Professor Smith deliver a lecture on the subject.
5. The lifetime of the equipment is assumed to be 30 years.
6. The method is reported to give good results.
7. We know metal to conduct electricity.
8. The fact happened to become known to everybody.

III. Choose sentences with unreal condition.

1. If the team he supports wins, he is elated, it loses he is disappointed.
2. If tools had been used with greater force the depth of the cut would have been affected.
3. The system will fail to perform unless the requirements are satisfied.
4. If my aunt had been a man, she would have been my uncle.
5. Had we time we should test the sample twice.
6. If people are unwilling to hear you, it is better to hold your tongue than them.
7. Had it been avoided in the other problems, *W* would have been smaller by *x*.

Test 4

I. Choose the correct connective in the following sentences:

1. Your report is badly organized and full of spelling mistakes. *Though/Nevertheless,* it contains some very interesting ideas.
2. *Despite/Although* having worked together in the laboratory for more than 5 years, I don't really know him that well.
3. We closed the window *so that/since* the noise outdoors didn't prevent us from hearing the lecturer.
4. *Due to/In order to* the heavy rain last night some roads are still closed to traffic.
5. Our laboratory has bought a new device *so as to/as* finish the control test.
6. *Despite/although* working overtime they did not manage to obtain the results before the start of the conference.
7. The climatic conditions were not quite suitable. *Nevertheless/Because of* they did all their best finish the research in time.
8. *According to/Since* the presented theory we could have calculated the negative result.

9. *Because of/As to* the new law passed last week, many small businesses will be closed.

10. *However/despite* that may be, there are indications that Davy's fundamental idea is nearer the truth than Faradau's.

11. The most striking difference between phosphorus and nitrogen is that nitrogen is quite inactive under ordinary conditions *while/in spite of* phosphorus reacts readily both with metals and with non-metals.

12. Measured values are important in many ways. *On the other hand/So as*, the following results are of particular importance.

II. Choose the correct linker for the following sentences:

1.Более того, программы постоянно обновляются, включают современные подходы обучения и выработки необходимых навыков (*in fact/in addition*).

2. В любом случае, ваша задача в максимально короткие сроки представить результаты исследования (*also/in any case*).

3. В целом, рекомендуется прикладывать к пакету документов любые свидетельства ваших достижений – дипломы, сертификаты и т.д. (*in general/ in spite of*).

4. Более того, любая кафедра заинтересована в том, чтобы аспиранты защищались в срок (*however/moreover*).

5. Помимо профессионального преподавания теоретических аспектов, каждая из программ носит прикладной характер (*besides/by the way*).

6. Аннотация представляет собой краткую характеристику статьи, тогда как реферат – краткое изложение содержания статьи и доклада (*while/namely*).

7. Фактически многие учебные заведения предлагают программы подготовки в магистратуру по специальным методикам (*including/in fact*).

8. К тому же, магистерская степень повышает вашу значимость в глазах работодателя и является бесценным опытом в жизни (*in addition/alternatively*).

9. Во-вторых, точные формулировки повышают эффективность следующего этапа научной работы (*firstly/secondly*).

10. Однако аспирантура – это самостоятельная форма получения образования, цель которой – научиться заниматься научными исследованиями (*on the other hand/for instance*).

11. К тому же, результаты, представленные в таблицах и схемах, в форме компьютерной презентации, помогают в восприятии информации (*also/anyway*).

12. Тем не менее, наилучший результат достигается, когда периоды собственного творчества чередуются с периодами глубокого изучения темы (nevertheless/in other words).

13.Во-первых, в аспирантуру принимают не всех, а только тех, кто достиг успехов в учебе, и, во-вторых, тех, кто ведет реальную научную работу *(firstly/as a matter of fact, for instance/secondly*) .

14. И наконец, планировать свое участие в конференциях нужно заранее, т.к. сроки подачи тезисов обычно заканчиваются задолго до начала конференции (*in short/finally*).

III. Gerund or Participle I?

1. Everything must have a beginning.
2. The proof of the pudding is in the eating.
3. By this definition the following is meant.
4. This procedure is finding increasing use.
5. A man should be viewed as a free, rational being, possessing a free will.
6. After all in sport what really counts is not the winning, but the playing.
7. Two results obtained using the protocol showed an interesting effect worth presenting and discussing here.
8. Frequently, one is watching a sports event involving two teams without any intrinsic reason for supporting either.
9. The accumulated bulk of knowledge on how to run a business provides deep understanding of the mechanism of business.

10. The theory also basically improves understanding of a queuing situation enabling better control.

11. Everything depends on the substance being used.

12. The explosion resulted from the substance being volatile.

13. They objected to your data being published before all the experiments were completed.

14. We have diminished the amount of light falling on one square foot to one quarter of its previous value.

15. The acceleration of a particle is always proportional to the force acting on it.

16. Studying experiments with ice one can show that pressure causes ice to melt.

17. Subtracting the vapour pressure at the existing temperature gives the initial gas pressure.

18. Substituting this value in our equation, we get the following formula.

Supplement 1

Irregular verbs

Infinitive	Past Simple	Past Participle	Перевод
be	was/were	been	быть
do	did	done	делать
go	went	gone	идти
show	showed	shown	показывать
bet	bet	bet	держать пари
cost	cost	cost	стоить (о цене)
cut	cut	cut	резать
hit	hit	hit	ударять
hurt	hurt	hurt	причинять боль
let	let	let	позволять
put	put	put	класть, ставить
shut	shut	shut	закрывать
spread	spread	spread	распространять
lend	lent	lent	одалживать
send	sent	sent	посылать
spend	spent	spent	тратить
keep	kept	kept	держать
sleep	slept	slept	спать
sweep	swept	swept	подметать
build	built	built	строить
leave	left	left	оставлять, уезжать
lose	lost	lost	терять
deal	dealt	dealt	иметь дело с кем-л.
mean	meant	meant	означать
feel	felt	felt	чувствовать
meet	met	met	встретить
blow	blew	blown	дуть
draw	drew	drawn	рисовать

