

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

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Fundamentals of Scientific Writing

Навчально-методичний посібник
для тренінгу з англійської мови
студентів-магістрів економічних спеціальностей

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Посібник містить теоретичні матеріали, де проаналізовано структуру, сучасні вимоги, основні методи і прийоми анотування та реферування наукових текстів. Також у ньому запропоновано комплекс інтерактивних вправ, спрямованих на формування навичок наукового писемного мовлення, які сприятимуть розширенню термінологічного словникового запасу, а також професійному розвитку молодих науковців.

Призначено для магістрів, студентів економічних спеціальностей, фахівців маркетингових служб, економістів.

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ПЕРЕДМОВА

У зв'язку з активною інтеграцією нашої держави до Європи, розширенням ділових та політичних відносин України з іншими країнами світу, останнім часом значно зросли обсяги письмових контактів як традиційними, так і сучасними електронними засобами. Але, як показує досвід спілкування з молодими науковцями, багато хто з них відчуває істотні труднощі в оволодінні письмовим мовленням, висловленні власних ідей. Тому навчання цьому виду мовленнєвої діяльності є дуже актуальним.

Розпочинати таку роботу слід з аналізу першоджерел. Це аналітично-синтетичний процес опрацювання інформації. Він полягає у пошуках основних фактичних відомостей (результатів, висновків, положень і т. ін.), найвагоміших у змістовому відношенні.

Посібник «Fundamentals of Scientific Writing» для студентів денної та заочної форми навчання економічних спеціальностей створено відповідно до вимог програми з іноземних мов. Мета, яку ставили перед собою автори, полягає в підготовці майбутніх фахівців до самостійного опрацювання та розуміння фахово спрямованого наукового матеріалу англійською мовою.

Посібник складається з шести розділів, кожен з яких присвячено окремим видам та формам, методам та прийомам анотування, реферування і рецензування наукових текстів – цілісної узагальненої інформації, релевантної первинним моделям. Аналізуючи зміст основного потоку документів з певної галузі, студенти вчать прогнозувати подальший розвиток нових напрямів досліджень.

Виконання письмових завдань стимулює розвиток лінгвістичної та професійної компетенції, покращує рівень граматики-стилістичної грамотності, істотно розширює словниковий запас. Пояснюється це в першу чергу тим, що у процесі підготовки своїх творів студентам доводиться багато самостійно працювати з довідковою літературою, словниками, займатися пошуковою роботою для того, щоб знайти відповідні мовні засоби та інформацію, які б дали можливість якомога ґрунтовніше та змістовніше передати їх думки.

«Fundamentals of Scientific Writing» стане у нагоді тим, хто відчуває потребу у самовдосконаленні і хоче стати висококваліфікованим фахівцем, чийі знання та вміння відповідатимуть вимогам сучасності.

I. BASIC CHARACTERISTICS OF SCIENTIFIC ENGLISH

Language as a tool of science

Scientific English is a number of things. It is a communication tool, a culture of writing, and a plain and readable manner of writing with specific compositional strategies and uses of language - all of which permit the community of scientific researchers to conduct its professional affairs. In desiring essentially to be masters of their own language, scientists rely on narrowly restricted uses of words.

Scientists use language strictly and narrowly as a communication tool. This distinguishing intention of communication shapes the professional culture and compositional style of scientists as writers. The communication model of using language suggests that words are merely physical objects or mechanical tools. Applied to scientific language, this rather simplistic view limits the role of words to something like conveyor belts in automated factories, delivering to their readers units of objective information derived from and in the service of the equally objective methods of scientific inquiry. In contrast, non-scientific uses of language like those in the literary world give prominence to personal and subjective expression. In actuality, the use of scientific language has inherent biases and subjectivities that, however desirable it may be to eliminate them, are an inescapable dimension of the human presence in written texts. Here we have, then, the key distinguishing criterion: the priority that scientists as writers, as users of the English language, give to the objective information that words impart. This central priority of communicating information demands that scientists use the tool of language responsibly and effectively to serve a scientific purpose, with the aim of convincing their intended readers of that purpose's value. There is a wide range of documents that scientists can use for achieving this effect with their discourse.

The fundamental point to keep in mind is this: any attempt to understand scientists as writers must begin with the observation that their work and their documents depend vitally upon language. From note taking to publishing and teaching, language is the tool that gives sense to scientific activity. Without the resources of language, the scientific enterprise would not progress for long.

What are the specific and practical rules of scientific English? To understand what it means to use scientific English effectively - at the level of words, sentences, and paragraphs - it is helpful to understand what scientific English is in its broader contexts: What are its scope, aims, and linguistic qualities? What are the professional relationships among scientist-writers, their documents, and their intended readers? What is the historical origin of the scientific attitude toward language? It is only through the lens of the historical evolution of modern science's view of language that the effectiveness of today's scientist-writers can be gauged.

The basic nature of scientific English can be illuminated within two basic contexts: first, as constituting a practical communication framework, a culture of writing, founded on certain professional aims and purposes, and second, as a utilitarian attitude that cultivates an ethic of plainness in the use of language for scientific ends.

There are at least five distinct obligations shared by scientists in their professional communication:

- publishing their methods and findings truthfully, clearly, and fully so that they can be verified and extended by fellow researchers;
- disseminating their findings more widely through abstracting and indexing media;
- writing critical reviews that synthesize current knowledge in their field;
- sharing their knowledge and its practical implications with the public;
- teaching what they know to future generations of scientists.

To this list, one may add the writing of laboratory notes on research methods and outcomes, proposals of research to acquire grant funding, and daily on-the-job communication. Based on all these goals, it is possible to identify six basic kinds of purposes that researchers have when they write particular documents for particular readers in order to achieve those purposes effectively: recording and archiving, professional exposition or dissemination of research results, teaching, job duties, seeking financial resources, and informing citizens (Table 1).

Table 1 – Purposes, types, audiences, and styles of scientific writing

Purpose	Document Types	Intended Readers	Linguistic Style
1	2	3	4
Recording and archiving	Laboratory notes, with other preservable forms of documentation, such as equipment, printouts, photos, and special artifacts for verifiability	Self; research collaborators; workplace supervisors	Informal to highly formal notations in arcane shorthand; lab jargon
Professional exposition and synthesis	Scholarly articles and books; abstracts; notes and visual media for conference papers and seminars; letters; e-mail	Researchers in same or related field	Highly formal, with heavy use of jargon
Teaching	Textbooks, syllabi, electronic slides, Web-based information, and other pedagogical materials	Students at all levels	Moderately to highly formal, with parallel range in jargon
Performing job duties	On-the-job communications, including e-mail, letters, memoranda, meeting minutes, and activity or progress reports; internal and external	Research associates, colleagues, and administrators	Informal to highly formal; low to high level of jargon

Table 1 continuation

1	2	3	4
Seeking research resources	Grant proposals to government agencies, corporations, and philanthropic foundations	Granting agency officials; peer reviewers	Highly formal; moderate to heavy use of jargon
Informing citizens	Articles, essays, and books; special letters; Web-based material; creative forms; expert testimony and other consulting documents	General public; special-interest groups	Formality and jargon low to moderate

In scientific activity itself, the most immediately important uses of language occur in making a reliable and permanent record or archive of research methods, outcomes, and conclusions. The next professional purpose for researchers is to share their work with peers through publication. Beyond these prime archival responsibilities - which allow the profession to advance in the collaborative spirit it requires – scientists also must share their knowledge in various forms with a range of reader – constituents. These interested readers range from students and fellow researchers to public officials and citizens. Each of the important purposes in scientific writing calls for a particular nuance in the basic manner of using scientific English, in how formal or detailed the communication may need to be.

A culture of writing also means a culture of readers. The particular choices that scientists make as writers must be guided by assumptions about their readers. It is not enough, then, for effective and responsible scientist-writers to know their subject. They also must know a document's readers; for example, how much do they know about the subject? Is the document for a research supervisor, a journal, a public official? How should a document's technical formality and style be adjusted for its reader(s)? Do the writer's intentions match the reader's expectations? Consider any given document mentioned in Table 1 in light of this question: What would the reader expect? Scientists do write for their all-important and diverse readers with their range of expectations.

The professional standards for doing science are reflected in the strict standards and practices for writing science. The modern scientific community's culture of writing also demands a unique sense of plain language.

The new language of science focused not on psychological but rather on material reality. Such attitude toward language largely defines the present culture of writing in the community of scientific researchers, wherein words are used in very specific, constrained, highly formalized, and generally impersonal ways that accord with scientific objectivity. The old emphasis on the writer and on artistic language has given way in the past four centuries to the modern scientific emphasis on words merely as neutral conveyors of information for the practical benefit of the reader.

The call in science is for reader-centered writing. In the age of information technology, reader-friendly communication will only continue to grow in demand. The basic principle remains simple: No matter how much information a document

may contain, if comprehension of it is blocked by inaccessible or imprecise language then the writing is not much more useful than the pre-Baconian varieties of linguistic ambiguity and opaqueness. Fundamentally, the concept of readability simply places readers at the center of communication, facilitating their decoding of information without making them expend undue time and effort re-reading. Writing readable scientific prose means putting into practice, using various compositional strategies, the principles of objective wording valued by research scientists. The more generalized call of the Plain English Movement for reader-centered writing, with its readability theories, also produced mathematical formulas for measuring how readable a document is.

Measuring Scientific Readability

Readability formulas are designed to measure qualities of writing that comport with a scientific style, with simple, direct, and concise wording. The word-processing software you use probably has a feature to calculate the readability of your writing. Stand-alone style and grammar checkers also have been marketed under such names as RightWriter, CorrectGrammar, Editor, and Grammatik. These programs use readability formulas, such as Flesch-Kincaid, Dale-Chall, Spache, and Gunning, to measure the number of technical words, number of syllables, and length of sentences and paragraphs in a written work. To get a sense of how readability formulas work, try computing the so-called Gunning Fog Index by taking a short technical report and following three simple steps:

1. Average sentence length (ASL): Count the sentences in several 100-word samples and divide the total word count by the sentence count.

2. Percentage of hard words (PHW): Count the words in your samples that have at least three syllables, excluding proper names, simple compound words (e.g., afternoon, humankind), and verbs with three syllables due to -ed, -es, or -ing endings (e.g., enriches, extruded).

3. Gunning Fog Index (GFI): Add your ASL and PHW from the first two steps and multiply that sum by 0.4. For example, an ASL of 15 and a PHW of 21 adds up to 36, which, when multiplied by 0.4, yields a GFI of 14.4.

The GFI value represents the document's level of difficulty as a grade level, which in this case means that readers should have a grade 14, or college sophomore, reading ability. The various formulas work their magic in different ways. The Dale-Chall formula checks a document's ASL and the number of words that are not on its list of a few thousand words. The Cloze Procedure deletes every fifth word and determines the readability score according to how difficult it is for a reader to fill in the blanks. However much faith one may place in such devices, it should not be surprising that a scientific attitude toward language would lead to experimentation with mathematically objective methods for measuring the readability of formal writing.

Compositional strategies of scientific English

An understanding of the historical evolution, philosophical orientation, and practical ethic of scientific English provides the contexts needed to grasp its

principles for sound practice. Using scientific English to communicate plainly and readably requires certain compositional strategies, from the level of words and phrases to that of sentences and paragraphs, which will be illustrated in the remaining sections of this chapter. Upon deeper consideration of the cliché that the facts (or data) speak for themselves, meticulous and experienced users of scientific English will realize that this is not so. It is the writer who must fashion a thesis, gather and evaluate information, make conclusions, and then find the best scientific English to communicate it all as accurately as humanly possible in a coherent account that both enlightens and convinces the reader. The researcher-writer's challenge is to try to ensure that the reader will readily decode virtually the identical meaning that the writer intended to encode and transmit. To achieve this rigorous standard it is advisable for scientists to use simple, direct words, words with little emotional weight and clear meanings.

The place of writing in graduate scientific education

While a baccalaureate curriculum affords glimpses of the unique demands of scientific writing, graduate training serves as a more direct initiation into the professional discourse of the scientific community. Advanced undergraduates have experiences that interconnect with those of graduate study, such as doing independent research supported by a professor's grants, presenting a paper or a poster at a conference, or writing a senior honors thesis involving laboratory work. The connection is felt even more deeply in those rare instances when an undergraduate is listed as a co-author of a journal article. In their transition from pre-professional to professional writing, graduate students must demonstrate competence in using the language of science, both spoken and written, as a rite of passage into their research community. Their research writing, which typically culminates in either a thesis or a dissertation, is subjected to rigorous scrutiny in its various forms. These include laboratory and field notes, laboratory reports, course papers, qualifying examinations, a thesis or dissertation proposal, and – after completing the dissertation itself – probably presentations, articles, and grant proposals.

For career researchers, the dissertation is seen as the ultimate qualifying test of one's training and authority. The importance of a dissertation as both a writing process and a written product must be seen in the broader context of the professional community that cultivates an authoritative and competent use of its tribe's language.

Scientific journals and their articles

Journals in the sciences contain various kinds of items besides articles that report original experimental work, a fact that can bewilder inexperienced readers like advanced undergraduates or early graduate students who are required to cite scholarly sources. Among the types of informational items published in scientific journals besides research articles are news reports, editorials, columns, letters, and book reviews. Journals also have other unique features or "departments" that they publish regularly. Although scientists will readily differentiate among these types and their respective aims, undergraduate students must be taught to distinguish their technical purpose and bibliographic value.

Students also need to know that journals vary in their degree of specialization, with some publishing articles on a broader subject range, such as Science or Nature, and others in narrower specialties or subspecialties, such as Astroparticle Physics or Journal of Electroanalytical Chemistry.

Whatever the subject domain or scope of a journal, research articles take one of the following typical forms: empirical or experimental, methodological, theoretical, review, and case study. Although there is no established formal typology of scientific articles, these forms may be differentiated in basic content and purpose as follows:

- experimental: reports original laboratory or field studies, typically organized by the IMRAD model (introduction, methods, results, and discussion);
- review: synthesizes previously published work to evaluate the state of current knowledge in a defined area, identifying gaps and suggesting future directions;
- theoretical: draws on available work, including empirical studies, comparing consistencies and contradictions of alternative theoretical constructs - whether verbal, graphical, or mathematical-to support an existing theory or develop a new one;³
- methodological: presents modified or new methodologies, such as in laboratory techniques or data analysis tools, permitting practical comparisons with existing approaches in particular research areas or problems;
- case study: describes and analyzes quantitative or qualitative information obtained from studying individuals or organizational settings to demonstrate a problem (such as a medical condition or an occupational hazard) or a need for new solutions and theories.

The focus here is on the conventional parts of a scientific article, especially the experimental article and its typical IMRAD (introduction, methods, results, and discussion) structure. As a genre, experimental articles proceed inductively by describing a series of laboratory or field events that lead to a broader statement about natural phenomena. The typical structure of scientific papers, beyond serving to report information in a formalized fashion, is an idealization of scientific inquiry - a simplified progression from experimental design to collection and presentation of results to conclusions about the natural world. The overall structure includes a range of features that allows articles to communicate their content with consistency and maximum readability.

The features of a scientific journal article

Scientific journal articles have conventional components that their writers include, as well as additional in-house features of design and layout determined by publishers. Besides the perennial concerns with effective use of scientific language, authors of articles should attend closely to the following aspects of their manuscript:

- Title
- Author byline
- Abstract
- Acknowledgments
- Textual organization
- Visuals
- References
- Ethics

Once a decision has been made about which periodical the paper will be submitted to, the prospective author(s) should consult the manuscript guidelines for that publication. Also helpful are the general guidelines for preparing manuscripts available in manuals from such organizations as the American Chemical Society (ACS), the American Psychological Association (APA), and the Council of Science Editors (CSE).

II. STRUCTURAL FEATURES OF A SCIENTIFIC REPORT

Whatever the disciplinary context in which one may write a scientific report, the standards of accuracy and truth for scientific information still apply. In essence, a university research report in the sciences is a highly organized, professionally worded, and documented communication of scientific knowledge derived from bibliographic experimental sources of information. Science majors who pursue a laboratory career or a graduate scientific education will see this bibliographic emphasis increasingly shift toward original experimental research as the primary source of information for reports. Some students may afford themselves an early glimpse of this shift through laboratory experiences associated with independent study and internships. Depending on the course or situation, a report's readers may range in expertise from the instructor and groupmates to other faculty members and research supervisors.

Basic features of a scientific report

Writing scientific papers involves some basic practices and features that are shared across disciplines and others that are based on the unique values and expectations of the scientific community of researchers.

Several elements are common to university research reports in general:

– First, university research reports typically require bibliographic searches (mostly online these days) that will yield both an appropriately narrowed topic and the published sources to rely upon and cite.

– Second, it is broadly expected that the report will be organized into key traditional parts: an introduction that explains the topic and thesis; middle parts that present, discuss, and cite the information and ideas; and a concluding section that discusses the upshot or implications of the reported information.

– Third, research papers across disciplines weave a scholarly tapestry with purposes and presentation modes that describe, explain, argue, and ultimately attempt to narrate and support a scholarly story, for which readers are judge and jury.

– Fourth, all research reports entail aspects of both process and product.

When it is finished, the document has the layout and look prescribed by scientific convention. It appears seamless, not revealing what went before: the dynamic and lived experience of making it, with all the associated decisions.

Finally, both the process and the product must have been completed responsibly and ethically. These features of research reports that are shared across the curriculum are part of higher education's emphasis on critical thinking.

The conventions and standards for producing a research paper - how the writer derives, thinks about, and conveys the researched information formally - take their own form in the scientific disciplines.

Specific features of a scientific report

What, then, are features that are specific to scientific reports? To begin with, the empirical nature of scientific inquiry itself dictates how or when something is viewed

as a fact. Scientific facts and concepts have qualities that differ radically from, say, literary or theological facts.

Writers of scientific reports must be mindful of the importance that scientific inquiry places on deriving knowledge from observation and manipulation of the physical and natural world. Scientific reports must reflect the fundamental process of doing science - they must be objective and accurate, and must rely on facts, ideas, and thinking that are consonant with scientific professionalism. This sense of scientific truth value and professional boundaries determines various aspects of scientific report writing as both a process and a product: how a scientific report's topic is delineated; how its thesis is formed and supported; how its information is organized and presented; and how language is used to communicate its content are all shaped by how science works.

There are always philosophical challenges in making absolute distinctions among different professional or scientific discourses, but the various types of discourse do each have their own special ways of speaking.

One framework for understanding the different expectations between scientific writing and literary or creative writing is to list the many particular components of any written work - purpose, scope, audience, voice, use of language, style, and so on - and look at how these two basic approaches differ in their treatment of those details (Table 2).

Table 2 – Characteristic differences between scientific and creative writing

Characteristic	Creative Writing	Scientific Writing
1	2	3
Purpose	Expression, exposition	Communication
Generality	Typically more general rather than highly specific and detailed	Highly specific, concrete, detailed, rather than general and abstract, except for theory
Writer vs. subject	Personal, subjective, or objective	Impersonal, objective, object-oriented
Audience	Public or non-specialized readers	Scientific peers
Rhetorical setting	Writer-centered	Writer marginalized in favor of readers
Form	Intrinsic, author-selected, or shaped during composing process	Extrinsic; determined by convention, material, structure of discipline
Content realism	Reflective, imaginative, imaginary	Observational, factual, reportorial
Form vs. content	Shaped by aesthetic objectives	Constrained by scientific content and purpose

Table 2 continuation

1	2	3
Reader interest	Designed to interest	Inherent in content; readers self-selected
Accuracy and clarity	Not central requirements	Central requirements
Language	Expressive, connotative, vivid	Precise, denotative, concise, plain
Stylistic variation	Used for expressiveness, interest	Avoided, conflicts with precision or clarity
Jargon	Undesirable, except aesthetics	Essential for precision among peers
Passive voice	Proscribed because weak, not direct	Used to focus on object of discourse
Coherence	Effected by topic sentences and transitional elements	Effected by internal hook-and-eye connections and transitional elements
Process of writing	Largely composing	Typically more straightforward
Source of material	Writer's knowledge and experience	Discrete body of data and concepts
Graphics	Exceptional, embellishing	Required for empirical demonstration
Format	Integrated; headings not common	Headings important, numerous

While such distinctions are sometimes difficult to maintain, they nonetheless serve to highlight the basic sense that scientific and creative documents ultimately have sharply different intentions. Still, it may be argued that some of these features simply are expressed differently across scientific cultures.

Disciplines may each, for instance, have their own senses of accuracy and clarity with regard to the content, style, and aims. Or, consider the opposition between «composing» and simply «writing» - pointing to a concern with style and expression in opposition to a straightforward telling of facts:

- First, scientist-writers do express their own individual style, which does require close composition or crafting.

- Second, while some parts of a scientific report may be relatively straightforward to write, such as experimental methods and results that are thoroughly familiar to the author, careful construction is required in those other parts that interpret, evaluate, and connect to current theory. Because the writer must argue

for viewpoints and conclusions convincingly, a process of composing - down to the level of words and phrases within sentences - actually is vital.