fly	flew	flown	летать
know	knew	known	знать
throw	threw	thrown	бросать
begin	began	begun	начинать(ся)
drink	drank	drunk	пить
ring	rang	rung	звонить
sing	sang	sung	петь
stink	stank	stunk	плохо пахнуть
swim	swam	swum	плавать
swear	swore	sworn	клясться, ругаться
tear	tore	torn	разрывать, рвать
wear	wore	worn	носить (об одежде)
see	saw	seen	видеть
lie	lay	lain	лежать
bring	brought	brought	приносить
buy	bought	bought	покупать
catch	caught	caught	ловить, хватать
fight	fought	fought	драться
teach	taught	taught	учить, обучать
think	thought	thought	думать
become	became	become	становиться
come	came	come	приходить
overcome	overcame	overcome	преодолевать
run	ran	run	бежать
drive	drove	driven	водить (транспорт)
rise	rose	risen	вставать, подни-маться
beat	beat	beaten	бить
eat	ate	eaten	есть, кушать
forgive	forgave	forgiven	прощать
give	gave	given	давать
shake	shook	shaken	дрожать, встряхивать
take	took	taken	брать

break	broke	broken	ломать
choose	chose	chosen	выбирать
freeze	froze	frozen	замерзать, замораживать
speak	spoke	spoken	говорить
wake	woke	woken	просыпаться, будить
bite	bit	bitten	кусать
fall	fell	fallen	падать
forbid	forbade	forbidden	запрещать
hide	hid	hidden	прятать(-ся)
ride	rode	ridden	кататься, ехать
write	wrote	written	писать
forget	forgot	forgotten	забывать
find	found	found	находить
get	got	got	получать, становиться
have	had	had	иметь
hear	heard	heard	слышать
hold	held	held	держать
lead	led	led	вести
read	read	read	читать
make	made	made	делать
shoot	shot	shot	стрелять

sit	sat	sat	сидеть
win	won	won	выигрывать, побеждать
stick	stuck	stuck	застревать, прикле-ив.
strike	struck	struck	ударять, бить
stand	stood	stood	стоять
understand	understood	understood	понимать
sell	sold	sold	продавать
tell	told	told	сказать, говорить
lay	laid	laid	класть, положить
pay	paid	paid	платить
say	said	said	сказать, говорить
bleed	bled	bled	кровоточить, истек. кров.
feed	fed	fed	кормить
hang	hung	hung	вешать
burn	burnt/burned	burnt/burned	жечь, сжигать, гореть
lean	leant/leaned	leant/leaned	наклоняться, прислон.
learn	learnt/learned	learnt/learned	учить, изучать
light	lit/lighted	lit/lighted	зажигать
smell	smelt/smelled	smelt/smelled	пахнуть, нюхать
spoil	spoilt/spoiled	spoilt/spoiled	портить

Supplement 2

Word formation

Prefix	Meaning	Example	Translation
anti-	анти-, проти-во-	antisocial	антисоциальный
counter-	контр-, по-тиво-	countershaft	контр привод
de-	де-	deformation	деформация
dis-	раз-, дез-, обез-	disorganize	дезорганизовать
in-	не-	invisible	невидимый
im-	не-	impossible	невозможный
il-	не-	illiterate	неграмотный
ir-	не-	irregular	неравномерный
mis-	отриц.знач.	misunderstand	неправильно
non-	не-	non-ability	неспособность
un-	не-	unkind	недобрый
be-		belittle	уменьшать
co-		cooperate	сотрудничать
en-		enlarge	укрупнять
em-		empower	уполномочить
ex-		ex-president	бывш.президент
extra-		extraordinary	экстраординарное
inter-		interaction	взаимодействие
out-		outbalance	перевешивать
over-		overestimate	переоценить

post-		postgraduate	аспирант
pre-		prehistoric	доисторический
re-		rewrite	переписать
sub-		subgroup	подгруппа
super-		superheat	перегрев
trans-		transplant	пересадить
ultra-		ultrasonic	ультразвуковой
under-		underestimate	недооценить

Suffixes

Nouns

age	shortage	нехватка
-al	removal	удаление
-ance/-ence	silence	молчание
- ant/-ent	assistant	ассистент
-dom	freedom	свобода
-er/-or	writer	писатель
-hood	childhood	детство
-ian	technician	техник
-ics	mathematics	математика
-ing	harvesting	уборка(урожая)
-ion/-sion/-tion/-ation	formation	формирование
-ism	heroism	героизм
-ist	economist	экономист

-ty	legality	законность
-ment	equipment	оборудование
-ness	softness	мягкость
-ship	friendship	дружба

Adjectives

-able	countable	поддающийся
-al	electrical	электрический
-ant/-ent	resistant	устойчивый
-ary	revolutionary	революционный
-ful	meaningful	содержательный
-ish	childish	детский
-ive	creative	творческий
-less	meaningless	пустой
-ous	famous	известный

Adverbs

-ly	usually	обычно
-ward	backward(s)	назад

Verbs

-ate	activate	активировать
-en	harden	закаливать
-fy	intensify	усиливать
-ize	summarize	суммировать

Supplement 3

‘It’ and its functions

Personal	Formal	Formal	Introductory	Demonstrative
Pronoun	Subject	Object	Word	Pronoun
I found	It is warm.	Vacuum	It is silver	What is it?
the article		tubes	that is the	It is a lamp.
I needed.		make it	best con-	
I started		possible	ducting	
translating		to convert	metal.	
it at once.		part of		
		their out-		
		put into		
		visible		
		light.		