Other distinctions are more readily evident, such as subjectivity versus objectivity of content and language, degree of authorial presence (passive versus active wording), sources of information, and relative use of certain organizational and graphical features.

Scientific research reports are a form of writing that is basic to the success and progress of science itself. The strict authorial expectations and responsibilities, that they demand, reflect the values of modern science as a profession.

Writing scientific reports encompasses elements of both process and product. The particular nature of the process (what you do) and the product (what you make and submit to an instructor) will vary with the educational situation that sets those parameters. Writers of scientific reports must also recognize the human dimension of the process.

The general parameters of writing a scientific report

From that moment on the pressures of bibliographic and topic decisions, as well as of constructing the report itself to communicate the information to be found, all begin to weigh on the writer. Where does one begin? Before jumping right into the process of making decisions about the report's topic and other aspects, full awareness is needed of the project's context and situation.

In short, what exactly are the expectations? Various situational factors must be understood from the start, including the following:

- What is the report's purpose, scope, length, timeline, and intended audience?
- Should the report be mainly either explanatory or argumentative, focused more on reviewing and explaining scientific theory or on supporting a particular view?
- How does the report relate to the overall content and goals of the class?
- Is collaborative writing required? Peer-critiquing?
- Will it be written for «other» audiences? (Is it part of an internship requirement? Is it cross-disciplinary?)
- What computerized writing environment is available? (This may include computer labs, word-processing and graphics software, printers, scanners, and online research resources through a library or the instructor's Web site.)
- Are there any restrictions on the types of bibliographic sources to be used?
- What criteria will the instructor use to evaluate the report?

As to the question of audience, for instance, the paper's focus and overall value as a writing experience are likely to benefit by conceiving an audience other than just its evaluator (the instructor). A clear understanding of the parameters of the writing situation and of the instructor's specific expectations will permit the report-writing process and its stages to proceed more smoothly and confidently.

Collaborative scientific reports

Collaborative research writing in the sciences and technology is common. Whether in scientific or industrial settings, scientists and other technical researchers routinely conduct their work and prepare reports in team situations.

Writing a scientific report collaboratively poses challenges that require special attention, including differences among team members in specific talents and abilities, motivation, commitment, timeliness, and personality. If your project is collaborative, here are some key suggestions for optimizing the team's effectiveness in working together:

- Use a detailed outline to determine the project's scope and to distribute specific responsibilities among the team members.
- Determine the strengths of each team member, such as graphics or editing for style and grammar, and ensure that duties are distributed equitably and fairly.
- Prepare a document template that shows agreed-upon styles and formats for such aspects as multilevel headings, figures, and documentation.
- Create a firm schedule for team members to complete and share their progress on their assigned duties, using focused team meetings and e-mail distribution lists.
- Develop methods, such as distributing minutes of meetings, for keeping close track of which project tasks have been completed and which still need action.
- Take into account each team member's personality in assigning roles and for team activities such as meetings or interviews.

In writing situations, personality and emotional differences can wreak havoc if not anticipated and monitored, or they can be used constructively to the team's advantage. To the extent possible, the team should identify members who would serve best in such roles as initiator, energizer, follower, diagnostician, opinion giver, coordinator, orienter-summarizer, evaluator-critic, procedure developer, graphics designer, and secretary (taking the minutes, for example).

Assigning roles based on personality insights will not guarantee a project's overall success, but together with mapped-out procedures it will go a long way toward minimizing potentially disruptive surprises that could slow the project's momentum or jeopardize the final report's quality.

The recursive stages of writing a research report

Because it is a nonlinear process, writing a research paper will have you moving back and forth among the various aspects of the research and writing process. This recursive cycle involves the following components, with whatever personal mosaic any given writer may make of them.

- Selecting a topic
- Searching the literature
- Planning and drafting content
- Designing and laying out document-specific features
- Reviewing, editing, revising, and proofreading
- Documenting information

Considering each of these components, it will be helpful to keep in mind the two basic points:

• First, the writing process is whole and living rather than segmented into separate and discrete parts. Despite any intellectual or practical discussion or artificial division of its elements, it is a seamless, organic, and lived human experience that is

irreducible to a tidy set of steps or parts or tools laid side by side, as if for some surgical procedure.

•Second, writing a scientific report is an adventurous process in the personal sense of being engaged in creating an individual mosaic of choices. The writer cannot fully anticipate the nuances of the individual research and writing experience that lies ahead. It is important to keep this point firmly in mind from the start, even as you begin to weigh alternatives and make decisions regarding prospective topics and sources.

Whether your research and writing is yours alone or team-structured, as you embark on this decision-making process, you will need to frame working answers to some basic questions.

Writing a research paper: asking the right questions

The process of writing a research paper must begin with an inquiring mind that is open but thoughtful, vigilant, and prudent. The writer must test options and prospective avenues, avoiding dead ends and open waters alike, intent on carving out a supportable scientific narrative of appropriate and workable proportion. As the ideas about a topic and a specific thesis emerge - even as words are set to paper (or to a computer screen) - the process must be guided by a certain sense of direction. Just as scientific inquiry begins with experimental questions, so the process of writing a scientific report must begin with critical thinking that provides answers to some basic questions:

- What are the topic, thesis, and conclusion?
- What points, reasoning, and methodologies support the conclusion?
- How strongly does the evidence support the conclusion?
- How carefully does the language avoid ambiguity?
- How appropriate and helpful for the reader is the demeanor and «voice»?
- Are there any conflicting or questionable assumptions and «facts»?
- What are the limitations of the research and information presented?
- Is the conclusion warranted, given these limitations?
- Is the research and writing process being conducted responsibly and ethically?

This list includes questions about the report's language. How a person uses language is at the core of how he thinks, writes, reads, and processes information. Communication of scientific information depends on what the learner does with language. The questions posed above will permit a writer to fully evaluate the focus, thoroughness, and objectivity of the research and writing process judiciously and with dispatch. Sufficient time spent on these initial critical judgments will save much trouble with potential pitfalls later.

Any university writing project is defined by its instructional context, by the specific requirements of the course, the instructor, and the assignment itself, so it is necessary to grasp fully the given writing situation.

Topic and source decisions

Students are left to come up with them on their own, relying on their resourcefulness, imagination, personal interests, and any bibliographic constraints. Fortunately, using the many online databases available today will permit a quick

initial test of topic ideas for availability of sources. Online searches will also allow efficient refinement and focus of a topic idea. This is not to say that finding the best or “right” sources is any easier than deciding which topic or focus is best, but only that electronic searching, together with both patience and careful management of preliminary time, will make topic decisions go more smoothly.

Focusing on a topic goes hand in hand with the bibliographic search process. The kind of search process needed will be determined largely by the instructor’s leeway regarding allowable sources, whether they are restricted to the current periodical literature or even just journal articles, versus public magazine articles. There may also be course restrictions regarding electronic sources, such as specific types of Web sites or documents, the authority or expertise of which must be assessed.

Before starting to search for sources, the instructor’s bibliographic guidelines and restrictions must be understood. Once that is clear, the diversity of specialized online databases available on a campus network, together with any special links that an instructor may provide, will open up plenty of research avenues. Early in the search for topics and sources, the student will gain more control over the process by using online databases to assess the published work that is available.

The topic selected, the thesis, the points and evidence offered in support of that thesis, and the conclusions that can be made are all as good as the sources one chooses to consult and cite. An instructor’s constraints on types of sources may also limit topic options.

One of the problems that is common when there is an abundance of information on a topic and an instructor limits types of sources only mildly (such as regarding certain types of Web sites). Many scientific topics, such as those in health care biotechnology, readily yield rigorous scientific sources.

Given such availability, it is critical that source types be distinguished as to their type, audience, purpose, and overall scientific rigor. There can be a dizzying and potentially frustrating array of choices: beyond the millions of articles available in journals worldwide, many other types of articles, books, and specialized forms of scientific information and documents - from patents to corporate reports - may turn up on any given topic.

Today there are not only the printed documents in traditional libraries, but also specialized databases and the vast amount of material on the Internet. The great diversity in form and purpose of publications that communicate scientific information requires making careful bibliographic distinctions and assessments in the search process.

Types of sources and their application

In the course of searching for a particular type of source, it is necessary to distinguish the different types of published sources of scientific information. How is a book written by a scholar for a university press different from a book written by a journalist for a commercial publisher, for instance? How is an article on environmental toxins published in the *Journal of Environmental Health* different from an article on “sick-building syndrome” written for a popular magazine like *Time*? Or, what about an article on anabolic steroids in *Joe Wieder’s Muscle and Fitness*

magazine for bodybuilders versus one in the American Journal of Sports Medicine? These are critical distinctions to make because a report will be only as authoritative as the selected sources.

Books, articles, and other publications vary widely in purpose, audience, author expertise, formality level, technical rigor, and documentation (Table 3).

Table 3 – Types of sources containing scientific information

Source Type	General Features
1	2
Scholarly books	Primarily for professional readers. Includes state-of-the-field critical reviews, historical and theoretical expositions, and original research monographs. Formality, technical rigor, and documentation at highest levels. Peer reviewed.
Textbooks	Used for teaching at all levels. Formality, technical rigor, and documentation vary with student and professional level.
Guidebooks	Multipurpose, including pedagogy and personal use for professional and public readers. Focused on readers’ practical needs. Formality, technical rigor, and documentation vary widely.
Reference books	Multipurpose, for professional and public readers. Includes manuals, handbooks, dictionaries, and encyclopedias. Formality, technical rigor, and documentation vary.
Public books	For non-specialized readers. Includes explanations, personal arguments, histories, biographies, and autobiographies. Formality and technical rigor typically mild; documentation varies.
Journal articles	Communicate current research and ideas. Technical rigor, formality, and documentation at highest levels. Peer reviewed.
Trade magazine articles	Communicate current information and research. Formality, technical rigor, and documentation vary, but typically at high levels.
Public magazine articles	Coverage ranges from broad to special-interest subjects. Formality and technical rigor mild; documentation variable and informal.
Newspaper articles	Coverage typically broad. Formality and technical rigor mild; documentation variable and informal.
News letters	Cover special-interest subjects in short forms for public, professional, and internal workplace audiences. Formality, technical rigor, and documentation mild.

Table 3 continuation

1	2
Pamphlets and brochures	Provide practical information in brief forms for public and professional readers. Includes product or service details and special announcements. Formality, technical rigor, and documentation low.
Government documents	Serve public and professional readers. Includes books, reports, and collected statistical data. Formality, technical rigor, and documentation vary widely. Sometimes peer reviewed.
Private-sector publications	Serve public and professional readers. Includes research and development updates, special agency reports, and commercial catalogues. Formality, technical rigor, and documentation vary.

There are two important differences between lay sources, such as public magazine articles by journalists, and scholarly sources such as journal articles, and these differences will greatly affect the reliability of any report using them.

First, journal articles are primary rather than secondary sources: they are written by the original researchers who generated the knowledge.

Second, they are reviewed by peer researchers prior to publication.

While it is true that journalistic sources - secondary media removed from the original documents - are easier to read and comprehend, professional scientific sources are more rigorous, dependable, and therefore generally preferable. Before proceeding with our discussion of the research and topic-narrowing process, it will be helpful to take a closer look at the different types of sources that offer scientific information.

Electronic sources

Online resources allow broader access and more pinpointed searches for articles. Electronic documents, like print ones, must be carefully assessed for their value and authority. Besides the multitude of personal home pages, sites exist for government agencies, businesses, colleges, universities, public organizations, and professional associations. Specialized databases provide access to such items as biochemical structures (e.g., BioInfo Bank), and medical articles (Medline). Multiple databases containing articles can be searched through a gateway like ProQuest.

There are many search gateways and databases available through university networks and on the World Wide Web, either cost-free or by subscription, that contain abstracts and full texts of scientific articles. Users may perform selective searches on most of these commercial products not only by subject, but also by periodical title, author(s), publication year, and periodical type (such as public media versus scholarly journals).

There are also various bibliographic databases for scientific information, such as GeneralScience Index, AccessScience, Medline, and PsycInfo. Some databases also

provide articles as PDF files (which retain the appearance they had in the original publication), a format that is more readable and instructive to students becoming familiar with journal-style articles.

The PDF copies of articles in back issues sometimes are available without charge at journal Web sites. Optimal use of electronic resources requires organized and focused keyword searching to determine whether particular topics yield a sufficient and appropriate pool of sources. Besides the standard search boxes, databases may provide further options for narrowing searches.

Besides periodical Web sites and article databases, the Internet offers a vast array of sites containing all sorts of scientific information. These include scientific, professional, government, corporate, public, and private sites, as well as individual home pages. They provide links to fact sheets, frequently asked questions (FAQs), pamphlets, press releases, newsletters, position statements, or to their own research documents, periodicals, and books. Such public sites, as well as those of state and local agencies, have links to special reports, statistical information, or legislative proposals on medical and scientific issues that affect the public (e.g., environmental impact studies of industrial pollution, or mother and infant mortality due to postpartum depression).

There are also Web sites that provide such highly specialized resources as molecular, genetic, and anatomical databases. The MathMol Library, for one, contains three-dimensional images of many molecular structures discussed in introductory biology and chemistry courses.

On personal home pages, individual researchers may disseminate descriptions of their research activity and results.

Before using scientific information from a particular site, one must assess the site's authoritativeness and reliability (and perhaps consult with a course instructor). Here are some basic questions for evaluating a Web site's information:

- What is the site's purpose or motive?
- Who maintains the site - that is, does it provide names of authors or organizations?
- Does the site have a bias or an agenda, aside from simply providing information?
- What is the source of the site's or a particular document's information?
- Is the information scholarly, comprehensive, carefully researched and supported?
- Is the information current? Does the site include publication or "update" dates?

A particular site's main use may be simply to provide a reference point for author names or subject terms that can then be used for more comprehensive searches in databases.

Some Web sites, such as those of national associations or government agencies, may be used just for current statistics on disease prevalence or updates to legislation. An extra degree of scrutiny may be needed to find the components of an online document that will allow full assessment of its value or bibliographic identification for a report.

Planning and drafting the report

Once sufficient information has been gathered to begin drafting the report, it is time to make decisions about how to present the research findings.

Here it is necessary to return to those critical questions that guided the search in the first place. What kind of information was sought? Do the sources address each of the points that were necessary to discuss in the report for supporting its thesis? In planning for how the collected information will be used and ordered, a useful visualization technique is to map out the report using an outline.

Outlining content

Why do an outline? Even without actually writing out a formal plan, a focused and meticulous search is likely to begin producing mental images of a report's point-by-point organization.

An outline on paper, however, can serve as a concrete checklist, not unlike a pilot's preflight review of the plane's condition. It helps to double-check that every item is in its proper place.

An outline's structure and detail will allow the writer to assess how effectively the information will be conveyed and how convincingly the thesis will be supported for its readers. Is there sufficient or too much information, or data, or examples? Are adjustments needed in the report's scope?

The process of preparing an outline, in consultation with an instructor and with groupmates (whether in collaborative or peer-critiquing groups), provides the writer a more solid sense of the report's measure of quality and success.

How detailed should an outline be? The straightforward answer is: as detailed as is desirable for assisting the writing of the report's draft.

Should it be a keyword outline, a sentence outline, or some combination? An outline with keywords will later facilitate wording of the report's headings and subheadings. A sentence outline may provide topic sentences for starting paragraphs. An outline's level of detail is a personal decision (unless the report is collaborative) to be determined by the sufficiency of road signs that will guide the drafting of the report.

Along with the keywords or sentences, one can include various markers, such as approximations of the length in words of each of its sections, author - year citations to show how sources will be used, or notations indicating placement of visuals.

In the end, any outline is a customized blueprint to suit one's own needs in planning a report from title to bibliography. At the same time, it must be a flexible tool. It is best viewed as a guide, a plan yet to be fully tested, so the writer must remain open to practical adjustments in the roadmap.

Choosing reportorial modes of development

The writer must decide on the best-suited and most effective option for developing a report with its particular topic and purpose. A scientific report can be developed using one or more of the following methods: inductive, deductive, sequential, comparative, and analytical.

Deductive versus inductive development

Developing a report inductively parallels the sense of movement (not necessarily so linear) in scientific research from articulating a hypothesis about something unknown (a “problem”) to experimentally testing it and then generalizing from the results. Analogously, the report writer selects a topic (problem), fashions a thesis, tests it bibliographically, evaluates the research findings, and concludes with inferences or generalizations supported by those results.

This inductive method of development is commonly practiced when researchers report their experimental activity in journal articles using the IMRAD model (introduction, methods, results, and discussion). An inductive narrative must provide a clear, logical, stepwise roadmap so that readers are not forced to retrace their steps or make inferences from insufficient or ambiguous information. Readers trust and expect to be led along toward a report’s conclusions responsibly and smoothly.

Writing a paper deductively means revealing its destination at the start, thereby giving readers a reference point for visualizing and evaluating the path to that conclusion. As the narrative develops, readers can readily see where they agree or pause to check if they are still on track or whether the writer is proceeding along a logical route. Deductive development is well suited for long and complex discussions of concepts and theories.

Sequential development

Some topics are well suited to sequential development, such as those involving temporal events (describing procedures and processes, for instance) or spatial series (smallest to largest objects).

Describing three-dimensional entities like equipment (such as a microscope) does not lend itself to sequential development unless the description is based on accompanying visuals (having two dimensions). Then the paper’s development can move sequentially from, say, upper to lower parts of the visual (photo), from side to side (block diagram), or from top to bottom (organizational chart).

Comparative development

With a topic that is developed using a comparison structure, the writer compares either a linear series of entities (X to Y to Z) or two or more entities relative to a series of attributes. In any case, comparative reports are readily adapted to a linear process of scientific exposition.

Analytical development

Topics that are developed analytically may require consideration of a web of complex relationships, such as those associated with chronology, logical explication, cause and effect, and comparisons. Such a web of interrelationships can be treated like a two- or three-dimensional object, represented diagrammatically, and adapted to linear exposition.

Whatever the report's method of development, the writer is likely to engage in some combination of four basic compositional modes, namely, description (actions, objects), explanation (theories, logic), argument (alternative viewpoints), and narration (events, natural phenomena). Along the way, the writer will bring to bear facts, data, ideas, examples, logic, and personal ingenuity to convince readers of the validity of the report's thesis, evidence, and conclusions.

The methods chosen to develop the report and to achieve its purpose, together with the writer's command of technical language, will determine how readers respond to it as a scientific document.

Beginnings, middles, and endings

The simple and sensible idea that a written (or oral) communication must have a beginning, a middle, and an end is found two millennia ago in Aristotle, and it applies in specialized ways to scientific reports.

Tradition dictates that the standard parts of a report are the introduction, the sections that comprise its body of findings from the scientific literature, and a concluding discussion.

Introduction and background

The introduction to a scientific report sets up the reader's expectations by providing a blueprint for what its writer intends to accomplish. An effective orientation to the subject's significance and to the aims of the report should do the following:

- identify a topic's scope—that is, what it will describe, explain, argue, or narrate;
- provide context for the topic's significance, namely, an overview of relevant research, theory, and practice;
- raise key ideas, concepts, or terminology applicable to the subject;
- state the report's proposition or thesis;
- delineate the specific objectives (subpoints) in support of the thesis.

Sections on research findings

Even after a plan has been outlined and the report's method of development has been determined, one must remain open to any necessary adjustments in structure or content.

In presenting the findings, a recursive process becomes important. Does the plan need to be adjusted? Are more sources needed for better development or support of particular points? In any case, an effective presentation of the findings should:

- take up each point or aspect in some logical and apparent order (e.g., spatial or temporal features, strongest to weakest evidence);
- interconnect key points with one another and with the thesis coherently;
- support points concretely (with appropriate data, examples, cases, logic, analogies);
- reconcile or address opposing viewpoints that are relevant to the thesis;
- tell and show by complementing verbal reportage with visual representation;

- partition major aspects liberally but judiciously using headings and subheadings;
- recognize informational limitations (the writer's, the report's, the readers').

A clear and plain presentation will be reflected in how authoritative and convincing readers perceive the narrative to be. This is particularly important when a point is being addressed on which experts offer conflicting data or interpretations.

Scientific facts and ideas that are communicated logically, visually, and readably will permit readers to comprehend more readily how the report's conclusions are grounded in the documented sources.

Discussion and conclusions

The concluding section of a research report is not a mere formality. It is an opportunity to pull together the scientific narrative with a sense of closure regarding the significance and implications of the research findings.

A scientific report's ending should do some combination of the following:

- reaffirm the thesis, with its scientific significance (practical, theoretical);
- underscore the major scientific points covered in support of the thesis;
- reach conclusions from scientific evidence that validates or modifies the thesis;
- offer recommendations implied by the conclusions (e.g., on workplace practice, public policy, legislation, legal issues, ethics, or further study).

A report's closing should leave readers with a convincing demonstration of the rigor and authority of its information as well as of the validity of its conclusions.

While a scientific research report in any subject typically must have appropriate content in its beginning, middle, and ending sections, the expectations for scientific reports are unique and highly formalized. Certain types of statements and information are expected to be in their traditional parts of the research report, in a manner that parallels experimental thinking.

Scientific conventions also apply to bibliographic documentation and to the incorporation of visual matter. A scientific report also tends to be highly segmented by extensive use of headings throughout its text.

A scientific report's headings

Besides a report's internal dynamics for developing a topic and for writing effective prose, there is an external technique for guiding readers through content: dividing and subdividing information using a system of headings and subheadings. In partitioning a topic and identifying its key elements, headings are superimposed signposts.

Readers are helped by headings in various ways, such as in finding parts of the paper that may be of special interest to them or when a paper's development is unconventional or especially complex. Because headings stand outside the scientific narrative itself, their removal should make no difference to the text's meaning, though their absence will make readers expend more energy following and decoding the narrative.

The detailed and four-tiered outline (I, A, 1, a) for a scientific report facilitates a multilevel sectioning system. The style of the headings must allow readers to recognize each division level.

Each level of heading uses a different style to distinguish it from the others. Typography, positioning, and spacing are typical features used for multilevel text segmentation. Heading systems may also use numbers to distinguish the various levels, or differences in type size.

Although numerical and letter-size systems are used less frequently in college reports, they can be especially helpful for navigating other types of documents, such as lengthy government reports.

Headings for scientific reports do not use color, unlike such technical documents as procedural or equipment manuals (such as red headings for sections that caution about special hazards or troubleshooting certain problems).

Two other important aspects of headings are their wording and their relation to a document's text. Wording in headings typically is compressed ("Preparation of liver homogenate"), or just a single word may suffice ("Chemicals").

It is generally inadvisable to use full sentences or questions as headings. And because the headings are meant to serve only as guideposts for the reader, they are considered outside the narrative, not a part of it.

Therefore, the sentence of any particular section does not follow directly from the words in its heading, but rather from the preceding section's last sentence. So if a heading reads "Preparation of the liver homogenate," for instance, the first sentence following it ought not to begin "It was prepared by ..." but rather "The liver homogenate was prepared by ..." - as if the heading did not exist.

Despite their extra textual nature, well-designed headings do provide structural guidance for moving through a document's contents efficiently or selectively and will earn the writer gratitude for saving the reader time and energy.

Additional elements for reports that are formal

In some instructional situations, especially in technical or scientific writing courses, students may be asked to prepare research reports that are of the formal type. Formal reports contain features that are typical in corporate, government, and institutional settings. While the text or body of these reports has the traditional content and structure already described, there are other parts used to increase their formality.

The more evident features are covers and binding, but the primary additional elements that make a report formal are referred to as the front and back matter.

Front matter

Elements preceding a formal report's body provide information that orients its intended readers about the report's purpose, context, and content. The front matter also is a chance not only to impress upon readers the significance of the information itself but to show the care and professionalism with which the document was prepared - something especially important in the business or administrative side of the scientific work world.

The typical components of front matter are:

- Front cover: title, author(s), date, and graphical elements
- Title page: title, author, and author affiliation
- Transmittal memorandum: explanation of report's aim, scope, and content
- Table of contents: list of all sections and subsections, with their page numbers
- List of visuals: list of all tables and figures with their number, title, and page
- Abstract or executive summary: encapsulation of the report's content and conclusions.

The design and layout of each of these features vary considerably within the expected conventions. For instance, cover graphics may be absent or range from being conservative or subtle to dominant and colorful, though they should always be tasteful, inoffensive, ethical, and culturally sensitive.

There may be legal considerations involving appropriate use of licensed logos. Practices also vary regarding the abstract or executive summary, in both length and detail.

The transmittal memo, typically a single page that explains the report's impetus, purpose, and contents, may also include relatively informal or editorial commentary and special acknowledgements.

More than a minor formality, the transmittal memo introduces a document into the administrative archive officially, so that further action can be taken. The memo also provides the gist of the report for busy readers who must prioritize their day-to-day work activities. The same professional attention must be given to the typical items that are placed in the report's back matter.

Backmatter

Following the report's main text - with its findings, conclusions, and recommendations - several kinds of items can be included as back matter, such as the following:

- List of references or bibliography: lists all sources cited or consulted, sometimes accompanied by brief annotations
- Glossary: lists and defines technical terms used in the report
- Supplementary graphics: tables and figures that further illuminate the text
- Mathematical information: formulas, special derivations, and statistical data
- Sample documents: brochures, Web sites, FAQs, and fact sheets

Back-matter items that follow a list of sources typically are titled as appendixes, for example, "Appendix A: Glossary." The format and sequence of back-matter items vary. Glossaries may read across the page or in columns, with the term on the left and its definition in the right column.

A list of references may precede or follow appendixes, which may have their own citations. The selection and style of back-matter items must be guided by the particular needs of the report's audience(s).

Writing the draft

The draft stage naturally is the point of thorough testing of a topic. The writer should assess the draft as it develops by asking basic questions concerning the

purposes and methods, for each component of the report; examples of such questions are listed in Table 4.

Depending on the specific writing situation, additional questions may arise as the draft is continually reviewed (with instructor or peer critiques). A university research report in the sciences is characterized as a highly structured, professionally worded, and documented transmission of scientific information.

Readers of a scientific report expect that it will present the information coherently, with a clear interrelationship among its parts, and that the writer will follow the strictures of scientific English proficiently and responsibly. Gauging a paper’s overall success requires asking the right questions about its fundamental parts and traditional features.

In assessing the draft the writer must also examine particularly its grammar, usage, and readability. The key criterion by which scientists judge the value of language is not its capacity for expressiveness in subjective or literary senses, but rather its practical utility.

Once a draft is completed, guided by all the factual, structural, and linguistic expectations, the remaining task is to polish it into a final copy by double-checking it, standing, as it were, in the shoes of both writer and reader.

Table 4 – Questions for critiquing a report at the draft stage

Report Aspect	Questions for Assessing Draft
1	2
Introduction	<ul style="list-style-type: none"> • Are the topic’s focus and current significance explained fully? • Is there background information on current scientific activity and thesis? • Is the thesis statement appropriately focused and clearly stated? • Are the points to be covered in support of the thesis delineated?
Findings	<ul style="list-style-type: none"> • Is each objective or point sufficiently, clearly, and rigorously covered? • Is the content presented in an accessible and thought-provoking manner? • Is there sufficient scientific support (examples, data) for each point?
Discussion and conclusions	<ul style="list-style-type: none"> • Are the thesis and key scientific findings reaffirmed? • Does the conclusion point up the findings’ practical or theoretical implications? • Are the limitations and remaining questions regarding the findings assessed? • Does the report end thought-provokingly (e.g., by looking to the future)?

Table 4 continuation

1	2
References	<ul style="list-style-type: none"> • Are the sources authoritative, unbiased, and mainly primary? • Are expectations being met for source types (e.g., current journal articles)? • Are any Internet sources carefully screened (or even preapproved)? • Is documentation precise and stylistically consistent?
Visuals	<ul style="list-style-type: none"> • Are the visuals selected, designed, and incorporated carefully? • Are visuals fully labeled with a number, title, caption, and credit? • Does any visual need a legend to identify symbols or colors?
Format	<ul style="list-style-type: none"> • Are multilevel headings used logically to segment information? • Are heading titles and subtitles brief, informative, and parallel? • Are the report's layout, design, and typography appropriate and effective?
Readability	<ul style="list-style-type: none"> • Is technical jargon minimized and glossed sufficiently? • Is there awkward or ambiguous wording? • Is wording simple, clear, concise, direct, concrete, objective? • Are there coherence devices, such as emphasis of key points and transitions?
Grammar and usage	<ul style="list-style-type: none"> • Are there spelling, punctuation, typographic, or other mechanical errors? • Are scientific terms and numbers used properly and written correctly? • Are verb tenses used accurately (e.g., in findings versus conclusions)? • Is active versus passive wording used where appropriate? • Is wording concrete and denotative versus abstract and connotative? • Is language biased or inappropriate (e.g., gender, culture, ethnicity)?

Final copy: reviewing, editing, revising, and proofreading

A final double-checking of the report means evaluating its overall readability, from its content, organization, and language to its use of visuals and typography. Again, the questions used in assessing the draft provide the broad strokes for a starting point in the editing process. The actual work of editing a scientific report can make use of electronic resources while also applying human judgment.

Computers as editors

The computer is a convenient and efficient tool for electronic cutting and pasting as well as using language aids like a thesaurus and spelling, grammar, and style checkers. For scientific writing in particular, specialized functions and software provide discipline-specific features for creating or editing mathematical formulas, chemical and anatomical structures, or engineering drawings.

Separate software packages are commercially available that contain scientific dictionaries, spellers, bibliographic stylers, and proofreaders. Examples of such software, also used for documents more professionally advanced than college reports, are Inductel Scientific and Technical Dictionary, SciProof, and Scientific WorkPlace.

Computer-aided writing does have its limitations. Software for checking spelling, grammar, and style is not error-free, foolproof, or comprehensive. A spell-checker will flag typos-words with missing letters or inverted letters, unfamiliar letter combinations or words, or double-word errors like “the the”-to help in correcting these efficiently and quickly. On the other hand, it will not flag a missing word like an article, as in “drank [the] fluid,” or a correctly spelled word that is used incorrectly or poorly chosen (“two,” “too,” and “to,” or “effect” and “affect”). A spell-checker will not catch an inadvertent use of “phase” for “phage” or “animal infections” in place of “annual inspections,” errors that surely will confuse if not chill readers.

Grammar and style checkers are helpful in finding such items as unbalanced marks (quotes, parentheses), use of the passive voice, or single-gender referents; however, they also flag unusual or innovative but technically correct wording. As dazzling and convenient as all the ever-improving electronic resources may be, they cannot substitute for the creativity and ingenuity of the human mind. Computers cannot write, either literally or figuratively, for us.

Human editing

In the editing process, writers have to face two complicating human realities: the first is that it is not easy to objectify language to the extent required by science, and the second is that the individuality of the writer cannot be surgically removed from scientific writing any more than one can control the individuality of the reader’s interpretation of the text.

However, the primacy of intention is a fundamental criterion for a scientific report. The reader of a scientific report must decode the specific technical meanings intended in the writer-researcher’s exposition.

In contrast, the intentions of the literary writer may become irrelevant as the work takes on a life of its own as an art object to be individually experienced.

The essential task in editing a scientific research report is to root out ambiguities so that writer and reader can share the same understanding of the text.

The second and related truth, scientific writers face, is that no amount of editing will eliminate the individual person in any text. It is not simply a matter of removing personal pronouns or feelings.

The issue is not whether scientific writing is a human act that is subject to human limitations, but whether the truthfulness, honesty, and professional integrity of the writer, process, and product have been preserved and protected to the extent that is humanly possible. A meticulous draft-editing process goes a long way toward helping a report’s writer survive the scientific and human challenge of producing a successful scientific report.

III. LINGUISTIC ASPECTS OF A SCIENTIFIC REPORT

Purpose and Strategy

Audience, purpose, and strategy are typically interconnected. If the audience knows less than the writer, the writer's purpose is often instructional (as in a textbook). If the audience knows more than the writer, the writer's purpose is usually to display familiarity, expertise, and intelligence. The latter is a common situation for the graduate student writer.

Organization

Information is presented to readers in a structured format. Even short pieces of writing have regular, predictable patterns of organization. You can take advantage of these patterns, so that readers can still follow, even if you make errors.

Language Focus: The Vocabulary Shift

A distinctive feature of scientific writing style is choosing the more formal alternative when selecting a verb, noun, or other part of speech.

Verbs

English often has two (or more) choices to express an action or occurrence. The choice is often between a phrasal or prepositional verb (*verb + preposition*) and a single verb, the latter with Latinate origins.

Often in lectures and other instances of everyday spoken English, the verb + preposition is used; however, for written academic style, the preferred choice is a single verb wherever possible. This is one of the most dramatic stylistic shifts from informal to formal style.

Nouns and Other Parts of Speech

English has a very rich vocabulary derived from many languages. Because of this, there may be more than one way to express an idea. It is advisable to choose words that are less informal in nature and also precise. However, in writing it is better to apply a more formal format if one exists.

Language Focus: Formal Grammar and Style

The following are some non-vocabulary-related recommendations for maintaining a formal scientific writing style.

1. Avoid contractions.
2. Use the more appropriate formal negative forms.
3. Limit the use of "run on" expressions, such as "and so forth" and "etc."
4. Avoid addressing the reader as "you" (except, of course, if you are writing a textbook).
5. Limit the use of direct questions.
6. Place adverbs within the verb.

Adverbs often are placed midposition rather than in the initial or final positions.

Flow

Another important consideration for successful communication is flow-moving from one statement in a text to the next. Naturally, establishing a clear connection of ideas is important to help your reader follow the text.

Language Focus: Linking Words and Phrases

Linking words and phrases can help a writer maintain flow and establish clear relationships between ideas. Table 5 lists some of the more common linking words and phrases, arranged according to their function and grammatical use.

Sentence connectors raise a small, but important issue, namely punctuation. The flowchart in figure 1 can help you choose appropriate punctuation.

Table 5 – Linking Words and Phrases

	Subordinators	Sentence Connectors	Phrase Linkers
Addition		furthermore in addition moreover	in addition to
Adversative	although even though despite the fact that	however nevertheless	despite in spite of
Cause and Effect	because since	therefore as a result consequently hence thus*	because of due to as a result of
Clarification		in other words that is i.e.	
Contrast	while whereas	in contrast however on the other hand conversely	unlike
Illustration		for example for instance	
Intensification		on the contrary as a matter of fact in fact	

*Note that *thus* may also be used in nonfinite clauses of result.
The scandal deepened, thus causing the Minister to resign.

Another way to maintain flow is to use *this/these + a noun* to join ideas together. Consider the following sentences:

– ESL lecturers know that students need to understand the differences between formal and informal language. However, this understanding cannot usually be acquired quickly.

– In recent years, the number of students applying to Ph.D. programs has increased steadily, while the number of places available has remained constant. This situation has resulted in intense competition for admission.

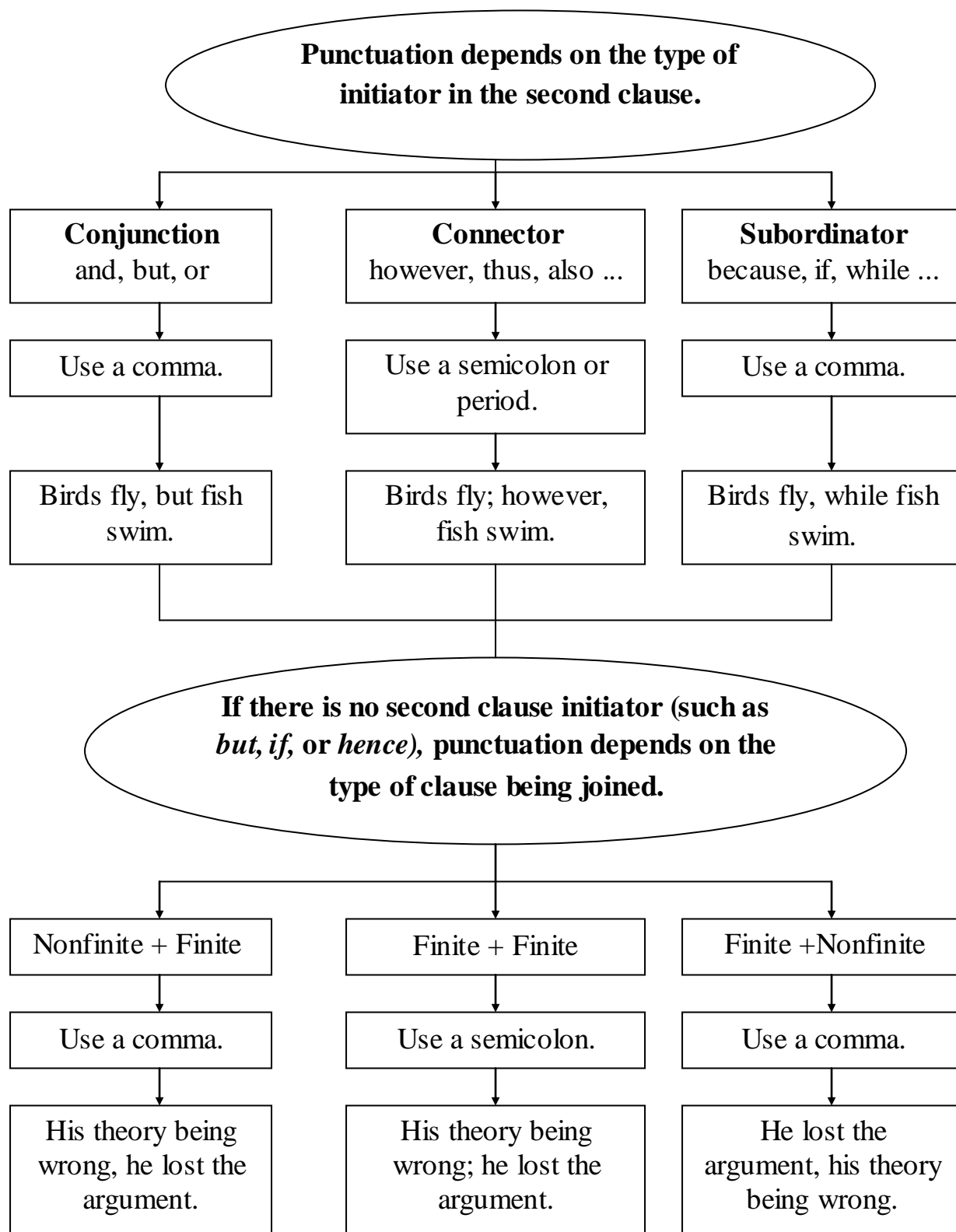


Fig. 1. Punctuation

Presentation

The presented scientific work is more likely to receive a positive response if the following tasks are performed:

1. Consider the overall format of your written work.

Does your paper look as if it has been carefully prepared?

Are there clear paragraphs?

Is the line spacing appropriate?

2. Proofread for careless grammar mistakes.

Do subjects and verbs agree?

Have the appropriate verb tenses been used?

Have the articles *a*, *an*, and *the* been used when necessary?

Is the used too much?

3. Check for misspelled words, even if you have spell-checked your work.

Has the correct homophone been used?

Did the spell-check routine miss anything?

Writing General-Specific (GS) Texts

There are three reasons to begin with GS (general-to-specific) texts. They are quite common in graduate student writing, they are comparatively simple, and they are often used as introductions for longer pieces of writing.

It is needed to produce a GS (general-to-specific) text for:

a. an answer to an examination question,

b. an opening paragraph of an assignment, or

c. a background (or scene-setting) paragraph to an analysis or discussion.

GS (general-to-specific) texts usually begin with one of the following:

a. a short or extended definition,

b. a contrastive or comparative definition, or

c. a generalization or purpose statement.

As their name implies, GS texts move from broad statements to narrower ones. However, they often widen out again in the final sentence. The shape is similar to that of a glass or cup (see fig. 2).

General statement

*More specific
detail*

*Specific
detail*

Broader statement

Fig. 2. Shape of GS (general-to-specific) texts

As in many GS texts, the “Writing” passage began with a definition. Definitions are a common way of getting started; they are “hooks” from which GS paragraphs can be hung. Such paragraphs typically open with full-sentence definitions. Textbooks, in contrast, often introduce the definitional information as a minor part of the sentence.

Deletions

It is possible to reduce the restrictive relative if:

1. the relative clause consists only of the relative pronoun, the verb to be, and one or more prepositional phrases;
2. the relative clause consists of a passive verb plus some additional information;
3. the relative clause contains the relative pronoun, an adjective ending in *-ble*, plus *additional* information.

Change in Word or Word Form

It is possible to reduce the relative clause if

1. the relative clause contains the verb *have*. In this case the relative pronoun and *have* can both be dropped and replaced by *with*;
2. the relative clause contains an active state verb (a verb that expresses a state or something that is going on). The relative pronoun is dropped and the verb changed to the *-ing* form. Exceptions to this are *to be* and *have*.

It is also important to note that a relative clause containing a modal auxiliary cannot be reduced.

Now notice also that in a full relative clause, the relative pronoun can be preceded by a preposition. The relative pronoun which must be used in this type of restrictive relative clause. This construction is common in formal scientific writing. These clauses cannot be reduced.

Extended Definitions

In some cases, one sentence may be enough before continuing with your GS passage (as with the text on writing at the beginning of this unit). However, in others, it may be relevant and important to expand your definition. In this way you can demonstrate your knowledge of a concept more fully.

An extended definition usually begins with a general, one-sentence definition and then becomes more specific as additional details are provided. There may be a need to display one or more of the following.

An extended definition may also include information regarding operating principles or causes and effects.

A description of operating principles is also known as a process analysis. A process analysis has some unique characteristics, which will be discussed in greater.

Comparative Definitions

Comparative definitions are typically introductory sections of assignments. They can be used to display your knowledge of the complexities surrounding key terms in

your field of study.