Supplement 4

'*One*' and its functions

Numeral	Indefinite-Personal Pronoun	Substitute Word
I know only	*One* should keep in mind	The simplest kind
one solution	that when water is heated	of lever is *one* in
of this problem.	in a vessel, the liquid on	which the arms are
	the bottom of the vessel	of equal length.
	is hotter than on the top.	

Supplement 5

'*That*' and its functions

Demonstrative	Conjunction	Union word	Substitute Word
At that point	They say	Give us a	The result of this
the line drops	that the re-	material that much	experiment is
down to zero.	port will be	can with- stand	better than that of
	followed by	very high	the previous one.
	a discussion.	temperature.	

Supplement 6

‘As’ and it functions

Adverb (как, в качестве)	Conjunction (так как, когда, в то Время как, как)
This arrangement is adopted	*As* current flows through a con-
as being more economical.	Doctor, it sets up a magnetic
	field in the neighborhood.
	This formula is not so simple
	as you think.

Supplement 7

Prounouns

Personal Nominative case I, you, he, she, it, we, you, they
Object case me, you, him, her, it, us, you, them
Possessive (-Adjectives my, your, his, her, its, our, your, their
-Nouns) mine, yours, his, hers, its, ours, yours, theirs
Reflexive and myself, yourself, himself, herself, itself,
Intensifying ourselves, yourselves, themselves
Reciprocal each other, one another
Demonstrative this (these), that (those), such, the same
Interrogative who, whom, whose, what, which
Relative and Conjunctive who, whom, whose, what, which, that
Indefinite some, any, one, all, each, every, other, another, both,
many, much, few, little, either, no, none neither

Supplement 8

Degrees of Comparison

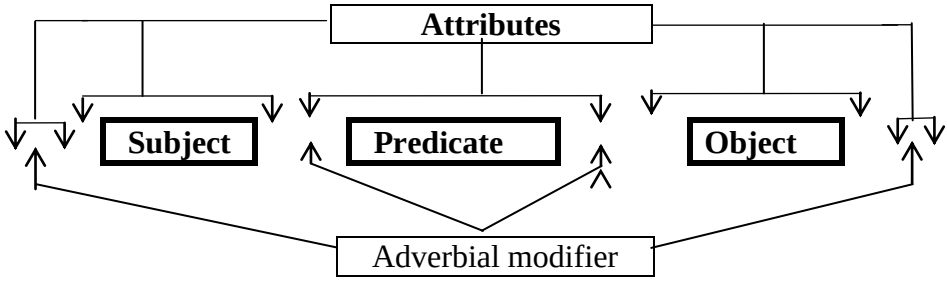
	Positive	Comparative	Superlative
monosyllabic words:	long	longer	the longest
polysyllabic words: important		more important	the most important
special forms:	good	better	he best
	bad	worse	the worst
	little	less	the least
	many	more	the most
	much		
	far	farther	the farthest
		further	the furthest

Comparative Constructions

than	The new results are much better *than* the previous ones.
as…as	The results are *as* good *as* the previous ones.
not so…as	The result is *not so* good *as* the previous one.
the (more) … the (less)…	*The more* we study *the less* we know.

Supplement 9

English sentence structure



Attribute: Adjective, Participle (I and II), Numerals, Pronouns, Noun, Adverb, Pronoun, Gerund, Infinitive, Attributive Clause.

Subject: Noun, Pronouns, Numerals, Infinitive, Gerund, Subject Clause, Formal Subject (it, one, there).

Predicate: Finite Form of the Verb, Compound Form (Link-verb+Predicative), Complex Form (Modal Verb+Infinitive).

Object: Direct Object (Noun, Pronoun, Numeral, Infinitive, Gerund, Object Clause), Indirect Object (Noun, Personal Pronoun), Prepositional Object (Noun, Personal Pronoun-Objective Case, Gerund).

Adverbial Modifier: Adverb, Participle (I and II), Infinitive, Gerund, Noun, Adverbial Clauses (of: Time, Place, Cause, Purpose, Condition, Concession).

Verb Forms

Active Voice

Indefinite	**Continuous**	**Perfect**	**Perf.-Cont.**
V	**be Ving**	**have Ved/PII**	**have been Ving**
Tense			
Pres. V(-s,-es)	am/is/are Ving	have/has Ved/PII	have/has been Ving
Past Ved	was/were Ving	had Ved/PII	had been Ving
Fut. will V	will be Ving	will have Ved/PII	will have been Ving

Passive Voice

be Ved/PII

Indefinite	**Continuous**	**Perfect**
V	**be being Ved/PII**	**have been Ved/PII**
Tense		
Pres. am/is/are Ved/PII	am/is/are being Ved/PII	have/has been Ved/PII
Past was/were Ved/PII	was/were being Ved/PII	had been Ved/PII
Fut. will be Ved/PII	–	will have been Ved/PII

Infinitive

	Active Voice	Passive Voice
Indef.	to V	to be Ved/PII
Contin.	to be Ving	–
Perfect	to have Ved/PII	to have been Ved/PII
Perf-Cont.	to have been Ving	–

Infinitive Functions

1. Subject.	To walk is useful.
2. Part of a Predicate.	Our aim is to fulfill laboratory tests.
3. Object.	She likes to experiment.
4. Attribute.	The method to be used is not new.
5. Adv. Modifier.	He went there to make a report.