There are basically two approaches to this type of task. One is to present a historical account of how a concept has changed over time. The other is to present an overview of how various experts today view a concept differently. Good comparative definitions often contain elements of each approach.

General-specific passages tend to be descriptive and expository. In contrast, problem-solution texts tend to be more argumentative and evaluative.

Data Commentary

In many writing assignments, there comes a place where graduate students need to discuss data. Typically, the data is displayed in a table, graph, figure, or some other kind of nonverbal illustration. This data may be incorporated in the main text or attached as an appendix.

Strength of Claim

Like many other aspects of graduate student writing, data commentaries are exercises in positioning yourself. There are, as a result, both dangers and opportunities. One danger is to simply repeat in words what the data has expressed in nonverbal form -in other words, to offer description rather than commentary. An opposite danger is to read too much into the data and draw unjustified conclusions.

The art of the matter is to find the right strength of claim for the data and then order your statements in some appropriate way (such as from the more significant to the less significant). In most cases, this means moving in a general-specific direction.

It is not easy to predict precisely what you might need to do in a data commentary, but here are some of the more common purposes.

- Highlight the results.
- Assess standard theory, common beliefs, or general practice in the light of the given data.
- Compare and evaluate different data sets.
- Assess the reliability of the data in terms of the methodology that produced it.
- Discuss the implications of the data.

Data commentaries usually have the following elements in the following order:

- location elements and/or summary statements
- highlighting statements
- discussions of implications, problems, exceptions, etc.

Highlighting Statements

The central sections of data commentaries consist of highlighting statements. Highlighting statements are generalizations that you can draw from the details of the data display. Highlighting statements need good judgment. They are an opportunity to show your intelligence.

In particular, they are an opportunity for you to demonstrate:

- that you can spot trends or regularities in the data,
- that you can separate more important findings from less important ones, and

- that you can make claims of appropriate strength.
- So, do not
- simply repeat all the details in words,
 - attempt to cover all the information, or
 - claim more than is reasonable or defensible.

Concluding a Commentary

Qualifications can be important in making highlighting statements. They can be even more so in the concluding parts of a commentary. These parts are diagrammed in table 6, in the order in which they typically appear.

Table 6 – Concluding a Data Commentary

Explanations and/or implications	Usually required
Unexpected results or unsatisfactory data	If necessary
Possible further research or possible future predictions	If appropriate

Language Focus: Dealing with “Problems”

The following phrases may be helpful as you discuss imperfect data.

The difference between expected and obtained results	may be due to	the incorrect calibration of the instruments.
This discrepancy	can be attributed to	the small sample size.
The anomaly in the observations	can probably be accounted for by	a defect in the camera.
The lack of statistical significance	is probably a consequence of	weaknesses in the experimental design.
The difficulty in dating this archeological site	would seem to stem from	the limited amount of organic material available.

Dealing with Graphs

Discussions of graphs essentially follow the same principles as those for tables with one major difference. Much of the vocabulary of commenting on graphs is quite different.

Language Focus: Referring to Lines on Graphs

Here is a list of terms that are used to describe lines of a graph:

upward trend	peak	low point	sharp rise
steep fall	rise	leveling off	fell off
remained steady	spike	increase	decline

Writing an Assignment Summary

Assignment summaries can be extremely challenging to write. A good assignment summary has three principal requirements.

1. It should offer a balanced coverage of the original. (There is a tendency to devote more coverage to the earlier parts of the source text.)
2. It should present the source material in a neutral fashion.
3. It should condense the source material and be presented in the summary writer's own words. (Summaries that consist of directly copied portions of the original rarely succeed.)

To do a good job, you must first thoroughly understand the source material you are working with. Here are some preliminary steps in writing a summary.

1. Skim the text, noting in your mind the subheadings. If there are no subheadings, try to divide the text into sections. Consider why you have been assigned the text. Try to determine what type of text you are dealing with. This can help you identify important information.
2. Read the text, highlighting important information or taking notes.
3. In your own words, write down the main points of each section. Try to write a one-sentence summary of each section.
4. Write down the key support points for the main topic, but do not include minor detail.
5. Go through the process again, making changes as appropriate.

When you write a formal summary of someone else's ideas, you should keep in mind the following guidelines. (Remember, if you are taking notes for yourself, direct copying is OK, but it is a good idea to indicate in your notes when you are directly copying.)

1. Always try to use your own words, except for technical terms.
2. Include enough support and detail so that the presentation is clear.
3. Do not try to paraphrase specialized vocabulary or technical terms.
4. Include nothing more than what is contained in the original. (Do not include your own comments or evaluation.)
5. Make sure the summary reads smoothly. Use enough transition devices and supporting detail. You do not want a collection of sentences that do not flow.

Language Focus: Summary Reminder Phrases

In a longer summary, you may want to remind your reader that you are summarizing.

The author goes on to say that ...

The article further states that ...

(author's surname here) also states/maintains/argues that ...

(author's surname here) also believes that ...

(author's surname here) concludes that ...

In the second half of the paper, (author's surname here) presents ...

In fact, you may want to mention the source author's name at three points in your summary - the beginning, the middle, and the end. In a short summary, it would be rather awkward to mention the author so frequently, and the text would not flow well if each sentence began with the author's name; however, in a longer summary, mentioning the author three times would be quite appropriate. When you do mention the author in the middle or end of the summary, be sure to use the surname only.

Goodman goes on to say ...

Suzuki also believes that ...

Some of the following linking words and phrases may be useful in introducing additional information.

additionally

also

further

in addition to

furthermore

moreover

The author further argues that ...

Comparative Summaries

Comparative summaries are common in many graduate courses. They can be assignments on their own, part of a longer paper, or a response to an examination question. Comparative summaries can be more challenging to write than simple summaries, because they require you to analyze and use information from two or more sources rather than just one.

In a comparative summary, you often need to infer and make explicit the relationships among your sources. Unlike a traditional summary, a comparative summary may not be an objective representation of the original sources. If you write a comparative summary in response to a question, you will use only material from the source that is relevant to the task.

Language Focus: Inversions

It is known that English usually requires an inverted word order for questions. It is also known that a different word order is required if a "negative" word is used to open a sentence. Consider the following examples:

– Not only has the author presented some valuable new information, he has also presented it in a very clear and coherent manner.

– In no case do the authors provide any statistical information about their results.

Notice how the auxiliary verb precedes the subject, as in a question.

Now look at this statement, first inverted, then in normal word order.

– Particularly prominent were functional strategies ...

– Functional strategies ... were particularly prominent.

In scientific English, it only occurs with emphatic (“particularly”) or comparative (“even more”) expressions. The inversion is a strong highlighting device and should only be used for special emphasis, as when we want to single out one *result/fault/problem/virtue* from many others. Six typical expressions follow.

1. Particularly important + BE + Noun Phrase . . .

2. Especially interesting

3. Much less expected

4. Rather more significant

5. Especially noteworthy

6. Of greater concern

Constructing a Research Paper

In order to write up your own research, you should use a typical organizational pattern for your paper - in other words, the IMRAD format (Introduction, Methods, Results, and Discussion) or some variant of it.

Overview of the Research Paper

The overall rhetorical shape of a typical RP (research paper) is shown below. This diagram gives a useful indication of the out-in-out or general-specific-general movement of the typical RP (research paper). As the RP in English has developed over the last hundred years or so, the four different sections have thus become identified with four different purposes.

Introduction (I)

The main purpose of the Introduction is to provide the rationale for the paper, moving from general discussion of the topic to the particular question or hypothesis being investigated. A secondary purpose is to attract interest in the topic - and hence readers.

Methods (M)

The Methods section describes, in various degrees of detail, methodology, materials, and procedures. This is the narrowest part of the RP (research paper).

Results (R)

In the Results section, the findings are described, accompanied by variable amounts of commentary.

Discussion (D)

The Discussion section offers an increasingly generalized account of what has been learned in the study. This is usually done through a series of “points”, at least some of which refer back to statements made in the Introduction.

As a result of these different purposes, the four sections have taken on different linguistic characteristics. We summarize some of these in table 7. The first line of the table shows, for instance, that the Present tense is common in Introductions and Discussions, but uncommon in Methods and Results.

Table 7 – Frequencies of Selected Items in RP (research paper) Sections

	Introduction	Methods	Results	Discussion
Present tense	high	low	low	high
Past tense	mid	high	high	mid
Passive voice	low	high	variable	variable
Citations/references	high	low	variable	high
Qualification	mid	low	mid	high
Commentary	high	low	variable	high

The remaining parts of a research paper are presented in the following order:

- Introduction sections
- Discussion sections
- Acknowledgments
- Titles
- Abstracts

Introduction Sections

It is widely recognized that writing introductions is slow, difficult, and troublesome for both native speakers as well as nonnative speakers. Writing the Introduction of an RP is particularly troublesome. In some kinds of texts, such as term papers or case reports, it is possible to start immediately with a topic or thesis statement:

The purpose of this paper is to ...

This paper describes and analyzes ...

My aim in this paper is to ...

In this paper, we report on ...

Moves in Research Paper Introductions

Move 1

Establishing a research territory

a. by showing that the general research area is important, central, interesting, problematic, or relevant in some way. (optional)

b. by introducing and reviewing items of previous research in the area, (obligatory)

Move 2

Establishing a niche

a. by indicating a gap in the previous research, raising a question about it, or extending previous knowledge in some way. (obligatory)

Move 3

Occupying the niche

a. by outlining purposes or stating the nature of the present research, (obligatory)

b. by announcing principal findings, (optional)

c. by indicating the structure of the RP. (optional).

Language Focus: Citation and Tense

Several studies have shown that at least two-thirds of all citing statements fall into one of these three major patterns.

I Past-researcher activity as agent

II Present Perfect-researcher activity not as agent

III. Present-no reference to researcher activity

Note these common uses of these patterns:

Pattern I-reference to single studies-past

Pattern II-reference to areas of inquiry-present perfect

Pattern III-reference to state of current knowledge-present

Also note that in patterns I and II, attention is given to what previous researchers did, while in pattern III, the focus is on what has been found.

Finally note that different areas of scholarship have somewhat different preferences. Patterns I and II are most common in the humanities and least common in science, engineering, and medical research. However, all three patterns tend to occur in many extensive literature reviews, since they add variety to the text.

The main verbs in Pattern I can refer to what a previous researcher did (investigated, studied, analyzed, etc.). By and large, in these cases the past is obligatory.

However, the main verbs can also refer to what the previous researcher wrote or thought (stated, concluded, claimed, etc.). With these reporting verbs, tense options are possible. The differences among these tenses are subtle.

In general, a move from past to present perfect and then to present indicates that the research reported is increasingly close to the writer in some way: close to the writer's own opinion, close to the writer's own research, or close to the current state of knowledge.

The present tense choice is sometimes called the citational present and is also used with famous or important sources.

Plato argues that ...

Confucius says ...

The Bible says ...

The Constitution states ...

Language Focus: Negative Openings

Probably the most common way to indicate a gap is to use a “negative” subject. Presumably, negative subjects are chosen because they signal immediately to the

reader that Move 1 has come to an end.

Note the following uses of little and few:

Uncountable: However,

little information ...

little attention ...

little work ...

little data ...

little research ...

Countable: However,

few studies ...

few investigations ...

few researchers ...

few attempts ...

Note the use of no/none of:

No studies/data/calculations ...

Use *no* when your conclusion is based on but does not directly refer to the cited literature. If you want to refer directly to the previous research, use *none of*.

None of these studies/findings/calculations ...

You may prefer, for various reasons, to avoid negative or quasi-negative comment altogether. In such cases, a useful alternative is to use a contrastive statement.

The research has tended to focus on ..., rather than on ...

These studies have emphasized ..., as opposed to ...

Although considerable research has been devoted to ..., rather less attention has been paid to ...

Two other strategies are quite common, particularly in the “harder” areas. The first is raising a question, a hypothesis, or a need.

Here are some skeletal examples.

However, it remains unclear whether ...

It would thus be of interest to learn how ...

If these results could be confirmed, they would provide strong evidence for ...

These findings suggest that this treatment might not be so effective when applied to ...

It would seem, therefore, that further investigations are needed in order to ...

Note that in these cases, sentence connectors are not limited to the however type. The second strategy is continuing a line of research. This last strategy is largely restricted to RPs written by research groups who are following up their own research or that done by similar groups. The authors draw a conclusion from their survey of the previous research indicating how some finding in the immediate research literature can be extended or applied in some way.

Occupying the Niche

The third and final step in the typical RP Introduction is to make an offer to fill the gap (or answer the question) that has been created in Move 2. The first element in Move 3 is obligatory. It has two main variants:

Purposive (P)

The author or authors indicate their main purpose or purposes.

or

Descriptive (D)

The author or authors describe the main feature of their research.

Language Focus: Tense and Purpose Statements

The use of *was* or *is* in purpose statements depends on how you refer to your work. You have two choices:

1. Referring to the type of text - paper, article, thesis, report, research note, etc.
2. Referring to the type of investigation-experiment, investigation, study, survey, etc.

If you choose to refer to the type of text, you must use the present tense.

If you write, “The aim of this paper was to ...,” it suggests that you are referring to an original aim that has now changed. If you choose to refer to the type of investigation, you can use *was* or *is*. However, there is an increasing tendency to choose the Present, perhaps because it makes the research seem relevant and fresh and new. The “safe rule” then is to opt for the present.

Secondary Aims or Features

These secondary statements are often introduced by such language as

In addition ...

Additionally...

A secondary aim ...

A further reason for ...

Limitations in Discussions

A. Limitations of Research Scope

1. It should be noted that this study has examined only ...
2. This analysis has concentrated on ...
3. The findings of this study are restricted to ...
4. This study has addressed only the question of...
5. The limitations of this study are clear...
6. We would like to point out that we have not ...

B. Limitations in Conclusions.

Below are some typical openings for statements that firmly state that certain conclusion should not be drawn.

1. However, the findings do not imply ...
2. The results of this study cannot be taken as evidence for ...
3. Unfortunately, we are unable to determine from this data ...
4. The lack of ... means that we cannot be certain ...

A useful alternative is to place the limitation in an opening phrase.

Notwithstanding its limitations, this study does suggest ...

Despite its preliminary character, the research reported here would seem to indicate ...

However exploratory, this study may offer some insight into ...

Acknowledgments

Acknowledgments have become an integral part of most RPs.

Acknowledgments occur either at the bottom of the first page, following the Discussion, or sometimes at the end. They provide an opportunity for you to show that you are a member of a community and have benefited from that membership. Here we list some of the common elements in Acknowledgments.

1. Financial support

Support for this work was provided by (sponsor).

This research was partially supported by a grant from (sponsor).

This research was funded by Contract (number) from (sponsor).

2. Thanks

We would like to thank A, B, and C for their help . . .

I wish to thank A for his encouragement and guidance throughout this project.

We are indebted to B for . . .

We are also grateful to D for ...

3. Disclaimers (following element 1 or 2)

However, the opinions expressed here do not necessarily reflect the policy of (sponsor).

The interpretations in this paper remain my own.

None, however, is responsible for any remaining errors.

However, any mistakes that remain are my own.

4. Other versions

An earlier/preliminary version of this paper was presented at (conference or seminar).

5. Source

This article is based on the first author's doctoral dissertation.

This paper is based on research completed as partial fulfillment for the Ph.D. requirements at (university name).

Research Paper Abstracts

RP abstracts usually consist of a single paragraph containing from about four to ten full sentences. This kind of abstract is more important for the reader than for the writer. Readers of scientific journals employ a vast amount of skimming and scanning. If they like your abstract, they may read your paper, or at least part of it. If they do not like it, they may not.

There are two main approaches to writing RP abstracts. One can be called the “results-driven” abstract, because it concentrates on the research findings and what might be concluded from them. The other approach is to offer an “RP summary” abstract in which you provide one- or two-sentence synopses of each of the four sections. In both cases, the abstracts will be either informative or indicative.

Most RP abstracts should aim to be informative (i.e., they should include the main findings). However, this may not be possible with very long papers or with very theoretical ones (as in mathematics).

Language Focus: Linguistic Features of Abstracts

There are the following linguistic specifications as characteristic of abstracts:

1. the use of full sentences
2. the use of the past tense
3. the use of impersonal passive
4. the absence of negatives
5. the avoidance of “abbreviation, jargon, symbols and other language shortcuts that might lead to confusion.”

Conference Abstracts

This second type of abstract is somewhat different from the RP abstract. It is usually much longer; most of a page rather than a single paragraph (and can be even longer, especially in engineering).

It is independent; in other words, whether you are accepted for the conference program depends entirely on how your conference abstract is perceived by the review panel. Your primary audience is, therefore, the conference reviewing committee. Appealing to the conference participants is a secondary consideration.

It is possible that you do not yet have a text to construct your abstract out of. Finally, it is also possible that you have not yet completed all the work for your RP. For example, you might have three experiments planned, but as the deadline descends on you, you have results from only two of them. In effect, your abstract may not be entirely informative.

In consequence of these and other factors, conference abstracts are much more of “a selling job” than RP abstracts. As a result, most conference abstracts have an opening section that attempts to

- create a research space,
- impress the review committee, and
- appeal (if accepted) to as large an audience as possible.

Scientific English and Latin Phrases

Nearly all scientific languages make occasional use of foreign phrases and expressions, either to add technical precision or to add “color” to the text. English is no exception.

Although in many fields the use of expressions or words from French or German may be declining in scientific English, the tradition of incorporating bits of Latin remains surprisingly strong. For that reason, this appendix (appendix is a Latin word!) deals only with Latin.

We include this appendix primarily to help you negotiate Latin expressions in your reading. You should consider the preferences of your field when deciding whether to use such expressions in your own writing.

Did you know that per in percent or kilometers per hour is a Latin preposition that originally meant through or by? Per is also used in the Latin expression per se meaning through or of itself, and hence “intrinsically.”

Although education conveys important economic benefits, it is also valuable per se.

As this example shows, Latin expressions are often set apart from the English language text by italics.

1. e.g.
2. i.e.
3. N.B.
4. A.M.
5. P.M.
6. P.S.
7. etc.
8. A.D.

Table 8 – Expressions Referring to Textual Matters

Expression	Full form	Literal meaning	Modern use
cf. e.g. et al. etc. errata	<i>confer</i> <i>exempli gratia</i> <i>et alii</i> <i>et cetera</i> <i>errata</i>	compare free example and others and others errors	compare for example and other authors and others list of typographical mistakes
ibid.	<i>ibidem</i>	in the same place	the same as the previous reference
i.e. infra loc. cit. N.B. op. cit. passim	<i>id est</i> <i>infra</i> <i>loco citato</i> <i>nota bene</i> <i>opere citato</i> <i>passim</i>	that is below in the place cited note well in the work cited here and there	that is to say see below in the place cited take note in the work cited the point is made in several places
P.S.	<i>post scriptum</i>	after writing	something added after the signature
<i>sic</i>	<i>sic</i>	thus	the error is in the original quote ..
supra	<i>supra</i>	above	see above
viz.	<i>videlicet</i>	obviously	namely

Table 9 – Latin Expressions Starting with a Preposition

a fortiori	with even stronger reason
a posteriori	reasoning based on past experience, or from effects to causes
a priori	deductive reasoning, or from causes to effects
ab initio	from the beginning
ad hoc	improvised, for a specific occasion, not based on regular principles (e.g., an <i>ad hoc</i> solution.)
ad infinitum	to infinity, so for forever or without end
ad lib	at will, so to speak off the top of the head
ante meridiem	before noon, typically abbreviated A.M. before the war, usually before the American Civil War
antebellum circa (c. or ca.)	about, approximately, usually used with dates (e.g., c. 500 A.D.)
de facto	from the fact, so existing by fact, not by right (e.g., in a <i>de facto</i> government)
de jure	from the law, so existing by right
ex post facto	after the fact, so retrospectively
in memoriam	in the memory of a person
in situ	in its original or appointed place (e.g., re-search conducted <i>in situ</i>)
in toto	in its entirety
in vitro	in a glass (e.g., experiments conducted <i>in vitro</i>)
inter alia	among other things
per capita	per head (e.g., a <i>per capita</i> income of \$20,000)
per diem	per day (e.g., expenses allowed each day)
post meridiem	after noon, usually abbreviated to P.M.
postmortem	after death, an examination into the cause of death
pro rata	in proportion (e.g., <i>pro rata</i> payment for working half time)
sine die	without a day, with no time fixed for the next meeting
sine qua non	without which not, hence an essential pre-condition for something.

Table 10 – Other Expressions

anno Domini (A.D.)	in the year of the Lord, or the number of years after the beginning of Christianity
bona fide	in good faith (e.g., a <i>bona fide</i> effort to solve a problem)
caveat	a caution or warning (e.g., <i>Caveat emptor</i> , «let the buyer beware»)
ceteris paribus	other things being equal (much used by economists)
curriculum vitae	a statement in note form of a person's achievements
ego	literally «I,» the consciousness or projection of oneself
locus classicus	the standard or most authoritative source of an idea or reference
quid pro quo	something for something, to give or ask for something in return for a favor or service
status quo	things as they are, the normal or standard situation
viva (voce)	an oral examination

IV. WRITING PRACTICE

Exercise 1. Abstracts.

Write an Abstract related to your current research, alternatively invent some research. Choose one of the two possible structures below.

STRUCTURE 1

1. Give a basic introduction to your research area, which can be understood by researchers in any discipline. (1 – 2 sentences).
2. Provide more detailed background for researchers in your field. (1...2 sentences).
3. Clearly state your main result. (1 sentence).
4. Explain what your main result reveals and / or adds when compared to the current literature. (2...3 sentences).
5. Put your results into a more general context and explain the implications. (1...2 sentences).

STRUCTURE 2

1. Begin by saying what you did plus introduce one key result, i.e. begin with information that the reader does NOT already know. (1...2 sentences).
 2. Introduce the background by connecting in some way to what you said in your introductory sentence / s. (1 sentence).
 3. Use the background information (which the reader may or may not already know) to justify what you did, and outline your methodology (and materials where appropriate). (1...2 sentences).
 4. Provide some more information regarding your results. (1...2 sentences).
- Tell the reader the implications of your results. (1...2 sentences).

Exercise 2. Introductions

Write your own introduction following the structure below. You may decide to leave out some of the stages.

1. Define the topic, suggest why it is important and of interest and / or give some brief historical background. (1...3 sentences).
2. Outline the accepted state of the art plus the problem to be resolved (i.e. the gap). (2...4 sentences).
3. State your major objectives, i.e. how you intend to fill the gap. (1...2 sentences).
4. Introduce the background literature that you intend to refer to in order to give the rationale behind your research. Ensure you make reference to current insufficient knowledge of your topic. For example, you may think a particular study did not investigate some necessary aspect of the area, or how the authors failed to notice some problem with their results. (an appropriate number of sentences).

5. Make a clear statement of how what you paper represents an advance on current knowledge, and what your objective is. (2...4 sentences).
6. Announce / Preview the main results of your work. (1...4 sentences).
7. Give the structure of your paper. (3...4 very short sentences).

Exercise 3. Creating variety when outlining the structure of the paper

The Introduction of a paper typically ends with an outline of how the paper is organized. How does the author of the text below create variety in his description of the structure? Then do 10.4.

For some years the community has encouraged collaborative clinical trials. In this section we describe the first of two unreported results on such trials that we believe deserve publication. Then, in Section 2, we outline the broad perspectives that have shaped the direction of the literature on clinical trials. Section 3 answers the question: ‘Under what circumstances have trials been carried out since the introduction of the new norms?’. Finally, we draw some conclusions in Section 4. We believe that this is the first time that such an approach has been applied to an analysis of clinical trials.

Exercise 4. Outlining the structure of the paper

Write a description of the structure of a paper based on the following information.

The rest of the paper is organized as follows.

Section 2 – theoretical hypotheses based on x and y.

Section 3 – methodology and data sources.

Section 4 – results.

Section 5 – discussion + limitations.

Section 6 – conclusions + possible extensions of the analysis.

The rest of the paper is organized as follows. The second section presents the theoretical hypotheses, based on the economics of media markets and communication studies. The third section describes the empirical methodology and the data sources, while the fourth presents the results. The last section draws some conclusions, and discusses the limitations and the possible extensions of the analysis.

Exercise 5. Survey of the literature

Write a survey of the literature following this structure:

- Introduction to aspect 1 (i.e. one specific area of research within the field).
- Support from the literature regarding Aspect 1.

- Mini summary explaining how your work represents an advance on what is already known.
- Introduction to Aspect 2, and so on.

Exercise 6. Methodology / experimental

Write your Methods section by answering some or all of the questions below. Your first subsection may be a general overview of the methods chosen, how they relate to the literature and why you chose them. Then in each subsequent subsection you:

- (a) *Preview the part of the procedure / method you are talking about.*
- (b) *Detail what was done and justify your choices.*
- (c) *Point out any precautions taken.*
- (d) *Discuss any limitations in your method or problems you encountered.*
- (e) *Highlight the benefits of your methods (perhaps in comparison to other authors' approaches).*

1. What / Who did I study? What hypotheses was I testing?
2. Where did I carry out this study and what characteristics did this location have?
3. How did I design my experiment / sampling and what assumptions did I make?
4. What variable was I measuring and why?
5. How did I handle / house / treat my materials / subjects? What kind of care/precautions were taken?
6. What equipment did I use (plus modifications) and where did this equipment come from (vendor source)?
7. What protocol did I use for collecting my data?
8. How did I analyze the data? Statistical procedures? Mathematical equations? Software?
9. What probability did I use to decide significance?
10. What references to the literature could I give to save me having to describe something in detail?
11. What difficulties did I encounter?

Exercise 7. Results

Write your Results section following this structure:

1. Highlight those results (including those from controls) that answer your research question.
2. Outline secondary results.
3. Give supporting information.
4. Mention any results that contradict your hypothesis and explain why they are anomalous.

Exercise 8. Discussion: 1

Write your Discussion section by answering some or all of the questions below.

1. Do my data support what I set out to demonstrate at the beginning of the paper?
2. How do my findings compare with what others have found? How consistent are they?
3. What is my personal interpretation of my findings?
4. What other possible interpretations are there?
5. What are the limitations of my study? What other factors could have influenced my findings? Have I reported everything that could make my findings valid or invalid?
6. Do any of the interpretations reveal a possible flaw (i.e. defect, error) in my experiment?
7. Do my interpretations contribute some new understanding of the problem that I have investigated? In which case do they suggest a shortcoming in, or an advance on, the work of others?
8. What external validity do my findings have? How could my findings be generalized to other areas?
9. What possible implications or applications do my findings have?
10. What further research would be needed to explain the issues raised by my findings? Will I do this research myself or do I want to throw it open to the community?

Exercise 9. Discussion: 2

Write your Discussion section by following the structure below.

1. Statement of principal findings.
2. Strengths and weaknesses of the study.
3. Strengths and weaknesses in relation to other studies: important differences in results.
4. Meaning of the study: possible explanations and implications for clinicians and policymakers.
5. Unanswered questions and future research.

Exercise 10. Differentiating between the abstract and the conclusions: 1

Read the two texts below very quickly. Decide which is the Abstract and which the Conclusions.

TEXT 1 In this work, MOR-ON, a tool for the prediction of the behavior of students at university is developed. MOR-ON is based on a lumped and distributed parameters approach and is capable of describing both the social and in-lecture

behavior of first-year students. On the basis of the boundary conditions applied to the model, it is possible to obtain the operating map of changes in behavior. Particular care is devoted to the analysis of alcohol consumption and of its influence on exam outcomes. The predictive capabilities of our tool are evaluated by simulating a reference case: first-year students from the 1950s. The most important parameters for the description of the behavior are detailed and a set of these parameters are found, in order to accurately simulate the complete operating map. Finally, numerical results are compared to measurements and a good agreement between experimental values and numerical predictions is found. The study highlights that alcohol and recreational drugs are responsible for the moronic behavior of many university students, particularly in Anglo countries and northern Europe.

TEXT 2 This paper focuses on the development of a tool, MOR-ON for the prediction of the behavior of students at university. Based on a lumped and distributed parameter approach, the model is capable of obtaining the operating map of changes in behavior, without restrictions in the operating mode.

The social behavior of students is detailed along with how they behave while carrying out their academic tasks, for example during lectures and tutorials. MOR-ON evaluates the consumption of alcohol and recreational drugs and compares it to the students' exam results. The predictive capabilities are then evaluated by simulating the reference case of exam results from the 1950s and the relevant consumption of stimulants.

Finally, numerical results are compared to measurements and a good agreement between experimental values and numerical predictions is found.

The only significant difference between the two texts is in the last sentence of Text 1 which is a summary of the conclusions of the work. Both texts could be used as the Abstract, but neither lends itself very well to the Conclusions. Ensure that when you write your Conclusions, that they are not a cut and paste or paraphrase of the Abstract. The Conclusions are not just a summary of the paper; they should highlight the key results, quickly deal with limitations and implications, and outline paths for future research.

Exercise 11. Differentiating between the abstract and the conclusions: 2

The texts below describe a study by a researcher investigating when would be the optimum time for a female student to terminate her love relationship with her male partner. Compare the Abstract and Conclusions below, by answering these questions.

1. What information is given in the Abstract that is also given in the Conclusions?
2. What information is exclusive to the Conclusions?
3. How does the author use the current research in China to summarize the methods used in her South American research?

ABSTRACT Three red flags were identified that indicate that the time to leave him has come. These red flags are: five burps per day, two channel-zapping sessions per day, and five games on the Playstation with friends per week. Many women have doubts about the right moment for leaving their partner. Often women wait in hope for a change in their partner's habits. One hundred couples (above all South American) were analyzed, recording their daily life for six months. Women were provided with a form to mark the moments of annoyance recorded during the day. Burps, channel-zapping sessions and games on the Playstation with friends produced the highest index of annoyance. The probability of eliminating these habits was found to be significantly low when the three red flags had been operative for more than three months. Thus, these numbers provide a good indication of when the time to leave him has come. With these red flags, women will no longer have to waste their time waiting for the right moment.

CONCLUSIONS The three red flags identified in our research – numbers of burps, zapping sessions, and Playstation sessions – should enable women to understand when they need to leave their partner. To counter any effects due to the nationality of the women involved (predominantly South American in our sample), we are currently doing tests in China. The results we have so far for China would seem to confirm our initial findings, but with an additional fourth flag: time spent studying for examinations. In addition, the timeframe for the flags to be operative in China is two months, rather than the three months reported in this paper. We also plan to replicate our tests on a wider range of women and a longer time scale, thus increasing the sample base from 100 to 1,000, and increasing the recording of daily life annoyances from six months to twelve months. Future research could be dedicated to doing analogous tests to enable men to see the signs of when they should leave their woman, and for employees to identify when they should leave their current employment.

1. The main findings (three red flags).
2. Current research in China, *timeframe for the flags, sample base, length of time researchers spent recording daily annoyances*, future work.

By stating the differences between the research in South America and the new research in China. Note: these differences are highlighted in italics in the key to question 2.

Exercise 12. Conclusions: 1

Write your Conclusions section by following the structure below.

1. Revisit briefly the most important findings pointing out how these advance your field from the present state of knowledge.
2. Make a final judgment on the importance and significance of those findings in terms of their implications and impact, along with possible applications to other areas.
3. Indicate the limitations of your study (though the Discussion may be a more appropriate place to do this).
4. Suggest improvements (perhaps in relation to the limitations).

5. Recommend lines for future work (either for the author, and / or the community).

Exercise 13. Conclusions: 2

Write a paragraph summarizing one or more of the following points.

The last few sentences should:

- Outline a general conclusion.
- Suggest some implications.
- Indicate lines of ‘future work’.

1. Your government’s performance in the last one to five years.
2. Your academic performance in the last year.
3. Your relationship with friends.
4. Your use of the Internet.
5. Your reading habits.

Exercise 14. Acknowledgements: 1

Write your Acknowledgement section by including some or all of the following.

- Sources of funds.
- People who gave significant technical help (e.g. in the design of your experiment, in providing materials).
- People who gave ideas, suggestions, interpretations etc
- The anonymous reviewers.

Exercise 15. Acknowledgements: 2

Think of all your academic achievements in your life so far. Write 50 – 100 words of acknowledgements to all those people who have helped you.

V. VOCABULARY FOCUS

I. Fill in the gaps

Exercise 1.1.

arbitrary (adj) • assign (v) • context (n) • criterion (n) • data (n) • denote (v)
• devise (v) • formulate (v) • ignore (v) • impact (n) • similar (adj) • summary
(n) • usage (n) • vertical (adj)

1. Although not exactly identical, the two books are so _____ to each other that one author must have copied much of his book from the other.
2. The Prime Minister set up a committee of financial experts to help him discuss and _____ new policies.
3. It is often possible to guess the meaning of a word from the other words around it – that is to say, the _____.
4. In 1990, the British researcher Tim Berners-Lee _____ the first browser, and so paved the way for the development of the World Wide Web.
5. In newspapers, the layout of the columns is _____, while the rows run across the page horizontally.
6. The rise in the number of deaths from AIDS has had a very significant _____ on people's sexual behavior.
7. The _____ of drugs has increased significantly in spite of more severe penalties such as longer prison sentences.
8. Students should not try to write down everything they hear in a lecture, but just make a _____ of the most important points.
9. We use the term "class" to _____ groups of people who share the same social and economic backgrounds.
10. In one case, a murderer may go to prison for life, while another may be set free: it all seems completely _____.
11. The new journalist was _____ to researching the election promises of the main political parties.
12. Before we can judge a government's success, we have to decide the _____, such as unemployment, defence or taxation.
13. One student failed because he completely _____ the instructions on the paper, although they appeared at the top of every page.
14. Market researchers use _____ such as people's spending patterns as well as information about age and occupation to decide on the most effective marketing strategies.

Exercise 1.2.

achieve (v) • automatic (adj) • conceive (v) • create (v) • ensue (v) • equilibrium
(n) • manipulate (v) • mathematics (n) • innovative (adj) • period (n) • precede
(v) • section (n) • series (n) • stable (adj) • tradition (n)

1. In order to be successful, some politicians _____ other people to get what they want.
2. Japanese and Korean companies have invested heavily in the UK, _____ thousands of new jobs.
3. The Internet was first _____ of as a way of linking computers in the USA together.
4. Serious unrest and rioting _____ as a result of the decision to ignore the result of the election.
5. Since consumers are always demanding new products, companies which can be _____ are more likely to succeed.
6. Most planes today are controlled not by human pilots but by a computer system known as an _____ pilot, which is even responsible for taking off and landing.
7. Most employers insist that their employees have qualifications in English and _____.
8. Some academics have argued that standards have been falling because more students are _____ first class degrees.
9. Over a _____ of twenty years, the economy grew at an average of 8% per year.
10. The price of a product will not change if there is _____ between the supply and the demand for that product.
11. By _____, wedding guests in most cultures give presents or money to the newly- married couple.
12. In addition to the regular lectures, we have a _____ of public lectures given by guest speakers from other universities.
13. Although the arrival of coffee in Britain _____ that of tea, it is the second drink which is the more popular today.
14. Reports are usually divided into separate _____ with headings such as «Findings» and «Conclusions».
15. After a very difficult night, his blood pressure became _____ again and his family were allowed to visit him.

Exercise 1.3.

coordinate (v) • discrete (adj) • estimate (n) • geography (n) • norm (n) • pole (n) • preposition (n) • rational (adj) • scheme (n) • source (n) • task (n) • underlie (v)

1. Paying for large purchases by credit card instead of in cash has become the _____ in many parts of the world.
2. Although speech is mostly continuous sound, written language is divided up into _____ units which we call words.
3. One of the roles of the Managing Director is to _____ the work of different departments to ensure that they work well together.
4. In _____, we study the physical features of the world – such as rivers and mountains – and how we make use of them.

5. The purpose of a bibliography at the end of an essay is to show the _____ of information used in writing the essay.

6. Remember that some verbs may need to be followed by a _____, such as lead to, result in, and so on.

7. Although we cannot be sure, most _____ point to a significant increase in average air temperatures in the next 100 years.

8. Everyone knows that diseases such as malaria are on the increase again, but what we are not so sure about is the _____ cause of this.

9. Most economic theories assume that people act on a _____ basis, but this doesn't take account of the fact that we often use our emotions instead.

10. Most countries in the Far East have developed very quickly, while at the opposite _____ many Third World countries have not grown at all.

11. The government has launched a new _____ aimed at reducing youth unemployment.

12. While half of the students were responsible for writing the questionnaires, the others had the _____ of analyzing the data.

Exercise 1.4.

administer (v) • analogy (n) • assemble (v) • distribute (v) • energy (n) •
impress (v) • intervene (v) • perpendicular (adj) • reject (v) • speculate (v) •
spontaneous (adj) • text (n)

1. She so _____ the interviewers that they gave her the job.

2. At the beginning of the examination, question papers were _____ to all of the candidates in the hall.

3. Artificial intelligence draws an _____ between the digital computer and the human brain, but some researchers think that this comparison is too simplistic.

4. Studying a language can take up a great deal of time, money and _____.

5. Following the earthquake, the house was unsafe because the walls were no longer _____.

6. Although there is very little evidence, many scientists _____ that life may exist on other planets.

7. The spell-check facility on a computer allows students to check the _____ of their assignments for basic errors.

8. The police have a duty to _____ the law fairly and give everyone the same treatment.

9. For some university courses, the majority of applications are _____ because the competition for places is so great.

10. Usually, we try to reach a conclusion after careful thought, but sometimes we may make _____ decisions instead.

11. A large number of people _____ outside the Parliament to show support for their party.

12. Because hundreds of people were dying, the United Nations decided to _____ and provide emergency food supplies.

Exercise 1.5.

aid (n) • biology (n) • edit (v) • enlighten (v) • homogeneous (adj) •
overlap (v) • stress (n) • symptom (n) • trait (n) • trivial (adj) • version (n) •
x-rays (n)

1. _____ are not simply used to photograph broken bones but also to fight against cancers within the body.
2. One big advantage of a word processor is that it allows you to check and then _____ your work easily.
3. The first witness accused the defendant of murder, but the second witness gave a very different _____ of events.
4. These experiments may seem _____ but they are in fact extremely important.
5. Of all the countries in the world, Japan may well be the most _____ as the great majority of its people are from the same race.
6. Heart disease can be caused by a bad diet (especially too much fat), inadequate exercise and too much _____.
7. With the _____ of new medical techniques, couples who were previously unable to have children may now be able to start a family.
8. Headaches may just be the result of tiredness but can be a _____ of a more serious problem.
9. Jealousy is one of the most unpleasant human _____.
10. She found physics easy because some of the course _____ with the maths she had studied at school.
11. _____ can be defined simply as the study of life.
12. Two students had great difficulty in solving the equation, but luckily their tutor was able to _____ them.

Exercise 1.6.

academic (adj) • arouse (v) • benefit (n) • compute (v) • contend (v) • degenerate (v) • hierarchy (n) • interlocking (adj) • metabolism (n) • radical (adj) • strata (n) • instinct (n)

1. Students at university are encouraged to play sports or join clubs in addition to following their _____ studies.
2. Animals with a very fast _____ have to eat very frequently and do not live very long.
3. _____ of rock likely to contain oil have recently been located under the ice-sheet in Antarctica.
4. The fact that the car was being driven very badly _____ the policeman's suspicions, and so he made the driver stop.
5. All the equipment is made up of _____ pieces which can be easily assembled in weightless conditions.

6. An organizational chart shows the company _____, from the managers at the top down to the employees at the bottom.

7. During the 1930's, President Roosevelt introduced _____ new policies to solve the American unemployment problem.

8. We can make machines which can _____ huge numbers of mathematical problems, but it is still too early to claim that machines can actually think for themselves.

9. Some people emphasize the _____ of new technology, while others stress the disadvantages.

10. The argument became so heated that it soon _____ into accusations of dishonesty and corruption.

11. By _____, a young baby will start to cry if it is hungry, cold, or in pain.

12. Some religious groups _____ that Darwin's theory of evolution is completely wrong.

Exercise 1.7.

adolescent (n) • affiliate (v) • aristocracy (n) • cell (n) • collapse (v) • commodity (n) • democracy (n) • dissolve (v) • friction (n) • invoke (v) • muscle (n) • repudiate (v) • saint (n)

1. _____ are the tiny, basic building blocks from which all living creatures are made up.

2. In many countries, there has been a worrying increase in the number of _____ taking drugs.

3. Without any warning, the building _____ killing more than 300 people inside.

4. In times of unemployment, _____ can arise between people who have jobs and those who do not.

5. _____ markets allow traders to buy and sell raw materials such as cotton, steel and sugar.

6. In order to become more powerful, trade unions usually _____ to a national union organization.

7. Individuals who have become very rich through business usually also have a lot of political _____ and can therefore influence political decisions.

8. Sugar and salt _____ easily in water.

9. At the public enquiry, the Managing Director _____ all suggestions that the company had tried to avoid responsibility for the accident.

10. He was more than a national hero; in fact, most people looked up to him almost as a _____.

11. As a result of the revolution of 1917, the royal family and the _____ in Russia were overthrown and a communist government was installed.

12. Many political scientists argue that it is impossible to have a truly modern economy without _____ and a more open society.

13. In the USA, citizens can _____ the right to silence if they do not want to answer a question in court.

Exercise 1.8.

aggregate (adj) • fraternal (adj) • lens (n) • liable (adj) • nuclear (adj) • oxygen (n) • pendulum (n) • postulate (v) • subordinate (adj) • supreme (adj) • reproduce (adj)

1. By putting two _____ together, it is possible to make a simple telescope.

2. If students do not attend lectures, they are _____ to fail their examinations.

3. The _____ value of all the companies in the group was in excess of \$250 million.

4. Periods of high economic growth tend to be followed by low growth, followed by more high growth again, like a _____.

5. The _____ Court in the United States is the highest and most important court in the country.

6. _____ energy provides approximately 80% of the electricity used in France, more than in any other country.