Objective with the Infinitive

S + P + **Noun (common case)/Pronoun (objective case) + to V**

He considers the lab workers/them to do it.
He sees the lab workers/them do it.

Subjective with the Infinitive

S/N (common case) + P + to V

The data prove to be wrong.
The work is considered to be unfinished.
The article is likely to be accepted by this journal.

Infinitive with *for*

***for* + N (common case)/ Pronoun (objective case) + to V**

He opened the window for people to hear the sound outside.
It is important for him to write about it.

Supplement 12

Participles

Participle I (PI)

	Active Voice	Passive Voice
Indefinite	Ving	being Ved/PII
Perfect	having Ved/PII	having been Ved/PII

Participle II (PII)

Ved/PII

Participle Functions

1. Part of a Predicate.	He is working at our University.
	He has worked for 5 years here.
2. Attribute.	The working student is my group-mate.
	The method used was effective.
3. Adv. Modifier.	(While) translating he used a dictionary.
	Written in pencil the article was difficult to read.

Participle Constructions.

Absolute Participle Construction

S + *PI/PII*, S+P
S+P, S + PI/PII

The choice *having been made*, all other alternatives have been rejected.

The other conditions *being equal*, the acceleration will be the same.

All the equipment *removed*, the explorers stopped working.

We carried out a number of reactions, the materials brought from their laboratory.

With the water being cool, the rate of the reaction was low.

Complex Object with Participle

S + P + *N/Pronoun(Objective Case)* + *PI/II*

We disliked the problem being treated this way.
She heard her report mentioned.
We know him work at this problem since last year.
They thought the reactions as being unimportant.
We have/got the device repaired.

Complex Subject with Participle

S* + P + *(as) PI/II

This phenomenon is postulated *as having arisen* from excessive heat.

They were seen *leaving* the laboratory.

Gerund
Ving

	Active Voice	Passive Voice
Indefinite	Ving	being Ved/PII
Perfect	having Ved/PII	having been Ved/PII

Gerund Functions

1. Subject.	*Doing* is better than saying.
2. Part of a Predicate.	Our aim is *mastering* English.
3. Object.	He preferred *changing* the course of test.
4. Attribute.	There are many ways *of doing* it.
5. Adv. Modifier.	You cannot make an omelet *without breaking eggs*.

Gerund Complexes

In addition to being very interesting *this book* is of great use.

In spite *of being* very complicated *the problem* has been solved.

There is unmistakable proof *of Paul's being wrong*.

The accuracy of the definition depends on *the terms being* carefully *formulated*.

We know *of their having been satisfied* with my work.

Though connectors

Type of connection	sentence connectors	conjunctions
comparing,	after all, all the same,	although, even
contrasting,	alternatively, any-way,	though, though,
indicating the	by contrast, even so,	whereas, while,
unexpectedness	however, in any case,	yet
of a situation	in contrast, instead,	
	nevertheless, on the	
	contrary, on the other	
	hand	
reasoning and	as a consequence, as	as, because,
results	a result, conse-quently,	for, in that,
	for one thing, so,	since, insofar
	(rather formal ones:	as, so, so that
	hence, in conse-quence,	
	therefore, thus)	
adding informa-	above all, after all,	
tion	also, besides, in	
	addition, further-more,	

	likewise, moreover,	
	similarly, what's more,	
	as well, too (the last two	
	not used at the beginning	
	of a sentence)	
condition	if not, if so, otherwise	as long as,
		assuming
		(that), if,
		on condition
		that, provided
		(that), so long
		as, supposing
		(that), unless
time: one event	at that time, at the same	as, when,
at the same time	time, meanwhile	whenever, while
as another		
time: one event	after, after that, afterwards,	after, as soon as,
before or after	before, before that, earlier,	before, since,
another	later, previously, soon,	until
	subsequently, then	

Role of spiders in agriculture and horticulture ecosystem

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Abstract

Spiders are carnivorous arthropods, consume a large number of preys and do not damage plants. They have unique habitat and they live in almost all the environments. Spiders serve as buffers that limit the initial exponential growth of prey populations. The predatory spiders are classified info five major groups based on their foraging style. Prey searching ability, wide host range, ease in multiplication and polyphagous in nature make them as a potential predator in biological pest suppression. Species abundance of spider communities in agricultural and horticultural ecosystem can be as high as in undisturbed natural ecosystem. About 19 species in rice ecosystem, 13 species in maize, 16 species in soybean, 18 species in oil seeds, 21species in cotton, 57 species in sugarcane, 13 species in vegetables, 11 species in fruit crops and 26 species in coconut were recorded. The use of biopesticides, botanicals and organic manure will enhance the spider population in different ecosystems. This contribution deals with mass production, importance in peat management and conservation of spiders.

Key words: Araneae, Arachinidae, arachinids, biological pest suppression, carnivorous arthropods, predatory spiders, prey populations.

Introduction

Spiders belong to order Araneae, class Arachinidae and are members of phylum Arthropoda, the largest assemblage of animal with jointed legs and hard exoskeleton. They are the largest group of arachinids comprising more than 30,000 species distributed over 60 families over worldwide. They have unique habitat and they live in almost all the environments. They are the most abundant predator of insects of terrestrial ecosystem and consume large number of preys without damaging the plants. Under favourable conditions, they can reach maximal densities and species abundance of spider communities in cultivated fields can be as high as in natural ecosystem[1, 2]. The population densities and species abundance of spider communities in cultivated fields can number of insects killed per unit time, good searching ability (especially hunting spiders), wide host range, adaptation under conservation mechanism and polyphagous nature makes them as a model predator[3]. This contribution deals with classification, mass rearing, predatory potential, conservation and augmentation of spiders (Table 1).