7. In any strike action by a trade union, _____ support from workers in other unions can be very important for it to succeed.

8. In this company, the supervisors are _____ to the inspectors, who in turn report to the Production Manager.

9. About 20% of the atmosphere is made up of _____, which is vital for life on Earth.

10. By law in the UK, you are allowed to _____ up to 10% of a book for your own personal study.

11. Karl Marx _____ that the structure of a society is determined by the economic structure of that society.

Exercise 1.9.

acid (n) • battery (n) • breed (v) • carbon (n) • illuminate (v) • integer (n) • lustre (n) • matrix (n) • molecule (n) • prince (n) • stationary (adj)

1. The element _____ is all around us, in the air we breathe, even in the pencils with which we write.

2. In the United Kingdom, the «_____ of Wales» is the official title of eldest son of the monarch.

3. In this exercise, just use _____, and don't bother with any fractions or decimal points.

4. The music was really quite boring and had no real _____.

5. Two atoms of oxygen and an atom of hydrogen together produce one _____ of water.
6. A great deal of research has shown that poverty, lack of education and unemployment can _____ social unrest.
7. Astronomers' work is becoming more difficult as the night sky is increasingly _____ by electric street lighting from urban areas.
8. Until 400 years ago, it was believed that the Earth was _____, and that the Sun moved around the Earth.
9. One of the biggest problems for electric cars is that the _____ they use for power are rather heavy.
10. Car batteries also have to be handled with care as they often contain an _____ which can burn holes in clothes or even cause injury.
11. The grid on the left of your handout is known as a square _____, as the number of columns and the number of rows are the same.

Exercise 1.10.

anthropology (n) • foetus (n) • intimacy (n) • province (n) • quote (v) • render (v) • repress (v) • sift (v) • surplus (n) • triangle (n)

1. The costs were so enormous that they _____ the project impossible.
2. _____ is the scientific study of man including such topics as religion and culture.
3. One of the simplest but strongest shapes is the _____.
4. The _____ between a mother and a child is very important for the emotional development of the child.
5. If you have made a plan for your writing, it becomes much easier to _____ through your notes and decide which ideas to include.
6. When there is a _____ of oil, the price on the world market falls.
7. In nearly all parts of Eastern Europe, attempts to _____ movements for political change failed completely.
8. The Canadian capital Ottawa is in the _____ of Ontario.
9. Recent research has shown that drinking heavily during pregnancy can harm the _____.
10. When you want to _____ something, make sure that the words you write are exactly the same as those in your source.

Exercise 1.11.

challenge (n) • diameter (n) • enable (v) • expert (n) • export (n) • fundamental (adj) • import (n) • luxury (n) • pest (n) • pollution (n) • starve (v) • temporary (adj) • tractor (n)

1. The _____ of live animals is strictly controlled so as to prevent diseases from being brought into the country.
2. We recommend that you take a pre-sessional study skills course, which will _____ you to practice the language skills you will need later.
3. Supplying _____ to Third World farmers may seem an excellent idea, but in practice these machines are often not suited to local conditions and so tend to break down.
4. Some business leaders become bored with well-established organizations and prefer instead the _____ of setting up a new company.
5. During the 1980's, thousands of people _____ in Sudan and Ethiopia because there was no food.
6. The USA has a huge domestic market and so is less reliant on _____ for the success of its economy.
7. One major problem with some early insecticides was that they tended to kill not only harmful _____ but also those insects which actually helped the farmer.
8. Most international students choose to live in university accommodation, while others may stay with a host family as a _____ measure before renting their own houses.
9. In many developed countries, what used to be considered as _____ goods are now regarded as necessities.
10. Jupiter is the largest planet in our solar system, with a _____ of about 570,000 kilometers.
11. With any quotation you wish to use, make sure that the author you are quoting is an _____ or academic authority.
12. Increasingly, major industrial companies are finding that consumers are concerned about any _____ created by the manufacture of their products.
13. The Director reminded the middle managers that full cooperation from all workers was _____ to the success of the company.

II. Choosetherightword

Exercise 2.1.

1. During the 1970's and 1980's, it became increasingly **evident** / **visible** that companies in the West were uncompetitive.
2. The United Kingdom **makes** / **publishes** more books than any other country.
3. There has been a major road accident, **involving** / **including** 23 cars and 16 lorries.
4. On the basis of the latest survey, we know that most people have a very **negative** / **bleak** view of politicians and their parties.
5. In many parts of the world, people are becoming more worried about the danger of pollution and its effect on the **environment** / **ecology**.
6. Education experts from France travelled to Japan to **evaluate** / **judge** the secondary school system there.

7. Although it is not very big, the library has an excellent **range / variety** of books, journals and other resources for study.

8. Increasingly, the design of buildings is being **adjusted / modified** to allow easier access for disabled people.

9. The lack of extra student accommodation **restricted / narrowed** the expansion in student numbers which the university was planning.

10. Many students **acquire / derive** a great deal of enjoyment and satisfaction from their time at university.

11. Although the world is getting warmer slowly, the increase in temperature **varies / fluctuates** from country to country.

12. Following the bank raid, the police **followed / pursued** the robbers but were unable to catch them.

13. Assessment on this course **includes / consists of** coursework (30%) and examinations (70%).

Exercise 2.2.

1. A new moon **occurs / takes** place every 28 days.

2. Students should not be **inert / passive** but should try instead to contribute as much as possible to discussions in seminar groups.

3. On the first day, the course director and the subject tutor explained their **respective / single** roles to the new students.

4. It is now possible to **infer / imply** a link between using mobile phones and contracting some forms of cancer.

5. The fact that population growth is still **accelerating / catching up** is one of the most important problems we face.

6. Most universities need to earn money from private sources, but the **important / major** part of their funding still comes from the government.

7. Expenditure on weapons such as guns, tanks and aeroplanes consumes a large **piece / portion** of a country's wealth.

8. Because foreign exchange rates ebb and **flow / fluctuate**, it is not always possible for exporters to know how much money they will receive from sales.

9. Member countries **award / contribute** money to the United Nations to pay for the running of the organization.

10. The main **concentration / focus** of Greenpeace is on problems concerning pollution.

11. Although their **plan / design** was often very good, the quality of many British cars tended to be poor.

12. Although it is very expensive, it is possible to **convert / exchange** other forms of carbon into diamonds.

13. Prehistoric man could not **think / comprehend** why the moon appears to grow bigger and then smaller each month.

14. In some situations, a law court can **authorise / let** the police to enter a house without the owner's permission.

Exercise 2.3.

1. If somebody has a diet which is **deficient / inadequate** in vitamins, he/she may suffer poor health as a result.
2. Although the characters were very convincing, the **tale / plot** was so weak that the film was a failure.
3. The **transition / transit** from a communist to a free-market economy has been very difficult for a number of countries.
4. Students usually dress casually at university, but this style of dress is not **correct / appropriate** when they start work.
5. The opinions expressed in a newspaper usually reflect the views of the **proprietor / landlord**.
6. Extreme religious groups living in isolated **communes / societies** have been responsible for a number of violent crimes.
7. In order to discuss the implications of the crisis, the President **convened / gathered** a meeting of his top advisors at the White House.
8. Because of the growth in the number of communication **stations / satellites** in space, viewers have access to more television channels.
9. An important social and political **topic / issue** in many developed countries is the growing number of old people.
10. Sometimes, unexpected economic changes force an organization to **deviate / divert** from its original business plan.
11. There are many reasons behind the success of the fastest-growing economies, but one common **factor / idea** seems to be high levels of education.
12. Because the weather was so bad, the astronauts **abandoned / left** their attempt to launch the space shuttle.

Exercise 2.4.

1. Although he was interested in many fields, Einstein is best known for his work in the **sphere / globe** of physics.
2. **Psychology / Biology** can help the police understand how criminals think.
3. Following the explosion at Chernobyl, scientists were keen to **assess / investigate** the cause of the accident.
4. The imaginary line between the North Pole and the South Pole is known as the Earth's **axis / axle**.
5. At the end of the year, the bank **praises / appraises** all of its staff and gives a bonus to the best performers.
6. If you are taking notes in a lecture, use **shapes / symbols** such as «+» and «=» as opposed to the words «and» and «equals».
7. The principle of **heredity / inheritance** explains why children tend to look like their parents.
8. The two sides have been engaged for some hours now in a lengthy **discourse / chat** on the issue of weapons, with no conclusions as yet.
9. After he had moved to Australia, he started to **acquire / obtain** a marked Australian accent.

10. Although the work is far from finished, some **approximate / tentative** conclusions can already be drawn from the responses we have so far.

11. In a dangerous situation, most people panic and become very frightened, while others show no **emotion / sympathy** at all.

Exercise 2.5.

1. During the process known as photosynthesis, plants **soak up / absorb** CO₂ and release oxygen.

2. So many contrary / unlike opinions were expressed that no agreement was possible.

3. The United Nations representative managed to **secure / acquire** agreement between the two sides who had been fighting over an area of land rich in oil.

4. Although one of the prisoners refused to **respond / answer** to any questions, each of the others made a full confession.

5. Adjectives (big, green), verbs (come, go), conjunctions (and, but) and prepositions (to, in, for) are all **categories / groups** of words.

6. Divorce arouses such strong feelings that it is difficult to remain **honest / objective** and logical about the best way to tackle this problem.

7. The opening of a new car factory **stimulated / aroused** the local economy and improved employment possibilities.

8. When the government tried to **implement / start** new employment legislation, there was a general strike.

9. During times of war, governments usually **stop / suppress** any newspaper reports which contain bad news.

10. Examination candidates are not allowed to eat, drink, smoke or talk for the **time / duration** of the examination.

11. The UK Government can decide to **suspend / expel** an overseas student who does not have a visa and refuse permission for the student to return.

12. Of all recent inventions, it is perhaps the motor car which has **transformed / modified** our lives more than anything else.

Exercise 2.6.

1. In India, Mahatma Gandhi refused all food and indeed nearly died in his **protest / complaint** against British control of his country.

2. If you are taking medicine, you should avoid alcohol as the two may **interact / cooperate** and make you ill.

3. **Medium- / Middle-sized** companies are often more flexible than larger organizations.

4. Government safety inspectors found **abnormal / unlikely** levels of radiation in the area around the nuclear power station.

5. More than 30,000 people **participated / contributed** in the experiment.

6. Most universities **oblige / force** overseas students to take an English language test before they start their course.

7. Companies which cannot adapt to changing situations very often go into **decline / decrease**.

8. The **tone / style** of the meeting was rather serious and formal.
9. Many police officers argue that ex-prisoners **commit / perform** as much crime after they come out of prison as before they went in.
10. Studying a new subject means having to learn a lot of new **vocabulary / terminology**, and these special words can make progress very slow.
11. He is such a powerful boxer that all his opponents are in **awe / fright** of him.
12. The **appeal / claim** by protesters for more money to be invested in education was rejected by the Government.

Exercise 2.7.

1. Although unemployment was falling, the economy remained **depressed / distressed** because consumers still felt insecure about their jobs.
2. Computer equipment can become **obsolete / antique** very quickly because new technology emerges so fast.
3. In swimming pools, there is a slight **odour / fragrance** because of the chlorine in the water.
4. Some religious groups are strongly opposed to modern science, and **refute / contradict** even well- established theories such as evolution.
5. When designers choose material for making new clothes, they are particularly interested in the colour and the **touch / texture** of the material.
6. Increasingly, it seems that politicians who are **dogmatic / pragmatic** rather than rigid in their views tend to be more successful.
7. There are so many aircraft using Heathrow Airport these days that the noise is almost **incessant / eternal**.
8. Recent tests show that girls are getting higher **scores / results** than boys in most school subjects.
9. **Creditors / debtors** of a company are those individuals or organizations to whom that company owes money.
10. The defendant is allowed to **discuss / confer** with his/her lawyer before and during the trial.
11. Before the election, all the main political parties tried to explain their main **policy / line** to the voters through television broadcasts and newspaper advertisements.
12. Some species of birds **migrate / commute** from North Africa to Britain.
13. If the **pattern / configuration** of the control panel in an aircraft makes it difficult for the pilot to read the instruments, the chance of an accident will increase.

Exercise 2.8.

1. In many cases, countries which may have been enemies in the past are often **allies / friends** today.
2. If a student does not **follow / adhere** to the regulations concerning examinations, he/she may fail.
3. In his book *The Plague*, Camus uses the disease mentioned in the title as a **metaphor / simile** to represent fascism and other extreme political ideas.

4. Some students complained because the extra lecture **coincided / synchronized** with one of their religious festivals.

5. The former President's personality was so strong that her influence **invaded / pervaded** every aspect of political life.

6. Some students are **reluctant / unhappy** to ask questions because they are shy.

7. The **contents / index** at the back of a book allows the reader to find specific information.

8. In some parts of the world, children have to work very long hours, to the **detriment / expense** of their education and even their health.

9. The idea that HIV and AIDS only affect homosexuals is a complete **error / fallacy**.

10. The number of people living on our planet is on an upward **trend / pattern** and is expected to top 10 billion in the years to come.

11. While our reserves of oil and coal are **fixed / finite**, energy sources such as the wind or the sun will in effect never end.

Exercise 2.9.

1. Most universities have a special **fund / finance** for students who have run out of money and need help.

2. The prediction that we will completely **tire / exhaust** our reserves of oil in the not too distant future seems now to be incorrect.

3. Because he lied to his colleagues and family about his **girlfriend / mistress**, the minister destroyed not only his marriage but also his career.

4. Because of the rise in the number of prisoners, the whole **penal / punishment** system will have to be changed.

5. After six weeks trapped in the embassy, the hostages were finally **emancipated / liberated**.

6. Sometimes a piece of music can **evoke / provoke** very strong memories and emotions.

7. The biggest issue on which the two parties' policies **divide / diverge** is the amount of money to be spent on education.

8. In some countries, the police regularly use **torture / torment** to force prisoners to give them information.

9. The most successful students are probably those who have a strong **integral / intrinsic** interest in their subject, as opposed to those who simply want a degree.

10. In the 1970's, Saudi Arabia and other oil-rich states **accumulated / collected** vast sums of money through the sale of oil.

Exercise 2.10.

1. Although many drugs are illegal, it appears to be increasingly easy for teenagers to **procure / secure** drugs if they want them.

2. If you have a lot of data which you want to include, an **appendix / index** at the end of the report or essay is the best place for it.

3. Before they take their examinations, students should revise thoroughly and try to **assimilate / ingest** what they have been studying.

4. A huge trench was dug to **channel / deviate** excess water away from farming areas.
5. According to opponents of the death penalty, the idea that executions help to prevent murder is a complete **myth / legend**.
6. For health reasons, smoking is restricted if not completely **embargoed / prohibited** in many public places.
7. At the end of an essay, students should always **append / affix** a bibliography, giving details of the sources of information they have used.
8. France's road and rail networks **diverge / converge** on Paris because it is the capital.
9. The influence of television is so great that actors can be **elevated / lifted** to superstar status almost overnight.
10. Some years ago, the shapes of cars were very **angular / bent** whereas today they are much more rounded.

Exercise 2.11.

1. Two of the missing children have been rescued but the **fate / destiny** of the other six is still unknown.
2. The **process / action** by which plants use sunlight to produce food is known as photosynthesis.
3. Very small **bubbles / blobs** of air can become trapped in liquid metal, causing it to become weak.
4. At first, students were **hostile / unfriendly** to the idea of being videoed during their presentations, but they soon realized that this would help them to improve their technique.
5. The government lost the election because of a whole **brochure / catalogue** of scandals and political errors.
6. Following the decision to pass legislation to **compel / urge** employers to improve safety standards at work, the number of deaths from accidents has fallen sharply.
7. Car **theft / burglary** remains higher in Britain than in any other European country.
8. In the past, large parts of Holland were **drained / emptied** of water to produce new farmland.
9. The area around the Great Pyramids is one of the most important archaeological **sites / spots** for the study of ancient Egypt.
10. Until recently, goods from countries such as Taiwan and Korea were often thought to be **worse / inferior**, and yet today these countries make many high-quality products.
11. The introduction of the fax and more recently e-mail has made it much easier to **communicate / contact** with other people all around the world.

III. Finish the sentence

Exercise 3.1.

1. I like your essay, but I want you to illustrate...
2. What will the result be if in the future we assume...
3. Students may be asked to compare many alternative...
4. The Channel Tunnel between France and England was constructed...
5. Everyone wants to be happy, but we probably all define...
6. Many universities now have language centers to facilitate...
7. Numbers and results are not particularly useful in themselves; we need to interpret...
8. In spite of warnings about cancer, many Westerners equate...
9. Advertisers use a variety of techniques...
10. At first, the police viewed the crimes as random...
11. It may be the case that no solution is possible, given the magnitude...
12. Although computers are becoming increasingly complex,...
13. The investigation was stopped because the witnesses could not identify...
 - a. ...theories, from which they have to select the most convincing.
 - b. ...happiness in many different ways.
 - c. ...that nearly everyone has access to a motor car?
 - d. ...the programs they use are becoming much easier to operate.
 - e. ...a sun tan with health and youthfulness.
 - f. ...the man they had seen commit the robbery.
 - g. ...language learning for international students.
 - h. ...at a cost of over £8 billion.
 - i. ...of this problem.
 - j. ...them to understand what they actually mean.
 - k. ...events, but realized later that there was a pattern linking them.
 - l. ...to persuade consumers to buy products and services.
 - m. ...your points by providing some supporting examples.

Exercise 3.2.

1. In 1905, Einstein published the first part of his theory...
2. Environmentalists point out that electric cars just shift...
3. Most metals expand...
4. As a result of the intense...
5. Fifty years ago, most smokers were not aware...
6. The new grading machine has the function...
7. In many universities, there is a coffee bar adjacent...
8. After studying for two hours, it becomes difficult to concentrate...
9. Some children show a great deal of maturity...
10. Sadly, according to government statistics,...
11. In the seventeenth century, Galileo demonstrated...
12. In the 1980's, the US and Soviet governments made the crucial...

13. Politicians often complain that newspapers distort...
14. The history of the Americas is usually from seen from the perspective...
15. An already difficult operation was complicated...

- a. ...of the dangers of smoking.
- b. ...at a young age, while others may continue to be irresponsible.
- c. ...to the library where students can take a break.
- d. ...the pollution problem from the car itself to the electricity station.
- e. ...that all objects (heavy or light) fall at the same speed.
- f. ...heat of the fire, the front half of the train was completely destroyed.
- g. ...what they say so that the readers cannot read the truth.
- h. ...of relativity, which completely changed our ideas of time and space.
- i. ...of the European immigrants, rather than from that of the original inhabitants.
- j. ...on your work and so it is a good idea to take a break.
- k. ...when they are heated.
- l. ...of separating the larger pieces of metal from the smaller pieces.
- m. ...over 30% of marriages end in divorce within five years.
- n. ...decision to reduce the number of atomic weapons.
- o. ...by the fact that the patient had a history of heart disease.

Exercise 3.3.

1. Resentment and jealousy over jobs is a common source of conflict...
2. Many members of the public question the relevance...
3. Retraining courses for the unemployed may just be a way to exclude...
4. The letters L, E and C on the map correspond...
5. Some environmentalists have a very bleak vision...
6. One way in which some countries can produce very cheap goods is to exploit...
7. The demonstrators refused to disperse, ...
8. Multi-national companies are often keen to seek...
9. The Earth rotates...
10. It is better to work at a constant rate and to maintain...
11. Nowadays, most people have a more favorable attitude...
12. If a family moves abroad, the children often adapt...
 - a. ...to their new environment more quickly than their parents.
 - b. ...towards women having top positions in the workplace.
 - c. ...within society and can lead to violence.
 - d. ...to London, Edinburgh and Cardiff.
 - e. ...although the police were heavily armed and very aggressive.
 - f. ...more people from the unemployment totals.
 - g. ...child workers by paying them very low wages.
 - h. ...this during the year rather than to try to learn everything the night before the examinations.
 - i. ...on its axis once every 24 hours.

- j. ...of the monarchy to life in modern society.
- k. ...local companies in developing economies willing to act as partners.
- l. ...of the future, while others are much more optimistic.

Exercise 3.4.

1. On the screen above me, you can see a diagram...
 2. In mathematics, a statement is known as a theorem...
 3. The student population is much more diverse...
 4. Older university buildings may be wonderful in aesthetic...
 5. The contract stipulated...
 6. The Internet may soon not be capable...
 7. The police usually contact parents about any incident...
 8. Because of pollution in the atmosphere,...
 9. The terrorists demanded that the government release...
 10. One journalist asked the minister to justify...
 11. The negotiations went on through the night, but the eventual...
 12. Heavy rains persisted...
-
- a. ...terms, but are not always very practical.
 - b. ...more UV radiation is reaching the Earth, resulting in more skin cancer.
 - c. ...his decision to reduce spending on education.
 - d. ...showing the different parts of the system.
 - e. ...than in the past, with many more part-time and mature students.
 - f. ...which involves young children.
 - g. ...outcome was agreement on all the main points.
 - h. ...for several days, causing heavy flooding.
 - i. ...their colleagues from prison.
 - j. ...of sending all the information users want.
 - k. ...if we can prove it by using logic and reasoning.
 - l. ...that all the goods had to be delivered within four weeks.

Exercise 3.5.

1. The European Union has insisted that all new aircraft incorporate...
2. In today's economy, full-time permanent jobs...
3. Most British students used to receive a grant...
4. The police officer denied...
5. At the end of a quotation, remember to put in parentheses...
6. Because the universe is so vast,...
7. The measurements taken by researchers must be accurate...
8. Religion has many aspects, one of which is to provide a code...
9. Although many elderly people retain...
10. At university, it is best to use a formal, impersonal style...
11. Some clothes can be made from synthetic...
12. Inside the hydrogen atom, there is one electron...

- a. ...otherwise the conclusions they come to will be useless.
- b. ...of conduct to show people how they should behave.
- c. ...that he had accepted money from any criminal group.
- d. ...moving around the proton at the centre.
- e. ...from the government to pay for costs such as rent, food and books.
- f. ...additional safety features.
- g. ...are disappearing to be replaced by part-time temporary employment.
- h. ...the author's name, the date and the page number: (Brown 1996:76).
- i. ...clear memories of their childhood, they may completely forget recent events.
- j. ...in your writing, and to avoid contractions such as 'isn't' and 'doesn't'.
- k. ...materials such as nylon as well as natural materials such as cotton.
- l. ...it is unlikely that man will be able travel to other galaxies.

Exercise 3.6.

1. The decision to expand the airport has caused a great deal of controversy, ...
 2. The murder was a very strange case but the most striking aspect...
 3. All new cars on the market today have to conform...
 4. The Pope in Rome is – according to the doctrine...
 5. Cars are not allowed to enter many civic...
 6. The police accompanied...
 7. The film was made on a very low budget, so all the minor...
 8. Mercury is the smallest planet...
 9. Whatever type of job you may be contemplating,...
 10. At the end of the process, any parts which are not of uniform...
 11. When selecting new employees, it is important to ignore subjective...
 12. Buildings in places such as California have to be reinforced...
 13. In the United Kingdom, Queen Victoria reigned...
-
- a. ...the witness to the court to ensure that he would be safe.
 - b. ...was the fact that the murderers were both under 10 years old.
 - c. ...centers today, because of pollution and congestion problems.
 - d. ...to the same safety and pollution regulations.
 - e. ...but construction has already started and should be completed soon.
 - f. ...of the Catholic Church – the representative of God here on Earth.
 - g. ...the university careers service can give you advice.
 - h. ...roles were played by people from the local area.
 - i. ...in our solar system.
 - j. ...for most of the previous century, before her son became king in 1901.
 - k. ...shape and size are rejected and sent back for recycling.
 - l. ...impressions and to base decisions on facts instead.
 - m. ...so that they will not collapse in the event of an earthquake.

Exercise 3.7.

1. One branch of mathematics is geometry, ...

2. Electrical equipment is usually supplied with a fuse, ...
3. Muslims have a system of divine...
4. In 1991, President Saddam Hussein of Iraq invaded...
5. The new management team managed to revive...
6. When we talk about sociology,...
7. People in Japan enjoy a great deal of affluence...
8. In this lecture, I just want to give you a brief sketch...
9. Fifty years after the Second World War, a state of tension prevailed...
10. Like the United States Congress, the UK Parliament...
11. Early computers were very cumbersome...
12. The Government has reduced the number of ships in the navy...
 - a. ...due to the economic growth of the last 30 years.
 - b. ...which is concerned for example with lines and the shapes and angles they make.
 - c. ...we are interested in the study of society and how people behave within it.
 - d. ...but today they are much smaller.
 - e. ...law based on the Koran.
 - f. ...the neighboring country of Kuwait.
 - g. ...which will blow if a fault develops.
 - h. ...and concentrated resources on the airforce instead.
 - i. ...between the communist and capitalist worlds, called the Cold War.
 - j. ...rather than speak in great detail about this new topic.
 - k. ...is responsible for making laws.
 - l. ...the company, which many had thought was beyond hope.

Exercise 3.8.

1. It is very important that a child's linguistic...
2. Teachers have noticed an increase in aggression, ...
3. The US Navy has the largest fleet...
4. Medical researchers managed to correlate...
5. University courses used to be very rigid...
6. From a very early age, children develop a spatial...
7. During the Korean War, communist countries aligned...
8. Some countries have a president, while others have a monarch, ...
9. The European Union has reduced most of the bureaucracy...
10. Because of radio telescopes, we can now detect...
11. It is vital to make sure that the structure of a bridge will not oscillate...
 - a. ...awareness allowing them to understand where things are around them.
 - b. ...which may be caused by the food which children are eating.
 - c. ...themselves with the North, with capitalist countries aiding the South.
 - d. ...either a king or a queen.
 - e. ...of ships in the world.
 - f. ...abilities develop fully so that it can communicate and learn.
 - g. ...up and down or from side to side, as this would cause it to collapse.

- h. ...distant stars which are invisible from Earth.
- i. ...and offered students no real choice or flexibility.
- j. ...associated with customs, thereby simplifying trade regulations.
- k. ...asbestos to lung cancer and other respiratory diseases many years ago.

Exercise 3.9.

1. She won the championship by a margin...
 2. Examples of animals imported by man replacing the indigenous...
 3. In 1685, an aristocrat by the name of the Duke...
 4. Civil war may break out very quickly if different factions...
 5. Plants can be subdivided...
 6. When you write an essay, you must confine...
 7. Because of the special apparatus...
 8. From the Vatican in Rome, the Pope...
 9. The organization of the department is really quite amorphous, ...
 10. The Romans built a large number of castles or forts...
 11. Because of their high price, some students are not averse...
-
- a. ...and so the people in it are free to work on what they like, when they like.
 - b. ...required, higher fees are charged for science and technology courses.
 - c. ...to stealing books from the library.
 - d. ...yourself to giving relevant ideas and information only.
 - e. ...of Monmouth led a rebellion against the English king.
 - f. ...in a country start fighting each other.
 - g. ...called 'castra,' which we now see in place names like Lancaster.
 - h. ...species already living there can be seen in all countries.
 - i. ...of only one point.
 - j. ...has the power to influence the lives of millions of Catholics.
 - k. ...into several different families.

Exercise 3.10.

1. Many people working today find it difficult to tolerate...
 2. In Canada, it is a huge advantage to be fluent...
 3. Although the lecturer's explanation was very cogent, ...
 4. In some American states, there is a strange anomaly...
 5. In recent years, some Asian countries have emerged...
 6. Some analysts think that many customers will dispense...
 7. New government proposals will increase the rigour...
 8. University students usually have the option...
 9. A new drug developed by a leading company purports...
 10. Although it was particularly radical and ingenious, ...
 11. Sometimes articles are anonymous, ...
-
- a. ...whereby a 16 year-old may get married but is not allowed to buy a beer.
 - b. ...but in the majority of cases the name of the author appears with the article.

- c. ...some students still could not understand the solution to the problem.
- d. ...with conventional phones altogether and use mobile phones instead.
- e. ...of choosing extra subjects to study if they wish.
- f. ...from almost nothing to become major economic players.
- g. ...in both French and English.
- h. ...the design for the Concorde was just too expensive to produce commercially.
- i. ...high levels of stress and insecurity.
- j. ...of the law by introducing longer prison sentences.
- k. ...to slow down the ageing process.

Exercise 3.11.

1. According to a recent large-scale government survey...
2. Car manufacturers are keen to develop other sources of fuel...
3. An increase in the number of accidents led to a public debate...
4. Although it means that people live longer, the equipment...
5. Japan's greatest resource...
6. A group of students decided to complain because one tutor cancelled...
7. Some countries use a thirteen-month calendar...
8. Young plants will grow quickly if the soil is moist...
9. Increasingly, universities are being asked to undertake...
10. As people can now make purchases on impulse...
11. Computers make use of the binary system (0,1), unlike the decimal...
12. Although the new equipment performed well under laboratory...
 - a. ...based on the lunar cycle, rather than the more normal twelve-month system.
 - b. ...about the safety of the national railway system.
 - c. ...system (0-9) which we use in everyday life.
 - d. ...used in modern hospitals has increased the cost of health care.
 - e. ...– such as solar power – since oil will not last for ever.
 - f. ...with credit cards, buying habits have changed.
 - g. ...all tutorials for a week.
 - h. ...conditions, it was simply not robust enough for everyday use.
 - i. ...and warm, but not if it is too damp or cold.
 - j. ...is its people, since it has very few sources of raw materials or energy.
 - k. ...conducted in the UK, levels of reading and writing skills are still low.
 - l. ...research in order to develop new products on behalf of large companies.

IV. Word substitution. From the list, choose one word which could be used in place of the language shown in bold without changing the meaning of the sentence. Remember that you may need to change the form or in some cases the grammatical class of the word.

Exercise 4.1.

comply with (v) • conclude (v) • equivalent (adj) • guarantee (n) • imply (v) •
method (n) • obvious (adj) • proceed (v) • require (v) • specify (v) • sum (n) •
presume (v)

1. If a company does not **observe** health and safety laws, it may be fined very heavily if any of its workers are injured. _____
2. For many years, \$4 was **equal** to £1. _____
3. University regulations **state** that students must pass 18 modules to graduate. _____
4. Anybody driving a car **is obliged** by law to have insurance. _____
5. On the basis of their examination results, it was **clear** that most students had completely misunderstood the first part of the paper. _____
6. Many people think that oil will run out in the next 100 years, but they are **assuming** that we will continue to use oil at the same rate as today. _____
7. Most electrical products have a one- or two-year **warranty** in case something should go wrong. _____
8. One problem facing overseas students is adapting to new teaching **techniques**. _____
9. The fact that crime increases when unemployment goes up seems to **suggest** a link between the two. _____
10. It may cost an overseas student around £15,000 per year to live and study in Britain, which is a very large **amount** of money. _____
11. The lecturer gave the students a 10 minute break before **continuing** with the rest of her lecture. _____
12. At the end of her talk, the lecturer **finished** with a brief review of the main points. _____

Exercise 4.2.

affect (v) • capillary (n) • notion (n) • decade (n) • emphasize (v) • expose (v) •
generate (v) • consequent (adj) • pertinent (adj) • predict (v) • select (v) •
signify (v) • structure (n) • undergo (v)

1. Over the previous **ten years**, we have seen an enormous growth in the number of home personal computers. _____
2. Lecturers often speak more loudly and more slowly when they want to **stress** an important point. _____

3. One important function of newspapers is to **uncover** dishonest behavior and wrong-doing by those in power. _____

4. The **organization** of the company has changed completely, with far fewer senior managers. _____

5. The decision to give longer prison sentences **indicated** a hardening of the government's attitude towards drug offenders. _____

6. The new computer system **created** a lot of interest among potential customers. _____

7. When the government increased the tax on petrol, there was a **resultant** rise in transport costs. _____

8. In the first instance, the blood passes out of the heart, through the lungs and along the arteries before reaching the **small blood vessels** within the skin. _____

9. Until the sixteenth century, the idea that the Earth moves around the Sun was regarded as a ridiculous idea, whereas today we accept this **concept** as completely normal. _____

10. Pollution is a problem which has an **effect** on every country today. _____

11. Most economists **forecast** that China will become a leading world economy in the twenty-first century. _____

12. One difficult aspect of writing an essay is selecting material which is **relevant** to the topic and excluding irrelevant information. _____

13. The company has **experienced** a number of significant changes in the last few years. _____

14. The first thing to do is to **choose** the courses which you would like to study and then look at each university prospectus. _____

Exercise 4.3.

accomplish (v) • adequate (adj) • area (n) • chemical (n) • conduct (n) • consume (v) • credible (adj) • dispose of (v) • exert (v) • manifest in (v) • occupy (v) • rely on (v)
--

1. Environmentalists are keen to persuade us to **throw away** rubbish and waste in more environmentally-friendly ways. _____

2. Poisonous **substances** released into the sea may be absorbed by fish and then find their way into the human food chain. _____

3. A growing number of scientists find it **plausible** that other life forms may exist elsewhere in the universe. _____

4. Some countries have such great economic problems that they are forced to **depend on** aid from richer countries in order to feed their inhabitants. _____

5. Before accepting an overseas student, a university will make sure that the student's English is **sufficient**. _____

6. The North Americans **use** more energy and resources than any other nation. _____

7. Although Mozart lived for only 40 years, he **achieved** a great deal in his short life. _____

8. At examination time, go to the library early as all the places tend to be **filled** very quickly. _____

9. Because of its economic and military strength, the USA **exercises** considerable influence over world politics. _____

10. He suffers from a lack of self-confidence, as **shown by** his very poor examination results. _____

11. Prisoners are sometimes released from prison early if their **behavior** has been good. _____

12. If global warming continues, many **regions** of the world will become drier while others may become wetter. _____

Exercise 4.4.

allege (v) • alter (v) • cease (v) • elaborate (adj) • fragment (n) • philosophy (n) • induce (v) • reservoir (n) • subside (v) • upsurge (n) • litigation (n)
--

1. The prisoner **claimed** that he had been attacked by the police, but there was no evidence to prove this. _____

2. Because of the possible link between disease in cows and humans, many companies **stopped** trading in British beef and associated products. _____

3. Your research proposal doesn't need to be too **detailed**: keep it simple and concentrate on the main points. _____

4. Global warming will **change** the way we live: everybody will experience some change. _____

5. Following an air accident, investigators examine every **piece** of the wreckage to determine the cause of the crash. _____

6. The most recent management **thinking** encourages managers to listen more carefully to the ideas of their employees. _____

7. During the last twenty-five years, there has been a significant **increase** in the number of overseas students in British universities. _____

8. When the interest in the company **declined**, the value of its shares began to fall. _____

9. The government's refusal to accept the result of the election **prompted** thousands of people to come out on to the streets and protest. _____

10. As so many jobs require good skills, there is a **pool** of people who are unemployed because they do not have any skills. _____

11. A number of universities are worried about **legal action** in the law courts by students who are dissatisfied with their courses. _____

Exercise 4.5.

advocate (v) • compound (n) • contract (v) • dictate (v) • insist (v) • preliminary (adj) • graph (n) • subtle (adj) • tiny (adj) • transfer (v) • retard (v)

1. Those who **support** military service claim that it promotes discipline, while opponents argue that such service disrupts young people's education. _____

2. Most metals **shrink** as they become cooler. _____
3. Although not all the votes have been counted, **initial** results suggest that the President has won the election. _____
4. In spite of a massive advertising campaign, only a **very small** proportion of consumers made a permanent change in their buying habits. _____
5. If you look at this second **chart**, you can see that unemployment has been in decline for the past six years. _____
6. Although the factory had to be closed, all the employees were **relocated** to another factory belonging to the same company. _____
7. Some organizations have a dress code which **lays down** what their employees should wear. _____
8. Although the two cases seemed to be identical, one lawyer showed that there were some **slight** differences between them. _____
9. One of the many effects of the hole in the ozone layer is that increased radiation will **delay** the growth of plants and lead to food shortages. _____
10. Water is a **combination** of hydrogen and oxygen. _____
11. The prisoner **said repeatedly** that he was innocent until he was released. _____

Exercise 4.6.

activist (n) • extract (v) • assist (v) • clarify (v) • converse (v) • incline (v) • propagate (v) • propensity (n) • sustain (v) • urban (adj)

1. The lecturer tried to **explain** her point **more clearly** by using another example more familiar to her students. _____
2. It is impossible to **grow** crops without an adequate supply of water. _____
3. By the age of three, most children are able to **talk** with an adult in a limited fashion. _____
4. Because of unhappy childhood experiences, he is **disposed** to believe that most people are basically very selfish. _____
5. During examinations, students are not allowed to talk to or **help** other students in any way. _____
6. Students should not read every page of a book but instead identify and then **take out** only those ideas which are relevant. _____
7. Some students will stay up all night to finish their work, but it is impossible to **maintain** this for very long and so it is not recommended. _____
8. One of the main causes of the increase in **inner-city** lawlessness is the number of young people dependent on drugs. _____
9. Heavy smokers have a **tendency** to develop lung cancer and other serious illnesses. _____
10. In recent environmental demonstrations, **campaigners** have protested against the building of new roads. _____

Exercise 4.7.

alcohol (n) • competence (n) • conserve (v) • corporate (adj) • defer (v) •
domestic (adj) • fraction (n) • horror (n) • incentive (n) • negotiate (v) •
peasant (n) • prudence (n) • rhythm (n)

1. In many types of music, some kind of drum is used to provide the **beat**.

2. Some products are exported and may not be available at all in the **home** market.

3. There is growing pressure on governments to **protect** forests and wild animals.

4. If you wish to travel or work before studying, it is possible to **postpone** your entry to university by one year.

5. Companies often give employees **inducements** such as bonuses and pay rises to encourage them to work harder.

6. It is now common **organizational** policy for a company to have a mission statement explaining the aim of the organization.

7. Only a **small proportion** of the competitors in the Olympic Games actually win a medal.

8. Agoraphobia can be defined as a **dread** of large, open spaces, its opposite being claustrophobia.

9. During the 1930's, the sale of **strong drink** was illegal in the USA, and yet consumption of drink actually increased.

10. I am impressed by her business sense, and I thought that her decision not to expand the company showed a great deal of **wisdom**.

11. Rather than use force, the authorities tried to **have discussions** with the terrorists to secure the release of the hostages.

12. Increasingly, employers are keen to recruit people who have at least a basic **ability** in computing.

13. The 1949 revolution in China was successful because the **agricultural workers** and farmers gave their support to the communists.

Exercise 4.8.

allude (v) • cater (v) • evolve (v) • launch (v) • discern (v) • drug (n) •
proclaim (v) • rebel (n) • territory (n) • testify (v) • utilize (v)

1. In the twentieth century, Britain **developed gradually** from an industrial economy into a service economy.

2. The independence of the United States of America was **announced** in 1776.

3. Many companies in the developed world are trying to **provide** for older customers as the proportion of young people decreases.

4. The witness was so nervous that he refused to **give evidence** when the case came to court.

5. There is a very real danger that **medicines** currently used to treat infection will become completely ineffective if they are used too often and indiscriminately.

6. One of the most important skills to learn as a student is how to **make use of** your time effectively.

7. Despite the efforts of the doctors, it was not possible to **notice** any real improvement in the condition of the patient.

8. Most animals will attack other animals which try to enter their **space**.

9. In the course of a trial, lawyers are forbidden to mention or even **refer** to any previous criminal activity the accused may have been responsible for in the past.

10. The government has decided to **initiate** an investigation into the increase in deaths from drugs.

11. **Revolutionaries** overpowered the troops holding the radio station so that they could announce the change of government to the people.

Exercise 4.9.

ambiguity (n) • annual (adj) • construe (v) • displace (v) • efficient (adj) • innate (adj) • material (n) • orbit (v) • residue (n) • reverberate (v) • suspend (v)

1. The **yearly** external examiners' meeting is held at the end of every academic year to discuss the examination papers which the students have written.

2. He is a very pleasant colleague, and very **proficient** at his job.

3. The workers went on strike as they **viewed** the management's plans as an attack on their job security.

4. Some psychologists think our language ability is **intrinsic**, while others think that we know nothing about language at birth.

5. Because of reports that the meat was not safe, all sales were **halted** until more tests could be carried out.

6. Aluminium is a very suitable **substance** for aircraft because it is light and strong.

7. The International Space Station **circles** the Earth about every 90 minutes.

8. The noise of the explosion **echoed** through the empty streets.

9. Most of the money was spent on salaries, with the **remainder** used for new equipment.

10. Some industry experts believe that the Internet will **supplant** television and all programmes will be viewed from a computer.