Mass Rearing of Spiders

There are three different methods followed for multiplication of predatory spiders based on its habitat.

Mass multiplication of hunting spiders: Egg-sacs of hunting spiders are placed into beehive-like, closed breeding boxes. The inner structure was covered with a removable material which provides the spiders with a large surface within a relatively small volume, in order to decrease cannibalism. There are holes on one side

of the box, where changeable tubes containing fruit fly (Drosophila melanogaster) culture are connected to the box. The inner side of the box is coated with teflon, or a teflon-like material that spiders are unable to climb so that they cannot get into these tubes. From hatching to egg-laying, spiders feed on fruit flies emerging from the tubes. At the bottom of the box there are larvae of flour-beetles (Tenebrio molitor), which continuously clean up the dead fruit flies, preventing underlay from mildewing. The maintenance of the breeding means the regular change of tubes containing old cultures to fresh ones. Simultaneously hatched spiders become mature and breed at the same time and attach their egg-sacs to the inner structure of the box. Egg-sacs are removed from the box together with the carrier surface and they are kept on low temperature to postpone hatching until application. Egg sacs are applied in greenhouses. From each egg-sac, 50-70 spiderlings emerged. Spiderlings distribute evenly on the plants and suppress or eradicate populations of small-sized arthropods. Since hunting spiders do not spin a web for capturing prey, they do not pollute the plans with detectable quantity of silk[5].

Mass multiplication of ground dwelling spider: Rearing of ground dwelling spiders (Micryphantids and Linyphiids) is comparatively easier than others. A wide mouthed jar covered with a net is commonly used for rearing. The net held in place with several rubber hands or a lid can be used with punched air holes. One to two inch of soil or sand layer is formed in the bottom of the jar for providing a good substratum to the spiders. A broken flower pot or a piece of bark is provided to create a conducive microclimate for the spiders. Spiders effectively use mud pot/bark for its sheltering. Egg cocoons are collected from the bottom and the sand layer is replaced with help of removable paper towel. In the process of culturing, water should be supplied in small plastic cups. If

the spiders are very small in size, the plastic cups must be filled with small rock pills, so that spider dose doesn't drown. Mostly the ground nesting spiders are delicate and weak and they should not be picked up by fingers as they will often lose legs in the process. If dropped, the abdomen usually bursts and spider dies. Chilling them in a refrigerator prior to handling may be helpful. While rearing young ones, they should be provided with rooms for establishing burrows. If they are left together, they will also eat each other (i.e. cannibalistic behavior).

Table 1. Classification of predatory spiders: The spiders are classified based on their foraging stylr[4].

Classification of predatory spiders	Important families	Species (Common name)
Tarantulas	Theraphosidae	Aphonopelma chalcodes (typical tarantulas)
Primitive hunters and weavers	Scytodidae	Scytodes sp. (spitting spiders)
Small hunters	Thomisidae	Misumenops asperatus (crab spiders)
	Salticidae	Metacyrba sp. (jumping spiders)
Large hunters	Pisauridae	Dolomedes tenebrosus (nursery web spiders)
	Lycosidae	Lycosa ceratiola (wolf spiders)
	Sparassidae	Heteropoda venatoria (giant grab spiders)
Web weavers	Filistatidae	Filistata hibernalis (snare weavers)
	Araneidae	Argiope aurantia (orb weavers)
	Agelenidae	Agelenopsis pennsyvanica (funnel web weavers)
	Linyphiidae	Florinda coccinea (black tailed red sheet weaver)

Mass multiplication of rice spiders: Barrior and Litisinger [6] reported the mass multiplication of the common rice spiders. The adult male and female spiders of each of the common rice spiders were collected from rice fields, border habitats, and fallows, and held in cylindrical plastic containers (15.4 cm x 36 cm) or Mylar film provided with a 35-45 day-old rice plant as a substrate. Some twigs or small bamboo sticks were also added to serve additional substrate. Egg masses and cocoons were cut from the foliage, kept separately by species in 1 cm x 6 cm glass vials provided with moist cotton at the bottom and capped with dry cotton.

Egg cocoons laid on inside the Mylar films were collected and placed individually in glass vials or in 1.5 mm x 9 mm plastic Petri dishes. Similar provisions were made in this set-up to avoid drying and desiccation of the eggs. Spiderlings that emerged were individually isolated using a camel hair brush in 7.6 cm x 12.8 cm plastic vials provided inside with freshly cut stems or leaves of rice, partly dried straw or small twigs any plant available and a nylon mesh window on top. Each mesh was secured by either a tare or rubber band on the mouth of the vial. The vegetation served served as substrate for clinging and walking. After first moult, in which almost all stored food (yolk) had been utilized, the spiderlings were fed with a variety of diest: first – instar nymphs of Cicadellids and Delphacids, Collembola, Drosophila flies, Hydrellia adults and Chironomids. The food, except Collembola, was partially crushed to help spiderlings feed. Drinking water was provided inside the cell in the form of an inverted film tube filled with water, the lid of which was picked with pin no. 3 allow water to ooze out slowly and wet the layer of cotton on its floor. After two or three moults, each immature of the Tegragnatgid, (Tetragnatha spp) was again trasnsferred to a bigger cylinarical cage (12 in x 15 in) with two mesh windows and a top vent. Simi-

larly, longer branches of sticks were placed inside each chamber along with a hanging cotton ball wet with water. In addition, plastic vial provided with water as described above was placed on the floor of the rearing cell. It provided an additional source of drinking water as well as cooling the spider.

The larger cage provided more space for the *Tetragnatha* to construct a web. A similar rearing methodology was used in *Argiope, Araneus* and *Neoscona*. The rest – the lycosids, oxyopids, etc. – were reared in smaller cells or tubes (2 in x 5 in). The bottom end of each rearing cell plugged with a cotton ball rested on the floor of a rectangular or circular pan lined with wet paper towel. Cut rice stems or leaves and some dry straws were placed inside the tube as additional substrate for the spider. The top end had a nylon mesh secured by rubber bands. As the spiders grew, more and more food had to be added. F diverse diet was continuously provided to the spiders to attain success in moulting and to reach the adult stage.

Predatory Spiders in Agriculture Ecosystem

Cereals and millets: Cereals constitute the staple food of the people of Asia. The damage caused by the insects lead to lesser yield and loss in quality in these crops. In rice, more than 100 insect species are associated at one stage or the other and 20 of these are of major economic importance [7]. The spider fauna found in the rice ecosystem effectively reduces the rice ecosystem effectively reduces the populations of *Nephotettix virescens, Sogatella furcifera, Nilaparvatha lugens* [8], *Scirphophaga incertulas, Mythimina separata* and *Cnaphalocrosis medinalis* [9]. About 19 species of spiders grouped under 15 genera belonging to 10 families were recorded in rice ecosystem. Spider species such as

Lycosa pseudoannulata Boeset. Str., *Paradosa sumatrana* Thorell (Lycosidae), *Clubiona nr.drossodes Cambridge* (*Clubionidae*), *Oxyopes javanus* Thorell (Oxyopidae). *Runcinia nr. Albostriata* Boesat. Str (Thomisidae) and *Neoscona theisi* Walckner were observed in the rice nursery. Among them *L. pseudoannulata, N. theisi* and *O. javanus* were abundant.

The spider species observed in field bund, irrigation channel and fallow land of rice ecosystem were *C. nr. Drassodes* (Clubionidae), *L.pseudoannulata, P. sumatrana,* Hippasa sp. (Lycosidae), *O. javanus,* (Oxyopidae), *Bianor nr. Anagulosus* Karsh, *B.hotingchieechi* Schenkel (Salticidae), *Tetragnantha mandibulata* Walknear and *T. maxillosia* Thorell (Trtragnathidae). The predatory potendies of *Paradosa sp., Tetragnatha sp.* and *Oxyopes sp.*indicated that they were effective against lepidopteran pest complex of rice [10] . The sap feeders like *N. lugens, S. furcifera* and *N. virescens* were effectively checked by *L. pseudoannulata, T. javana* and *O. javanus* [11]. Sigsgaard et al. [12] reported that a spider species *Afypena formosa* (Linyphiidae) was found effective against rice BPH under field conditions.

The *Erigone sp., Oedothrox sp.* (Micryphantidae), *Paradosa sp., P. agrestis, P. amentata* (Lycosidae) were predaceous on the harmful cereal aphids like *Rhaphalosiphum padi* and *Sitobium avenae* [13]. Maize crop was attacked by about 130 insect species; among this half a dozen are of economic importance. About 13 species of spiders belong to 7 families were evaluated against maize borer *Chilo partellus* [14, 15] . *Cheiracanthium sp.* seemed to be effective spider among all. The other important spider species recorded in maize ecosystem were *Clubiona sp. Clubionidae, Drassodes sp. Gnaphosidae, Heteropoda sp. Heteropodidae, Lycosa sp. Lycosidae, Oxyopes pandae* Oxyopidae, *Oxyopes sp.* Oxyopida. *Ulborus sp.* (Uloboridae), *Theridion sp.* and *Theridola*

sp. (Theridiidae) were recorded in sorghum, which checks the population of tetranychid mite *Oligonychus indicus* [16]. *Dictyna arundinacea* was effective against cereal aphid *Sitobium avenae, Rhapalosiphum padi* and various Dipterans in wheat ecosystem [17].

Pulses: Pulses are an important source of protein. Among the different pulse crops red gram and soyabean are the commonly cultivated crops. About 17 pests belonging to the families Lepidoptera, Diptera, Hemiptera, Coleoptera and Isoptera were recorded [18]. The predominant spiders found in redgram ecosystem were *Thomisus shivajiensis* (Thomisidae), *Clubiona abbotti* (Cluionidae) and *Hippasa haryanesis, ehich* were effective against Lycaenid butterfly *Lampides boeticus* [19]. They also control the population of *H. armigera, Clavigrella sp.* and moderately feed on *Mrlanagromyza obtuse* [20]. Among the pulses soybean holds the maximum spider density [21, 22]. In soybean 16 species of spiders were recorded. Among these *Redyviolus roseipennis, Tropionalis capsiformis* and *Hopistoscelis deceptirus* were the important predators of eggs and larvae of soybean semilooper *Pseudoplusia includes* and *H. armigera* [23]. The other effective species against these pests found in soybean ecosystem were *Peucetia viridanus* and *Ozyopes saltius.* Faleiro et al. [24] found that spiders effectively check the sucking pests on cowpea.

Oilseeds: The important oil seed crops in order of importance are groundnut, linseed, rape seed and mustard, sunflower, safflower, castor, sesame etc. There are 18 species of predatory spiders belonging to 16 genera genera in 7 families commonly observed under oil yielding crops [25]. *Lycosa sp.* and *Theridid sp.* play a prominent role in decreasing the pest complex in groundnut ecosystem [26]. In groundnut *O. saltius, P. pauxilla* and *Misumenops sp.* occupied 85.8 to 97.7% of overall population of spiders and effec-

tively controlled the population of sesame capsule borer *Antigastra catalunalis* and *Acherontia sty* [27].

Fibre crops: The cotton ecosystem includes a wide variety of arthropods throughout the world. More than 1326 species of insects have been reported attacking cotton in the world. In India, 162 species have been recorded among which only 15 species are considered potential threat to the crop. In cotton ecosystem 21 species of spiders grouped under 16 genera belonging to eight families were reported [28] (Table 2). The spider fauna present in cotton ecosystem are classified by Dhulia and Yadav [29].

The predatory potential of 4 species of spiders *viz., P. viridiana, Aranes minuta, O. javanus* and *N. theisi* against cotton sucking pests indicated that they effectively check the population of leaf hoppers, aphids and whiteflies. They were also effective against *Spodoptera litura* and *H. armigera.* The predatory potential of *P.viridanum* was maximum on sucking pests of cotton [30]. Nyffeler et al. [31] reported that spiders effectively check the population of cotton flea hoppers in Texas, USA.

Sugar crops: Sugarcane is grown throughout the subtropical and tropical parts of South and South East Asia. As many as 200 species of insect pests have been reported to cause damage to the sugarcane crop. In sugar cane ecosystem, 57 species of predatory spiders belonging to 13 families were reported in Southern Peninsular India [32]. Most dominant sp. are *Hippasa greenvalliae* (Lycosidae) and *Crytophora cicatorosa (*Araneidae). *H. greenvalliae* existed throughout the crop period and was seen abundantly up to 180 days and *C. cicatrosa* was seen from 100 days after transplanting up to 240 days [33]. These were effective against leaf hopper and borers [34]. The spider species *Plexippus paykull* and *Misumenops bivittatus* (Thomisidae) were found prey on pyrilla leaf hopper [35]. The potential predator spider sp. found in

sugar beet ecosystem is *Theridion impressum* (Theridiidae), which exponentially reduced the aphid population (*Myzus persicae*) [36].

Table 2. Different species of spiders recorded on hybrid cotton.

Group / Family	Species
Hunting spiders	
Oxyopidae	Oxyopes ratane
Clubionidae	Clubioa sp., Castianeira sp.
Salticidae	Plexippus sp.
Lycosidae	Hippasa sp.
Web building spiders	
Araneidae	Neoscona theisi, Neoscona sp.
Uloboridae	Uloborus khasiensis
Aegiopidae	Argiope puchella
Ambushing spiders	
Thomisidae	Thomisus sp., T. cherapunjeus T. projectus
Miscellaneous spiders	
Heteropodidae	Olios sp.

Predatory Spiders in Horticultural Ecosystem

Vegetables: The vegetable crops belonging to the families of Solanaceae, Cucurbitaceae, Brassicaceae and Liliaceae recorded 13 spiders belonging to 8 families [37]. *O. papaunus* was abundantly present in cabbage fields and effectively feeds on cabbage aphids and other pests [38]. Two salticid spiders were effective against brinjal brown leaf hopper population in the field. In watermelon *Clubiona japonicola* is a potential spider in this ecosystem [39]. In

edible aroids spiders were found effective on sucking pests such as *Aphis gossypii* and *Tetranychus sp.* [40].

Fruit crops: Fruit crops are attacked by insects, mites and nematodes. Insects eat away or bore into leaves, flowers, buds, fruits and roots. *Araneus singhagadensis, Cheiracanthium danieli* and *Stegodlyphus sarasinorum* were the abundant predatory spiders noticed among the 11 spider sp. recorded in mango ecosystem on mealy bugs [41]. The spiders belonging to the families of Theridiidae, Anyphenenidae and Dictynidae constuted 72-92% among the 68 species recorded in apple [42]. They were effective against mite pests and *S. littoralis* [43]. These spiders caused 98% reduction in *S. littoralis* larval densities which was the result from predation (64%) and larva abandonment of branches occupied by spiders [44]. In grapevine 27 species belonging to 14 families were recorded. The important species were *C. inclusum, T. dilutum, T. melanurum, Trachelas paceficus* and *Hololena dedra* [45]. These spiders were harmful to the grapevine leaf hopper *Erythroneura varibilis*

Plantation crops: Coconut (*Cocus nucifera L.*) is a majestic perennial palm. It is grown extensively in numerous islands and also in the humid coastal tracts of tropical countries. In coconut 26 species of spiders belonging to 6 families were commonly observed [46]. The *Rhene indicus* and *Cheiracanthium sp.* were effrctive against cocont black-headed caterpillar *Opisina arenosella.*

Conservation and augmentation of predatory spiders: Conservation is the most frequently used biological control tactic in IPM and is defined as the actions to preserve and increase natural enemies by environmental manipulation. The main disruptive effects under agricultural and horticultural ecosystem to predatory spiders are due to the application of pesticides/chemicals and cul-

tivation strategies/mechanical disturbance. Careful choice of insecticides might also restrict the adverse effects of not appear to be as susceptible to endosulfan [50], dieldrin [51], methyl parathion [52] and carbamates and pyridaphenthion [53] as they are to other insecticides. Limiting the spraying program to mid day when the spiders are in active and in sheltered locations, is one of the best ways to conserve spider numbers and diversities in agro-ecosystem. Abamectin, betacyfluthrin [54] and thiomethoxam [55] were found to be less harmful. There was no significant fluctuation in the population of predatory spider recorded with the application of fungicides[56].

Botanicals and biopesticides were not harmful to the spider population in the field. Use of botanicals namely neem oil, neem seed kernel extract, neem seed biters, chinaberry oil and custard apple oil almost conserved the natural spider population [57]. Mishra and Mishra [58] evaluated different pesticides including *Bacillus thuringiensis* on bhendi and found out that the spray schedule consisting of Biotox + Malathion + Biotox (in 20 days interval) was found to be less (0.3 plant) harmful to the spiders.

Rao et al. [59] studied the impact of chemical fertilizers and organic compounds against the development of coccinellids and spiders in groundnut. Application of FYM, neem cake and vermicompost resulted with lesser number of spiders/plank but in case of chemical fertilizers (NPK) IT IS MORE. This is due to lesser pest incidence in organic farming vice versa. Neem-coated urea (1:5) at the rate of 100 kg/ha significantly enhanced the spider population and reduction in the GLH population. Azolla @ 1.5 kg/m^2 along with N 30 kg/ha increased spider population, especially *L. pseudoannulata* as well as use of coir waste ash @ 150 kg/ha encouraged the spider population [60].

The planting and harvesting procedures utilized in agricultural systems are perhaps even more distruptive to spider communities than use of pesticides. At least once in each year, both the habitat and beneficial fauna are destroyed. Aside from the obvious problem with loss of egg sacs and the general suppression of spider numbers, habitat structure is lost, and this is a major determinant of spider community diversity [61]. So spiders can be effectively used in perennial agricultural system as orchards and citrus grooves, where habitat structure, microclimate and beneficial fauna are least distrupted. The back-tad garden is another habitat in which spider control of insect pest might be applied. If small plots are bound by hedge rows, abandoned fields and other natural habitats, the deleterious fauna each year can be offset by recolonization from adjacent habitats.

Spider emigration is generally associated with three phenomena (a) unfavorable thermal environment (e.g. temperature, humidity), (b) low prey availability and (c) disturbance. Among these, the third factor in agro-ecosystem plays a major role. So it is necessary to manipulate the cultivation strategies to avoid the spider emigration from one field to other.

Mangan and Byers [62] reported that minimum tillage will conserve the spider population. Rajendran [63] reported that the aquatic weed, *Pistia straitoides,* in rice ecosystem harboured more spider and spiderlings of *Oxyopes sp.* and *Paradosa pseudoannulata*. This weed provided favourable microclimate for the multiplication of spiders. Prey numbers and local thermal environments can be enhanced by planting beneficial weeds and annual flowers as regular intervals and by maintaining compost heaps in the garden. Maintaining compost heaps in agro-ecosystem is followed in USA and Australia to increase the detrivores (allochthonous) population which will serve as an off season food for the spiders. Folis and

Hord [64] reported that allochthonous inputs from detrivores food chain may also subsidize spider population densities, permitting them to have greater cascading effects on crop production.

Maintaining ground cover crops in orchard e.g. introduction of desirable legume species into old fields improved the spider fauna [65]. They also reported that a diverse spider population survived and activated during the establishment phase of minimum tillage pasture improvement. Further, the importance of ground cover on spider conservation revealed by Costello and Daane [66] and experimentally proved the increase in spider density is related to the addition of cover crops in turn it reduces the pest density. However they have indicated the limitations in the use of ground cover for the pest management.

Between-row mulching provides shelter for spiders and improves the foraging behavior. Chinese are using straw bundles to provides shelter for spiders and improves the foraging behavior. Chinese are using straw bundles to provide such shelter for spiders [67]. The bundles are initially laid down in areas where spiders are numerous and are subsequently transported from field to field as needed to implement control. Overall, by manipulating the cultural strategies, indirectly it provides structural complexity i.e. refugia with increased humidity.

Augmentation: Introduction of agg sace of spiders along with Drosophila flies were the main sources in augmenting the spider population under field condition. Spider egg sacs can be kept in low temperature to postpone the hatching period. So it is easy to augment the spider population in field. But before going to release the spiders in particular locality there should be thorough knowledge about the territory size, personal space, website construction and its influence in spider's predation.

Future thrust: A quantitative analysis of the capacity of spiders to suppress insect pests, including the spatial distribution of major species of spiders and pests, should be carried out in the field on a large scale, so that spiders can be successfully used as biological control agents. Ecological and biological characteristics of spiders need to be understood. Findings are necessary, to solve the cannibalistic behavior of spiders in rearing. Developing a new molecular insecticide compounds are needed for better colonization of spiders in field. Interpreting and analyzing the climatic factors affecting the spider population in the field and their predation efficiency are needed. Identification of specific diets or artificial diets preferred by spiders through molecular studies (i.e. using PCR, ELISA and monoclonal antibody technologies) should be done. Improving the web site success potential mechanism involved in web-building spiders is needed. Advanced study in spider taxonomy is needed to identify new in India and Bangladesh are all effective in field condition.

Conclusions

In recent years, utilization of spiders in biological control is getting more importance as the spiders are having much character suitable for a successful predator. Steady progress has been made for the past few years and from that scientists were removed the major obstacles in spider study, namely mass multiplication, conservation, taxonomy, reproduction, communication and other branches. However, still spiders are not fully utilized in pest management in most of the countries. In USA, Australia and China, spiders are effectively used in biocontrol programme. In China alone, particularly Hubei province, the use of chemical pesticides was reduced by 70-90% on behalf of spiders in the field. The study

effort on the challenges in developing spiders as successful biocontrol agents will hopefully extend the economically viable, environmentally sound and socially accepted pest management for the future generations.

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