11. He lost a great deal of political support because his speeches were so full of **uncertainty** and anomalies.

Exercise 4.10.

ascribe (v) • assent (n) • comprise (v) • emancipate (v) • embrace (v) • enhance (v) •
outcome (n) • inconsistent (adj) • interrelate (v) • saturate (v) • vague (adj)

1. The minister resigned because many people felt that his behaviour was **at variance** with his role in public life. _____
2. The clear increase in skin cancer has been **attributed** to the fact that more people now take holidays in hot countries. _____
3. The new law course attempts to **cover** all aspects of international law. _____
4. Some people argue that robots in the home will **liberate** us from having to do the housework in the not too distant future. _____
5. A significant number of students decide to study for a Master's degree to **boost** their knowledge. _____
6. The USA is **composed of** 50 states. _____
7. In Britain, the Queen must give her **agreement** to a new law before it can come into force. _____
8. The **result** of the experiment was a complete surprise to everyone: the new process was a success! _____
9. The market for cars in Europe is almost **full to capacity**, forcing car manufacturers to look for customers elsewhere. _____
10. A recent survey has found that most people have only an **uncertain** understanding of how and why we study theoretical science. _____
11. Wages and inflation are closely **linked**, in that as one rises or falls so does the other. _____

Exercise 4.11.

bulk (n) • fluid (n) • fulfil (v) • huge (adj) • inspect (v) • instance (n) • switch (v) •
novel (n) • revolve (v) • shrink (v) • topic (n) • vital (adj)

1. In some **cases**, the patients did not make any improvement, but generally the treatment was a huge success. _____
2. While a few students stay in university halls of residence, the **majority** of students choose to rent their own accommodation at some point in their studies. _____
3. In the course of a marathon, a runner needs to drink water periodically in order to make up for the **liquid** lost through sweating. _____
4. Before starting work on your dissertation, make sure that you have discussed the **subject** with your supervisor. _____
5. Staff responsible for **examining** aircraft checked the plane and declared it unsafe. _____
6. Some students find it very confusing when a lecturer **changes** from the topic under discussion to share a joke with his audience. _____

7. The **stories** of Charles Dickens give us a very clear picture of life in Britain in the nineteenth century. _____

8. Many students complained when the university failed to **keep** its promise to allow students 24 hour access to the computer centre. _____

9. Each time the star **rotates**, it sends out a radio signal which we can detect on Earth, allowing us to calculate the speed of rotation. _____

10. It is absolutely **essential** that you check your examination entries to make sure they are correct; if they are not you may not be allowed to sit your examination. _____

11. Most universities have found that demand for engineering courses has **decreased**, while new subjects such as media studies have become very popular. _____

12. The amounts of money owed by some Third World countries were so **enormous** that in many cases it was decided to cancel the debts since they would probably never have been repaid. _____

V. Choose the best word

Exercise 5.1.

1. In this first assignment, we will _____ your work and then give you detailed feedback on how to improve your writing.
a. assess b. judge c. measure
2. In a seminar or tutorial, everyone should take part rather than allow one person to _____ the discussion.
a. overwhelm b. dominate c. oppress
3. Although it is impossible to give a _____ age, we believe that the woman was between 25 and 30 when she died.
a. definite b. certain c. absolute
4. Rather than try to treat it, the best _____ to the problem of poor public health may be to attempt to prevent it.
a. way b. method c. approach
5. Surprisingly perhaps, the biggest _____ health risk for tourists travelling abroad is actually road traffic accidents.
a. potential b. possible c. theoretical
6. Water is made up of two _____, namely oxygen and hydrogen.
a. sections b. aspects c. elements
7. Computers can be difficult to repair because there may be hundreds of different _____ inside.
a. components b. pieces c. parts
8. Because Paris is expensive, many organizations pay higher salaries to _____ for the high cost of living there.
a. compensate b. adjust c. redress
9. Many people were killed instantly at Hiroshima and Nagasaki, but thousands more died from _____ radiation sickness.
a. succeeding b. following c. subsequent
10. The clothing of men and women used to be quite _____, whereas today women often wear trousers as well as men.
a. distinct b. diverse c. distinguished
11. Research _____ that customers want free car-parking when they go shopping.
a. claims b. indicates c. points out
12. In political terms, the Middle East is one of the most unstable _____ of the world.
a. locations b. places c. regions
13. The _____ cause of death today in Britain is heart disease, with cancer in second place.
a. first b. prime c. initial

Exercise 5.2.

1. Although he had no _____ injuries, doctors later found that he was suffering from internal bleeding.

- a. outside b. external c. outlying
2. There is a marked _____ between the poverty of the poorest members of society and the affluence of the richest.
- a. opposite b. contrast c. variation
3. The allied forces launched _____ bombing raids on several important sites in and around the enemy capital.
- a. simultaneous b. contemporary c. coincidental
4. Students are often advised to look at the first and last _____ of a book before attempting to read it in detail.
- a. headings b. chapters c. titles
5. Although this is far from certain, the _____ age of the universe is about 4.6 billion years.
- a. approximate b. general c. rough
6. Some economists argue that new _____ causes unemployment while others feel that it allows more jobs to be created.
- a. science b. engineering c. technology
7. After you have submitted your application, the university will attempt to _____ that the information you have supplied is correct.
- a. verify b. certify c. investigate
8. Young children go through a _____ in their development when they try to copy everything they hear.
- a. process b. phase c. transition
9. In the some countries, there is no tax on books on the _____ that education should not be taxed.
- a. principle b. idea c. concept
10. Further information can be _____ from the nearest British Council office.
- a. obtained b. found c. got
11. As everyone knows, certain metals such as iron and steel can have a _____ field while others like copper cannot.
- a. electrical b. magnetic c. chemical
11. Just as dividing up an orange into _____ makes it easier to eat, always try to break up a longer piece of text into small blocks of words.
- a. segments b. pieces c. sections
12. One problem for any teacher is that each student has his/her own _____ needs.
- a. separate b. individual c. distinctive
13. Good theories are important of course, but we must have _____ evidence to support them.
- a. empirical b. true c. realistic

Exercise 5.3.

1. Before giving a presentation, always _____ the focus on the projector so that everyone can read what is on the screen.
- a. adjust b. move c. change
2. The _____ changes companies make to their cars are often very _____ and may not change the basic structure of the cars at all.

- a. microscopic b. superficial c. minute
3. Although most cars can travel much faster, the _____ speed limit in the UK is 70 mph (110 kph).
- a. maximum b. highest c. biggest
4. In special _____, a person who is found guilty of murder may receive no punishment at all from the court.
- a. places b. times c. circumstances
5. The results of the government inquiry _____ that there had been no deliberate attempt by the company to deceive investors.
- a. displayed b. revealed c. explained
6. One important aspect of marketing is to create a positive _____ of a company or product.
- a. image b. picture c. style
7. Today, people are probably more familiar with _____ on the television and radio rather than in the theatre.
- a. drama b. acting c. play
8. Police could not understand why the arrested man had murdered his neighbour since he appeared to have no _____.
- a. objective b. motive c. purpose
9. The first two weeks of the course are designed to _____ new students and to allow them to settle into university life.
- a. orientate b. instruct c. introduce
10. The instructions from air traffic control were not fully _____, and as a result the pilot made an error and crashed.
- a. total b. explicit c. complete
11. A large number of people became ill after receiving blood transfusions _____ with the AIDS virus.
- a. polluted b. poisoned c. contaminated
12. Joining a newsgroup allows computer users to make _____ with other people who share a similar interest.
- a. touch b. approach c. contact
13. If you have time, I would really _____ some help with this assignment.
- a. appreciate b. respect c. value

Exercise 5.4.

1. The former West Germany tried to _____ its business approach onto the former East Germany.
- a. imprint b. enforce c. superimpose
2. In a nuclear power station, _____ of uranium are split into smaller particles, releasing huge amounts of energy.
- a. atoms b. chunks c. elements
3. Young army officers led the violent _____ which brought down the democratically- elected government.
- a. revolt b. policy c. way
4. The recent rise in leukaemia and similar diseases has been _____ radiation leaking from the nearby nuclear power station.

- a. credited to b. led to c. attributed to
5. One of the reasons for the relatively high price of many drugs is the huge cost of _____ and development.
- a. experiments b. research c. trials
6. The Channel Tunnel between France and the United Kingdom was a huge engineering _____.
- a. project b. development c. attempt
7. We have two e-mail systems here: one for _____ use, and another for contacting people outside the university.
- a. inside b. internal c. Indoors
8. The police interviewed three men but later _____ them from their investigation as they were all innocent.
- a. eliminated b. eradicated c. exterminated
9. A computer cannot blindly guess the answer to a question, since all its operations are based on _____.
- a. logic b. thought c. understanding
10. The _____ of the American space programme in the 1960's was to put a man on the moon by the end of the decade.
- a. ambition b. point c. goal
11. If public transport is to succeed in serving the public, it is important to _____ services such as trains and buses so that they work together and offer a more convenient service.
- a. integrate b. unite c. combine
12. Approximately 30 of the world's most industrialized countries _____ the Organization for Economic Cooperation and Development.
- a. constitute b. comprise c. are composed of

Exercise 5.5.

1. As trade union membership has declined, the number of _____ and strikes has also decreased.
- a. arguments b. disagreements c. disputes
2. The role of the middle manager is not to formulate new policies but to _____ them.
- a. manage b. use c. execute
3. Engineers worked throughout the night to _____ electricity to homes whose supplies had been cut off by heavy snow.
- a. reinstate b. renew c. restore
4. Many athletes take extra vitamins as a/an _____ to their diet when they are preparing for competition.
- a. reinforcement b. supplement c. extension
5. Police officers face many dangers, especially when they are _____ by violent criminals carrying weapons.
- a. confronted b. met c. encountered
6. The invention of printing allowed ideas to _____ much more quickly than before.

- a. scatter b. diffuse c. disseminate
7. In many cultures, it was traditionally believed that men were _____ to women, but this attitude has been changing rapidly in recent years.
- a. better b. inferior c. superior
8. In the early years, facilities for tourists were rather _____, but now they are highly developed.
- a. crude b. rudimentary c. uncomplicated
9. Increasingly, post-graduate students are asked to become teaching assistants in order to _____ undergraduates.
- a. instruct b. drill c. inform
10. Cigarette packets on sale are required to carry a _____ clearly stating the dangers of smoking.
- a. label b. message c. tag
11. A defence lawyer has a duty to try to establish the innocence of his/her _____.
- a. patient b. customer c. client
12. You can buy goods on the Internet with a credit card, but there is a danger of _____ if someone else obtains the number.
- a. corruption b. fraud c. embezzlement

Exercise 5.6.

1. Wearing a seatbelt when travelling in a car is now a _____ requirement in many countries, and people who do not so may be punished in the courts.
- a. legal b. compulsory c. binding
2. Because the strikers still refused to return to work, the employers agreed reluctantly to _____ their pay offer to the workers.
- a. rewrite b. revise c. reproduce
3. The age at which a child becomes _____ in the United Kingdom is 18.
- a. person b. an adult c. an individual
4. Many scientists believe that most dinosaurs were killed as a result of a huge meteor which _____ with the Earth 65 million years ago.
- a. crashed b. hit c. collided
5. The journalist asked the Prime Minister repeatedly about the scandal but he refused to _____ on it.
- a. comment b. mention c. discuss
6. Despite a great deal of evidence to the contrary, tobacco companies _____ the public for years that smoking was not a direct cause of cancer.
- a. promised b. assured c. persuaded
7. While South Korea has _____ over the last fifty years, North Korea is still relatively underdeveloped.
- a. succeeded b. prospered c. achieved

8. In most companies, employees receive extra _____ if they do extra work.
a. income **b. revenue** **c. salary**
9. Following unification, the German government decided to move the capital from Bonn and _____ it once more in Berlin.
a. position **b. locate** **c. place**
10. There are many parts of the world which are _____ enough to produce food but do not have enough water.
a. productive **b. fertile** **c. agricultural**
11. Most universities have trained counsellors who can reassure and _____ students who have academic or personal problems.
a. console **b. sympathize** **c. cheer**
12. The _____ of world trade increased enormously during the twentieth century.
a. size **b. volume** **c. scope**
13. To improve teamworking, students are often asked to _____ to produce a group report or presentation together.
a. assist **b. unite** **c. co-operate**

Exercise 5.7.

1. In any large company, the _____ Department is responsible for managing money within that organization.
a. Finance **b. Monetary** **c. Economic**
2. Some political parties want to _____ the process by which we vote in general elections so as to make it more representative.
a. rewrite **b. redraw** **c. reform**
3. In the next century, the _____ of Asia will become the most significant sector of the world economic market.
a. region **b. continent** **c. area**
4. Mad cow disease was probably caused by allowing cows to eat nerve _____ from sheep and other cows.
a. tissue **b. flesh** **c. matter**
5. In the US today, more and more children live with one parent, and yet the _____ of the two-parent family still exists.
a. icon **b. stereotype** **c. symbol**
6. The study of _____ has been helped considerably by the Hubble telescope, the only telescope up in space.
a. astronomy **b. astrology** **c. astronomer**
7. In the Second World War, Switzerland declared that it would remain _____ and not take part in any of the fighting.
a. neutral **b. disinterested** **c. impartial**
8. The roots of a plant absorb water and _____ from the soil in which it grows.
a. food **b. nutrition** **c. nutrients**
9. Because of modern communications, it is increasingly common for people to _____ business without actually meeting.

- a. perform b. transact c. make
 10. According to the _____, the building should be ready for use by the end of the year.
- a. timing b. schedule c. time
 11. Many food products carry a 'sell by' date since they _____ over time and become unusable.
- a. degrade b. degenerate c. corrupt
 12. A simple everyday example of the _____ is the standard postcard.
- a. triangle b. square c. rectangle

Exercise 5.8.

1. Some plants _____ a sweet, sticky liquid to attract insects.
- a. exude b. leak c. drip
2. To cut down on costs, the university _____ each student a limit of 500 pages of computer printing.
- a. allots b. gives c. allocates
3. If children are _____ of love and security they may have problems in later life.
- a. stripped b. deprived c. denied
4. The decision of the university to close the swimming pool at weekends _____ an angry reaction among students.
- a. created b. provoked c. stimulated
5. Students on the new technology course became very _____ at the lack of suitable books in the library.
- a. despondent b. frustrated c. sad
6. In the seventeenth century, William Harvey showed that blood _____ around the body on a continuous basis.
- a. flows b. circulates c. pours
7. The G8 is a _____ of the world's eight richest countries.
- a. division b. club c. league
8. According to witnesses, some UFO's can appear and disappear again as if by _____.
- a. trickery b. magic c. miracle
9. Many political parties support the introduction of a common _____, accepted all over Europe.
- a. money b. finance c. currency
10. The decision of the House of Commons surprised no one, as the politicians simply voted along _____ lines: the left-wing all supported the Prime Minister, and the right-wing all opposed him.
- a. partisan b. factional c. biased

Exercise 5.9.

1. There are still too many countries which regularly _____

their citizens' human rights.

- a. break** **b. violate** **c. breach**

2. In very hot climates, a considerable amount of petrol _____ from car fuel tanks and into the atmosphere.

- a. evaporates** **b. dehydrates** **c. dries**

3. When writing a summary, try to _____ the main ideas into just a few short sentences.

- a. condense** **b. shrink** **c. collapse**

4. The chief _____ which many companies have today is not the property they own but rather the creativity and skills of their employees.

- a. asset** **b. benefit** **c. liability**

5. His health is so bad that it will be a _____ if he is alive next year.

- a. wonder** **b. miracle** **c. marvel**

6. When you hit a drum, the movement of the drum causes the air molecules to _____, which we hear as sound.

- a. reverberate** **b. vibrate** **c. shake**

7. Although the research team are all somewhat _____ people, they work very well together and produce some very good ideas.

- a. conventional** **b. odd** **c. bizarre**

8. The professor _____ several possible explanations for the rise in recorded crime.

- a. numbered** **b. enumerated** **c. named**

9. The supervisor was not _____ concerned about the student asking for a week's extension to finish his essay, but warned him that there would be no more extensions after that.

- a. unduly** **b. absolutely** **c. highly**

10. Please _____ two colour passport photographs to the application form.

- a. link** **b. attach** **c. fix**

Exercise 5.10.

1. The President's speech was so _____ that many people were persuaded to accept the need for change.

- a. expressive** **b. articulate** **c. eloquent**

2. Car crashes are almost always accidental, but on rare occasions they may be _____.

- a. conscious** **b. purposeful** **c. deliberate**

3. The outline is a kind of _____ which gives in general terms the basic structure and content of a piece of work.

- a. sketch** **b. skeleton** **c. draft**

4. People who smoke heavily experience a/an _____ to smoke, which makes it very difficult for them to stop.

- a. compulsion** **b. obligation** **c. addiction**

5. Although we now believe this to be impossible, early scientists tried to produce _____ motion machines, that is, machines which would

never stop.

- a.** perpetual **b.** everlasting **c.** undying

6. If a questionnaire is badly written, it will not _____ the type of information required from the people completing it.

- a.** solicit **b.** elicit **c.** Obtain

7. Books are usually electronically protected so that they cannot be _____ from the library unless they have been issued in the proper way.

- a.** removed **b.** withdrawn **c.** extracted

8. Studying is important, but playing sports and joining clubs will help to _____ a student's time at university.

- a.** boost **b.** enrich **c.** bolster

9. No doubt every country has _____ in its history which its people now regret.

- a.** episodes **b.** stages **c.** sections

10. Students who are _____ on the campus make more use of the university sports facilities than those living outside.

- a.** domiciled **b.** resident **c.** settled

11. One of the biggest problems with malaria is that the disease can _____ and give the patient serious medical complications again and again throughout his or her life.

- a.** repeat **b.** recur **c.** arise

Exercise 5.11.

1. In addition to reading books and journals, the other main source of information available to university students is the _____ given by the academic staff.

- a.** lectures **b.** lessons **c.** classes

2. The atmospheres of most planets are not _____, making it difficult for us to see the surface.

- a.** transparent **b.** lucid **c.** clear

3. Three terrorists managed to escape but all of them were _____ within 24 hours and returned to prison.

- a.** trapped **b.** snared **c.** captured

4. Anybody who joins the army as a soldier has to accept that danger is an _____ part of the job.

- a.** inside **b.** internal **c.** inherent

5. Students without the normal academic qualifications but who have relevant work experience may be offered a place on an easier diploma course on the _____ towards an MBA.

- a.** journey **b.** direction **c.** route

6. In Egypt, water from the River Nile has been used for thousands of years to _____ the dry desert land so that crops may be grown.

- a.** irrigate **b.** moisten **c.** fundamental

7. Improvements in quality control techniques have resulted in more high-quality products with very few _____.

- a. mistakes** **b. failures** **c. defects**
8. As you can see from your handout, the first _____ of figures down the left-hand side shows the growth in population.
- a. line** **b. column** **c. string**
9. The _____ of men to women in China is unusual, in that there are more men than women.
- a. ratio** **b. number** **c. quantity**
10. According to a recent survey in Europe, most workers expressed a preference for increased _____ time rather than the chance to do more overtime and earn extra money.
- a. leisure** **b. hobby** **c. relaxation**

VI. Make a collocation. Start by reading through the sentences below. Then take one word from the box on the left and combine this with one from the box on the right to make a collocation. For example, valid can be joined with reason. (Note that more than one pairing may be possible and also that some words appear more than once.) Then try to match your combinations with the spaces in the sentences below.

Exercise 6.1.

new • analyze • leading • valid
 marital • new • initial • tense
 constant • ultimate • establish
 reverse • minimum • put forward

status • responsibility • role
 concept • the hypothesis • results
 dimension • temperature • reason
 a link • atmosphere • results
 the verdict • requirement

1. If you submit work late, you will lose marks and may even be given a fail grade, unless you have a _____ such as illness.
2. One travel company is now advertising a completely _____ in tourism: flights into outer space by rocket.
3. At the bottom of the ocean, the water remains at a _____ irrespective of changing weather conditions at the surface.
4. The growth of China will add a _____ to the economic and political situation in the Far East.
5. Students are expected not just to describe what they have done but also to _____ when they write a research report.
6. Investigators have been able to _____ between childhood illnesses and industrial pollution.
7. Following the demonstrations by thousands of students, there was a very _____ in the capital, with many choosing to leave the city and head for the countryside.
8. Unfortunately, although the _____ were very promising, the project failed in the long run because of a lack of interest.
9. Engineers have played a _____ in improving our health by giving us clean water supplies, perhaps more so than doctors.
10. The Managing Director may run the company, but _____ rests with the Board of Directors.
11. On the form, please give your name, nationality, address and indicate your _____.
12. When some scientists originally _____ known as global warming, the idea was not taken seriously, and yet today it is accepted by nearly everyone.
13. In some instances, a Court of Appeal may _____ reached at the first trial and released somebody who has been wrongly held in prison.

14. Most universities require international students to have an IELTS score of at least 6 as a _____ for English language competence.

Exercise 6.2.

endangered • sequence of • devote
transmit • assert • precise • reacted
natural • economically • highly
inhibit • verbal • separate

events • sophisticated • angrily
the right • signals • details
species • feasible • agreement
entities • phenomena • growth
time and money

1. In spite of advances in technology, we are still at risk from _____ such as earthquakes and floods.
2. One threat facing companies today is _____ computer 'hackers' who break into the most advanced computer systems.
3. The accident was the result of a tragic _____ which could have been prevented with better safety procedures.
4. The company _____ to the suggestion that its products were unsafe.
5. There is considerable doubt over whether the proposal by the American government for a manned trip to Mars is technically and _____.
6. Tigers (and other large cats) are now an _____ and may disappear altogether in the future.
7. After the Second World War, African nations started to _____ to become independent.
8. In law, a _____ even though it is not written down like a formal contract, is still a contract.
9. While she refused to give any _____, the Minister admitted that several people had been arrested.
10. In order to produce new medicines, drug companies have to _____ on a huge scale to their research and development activities.
11. Most economists believe that high taxes _____ in the economy.
12. In spite of its age, the satellite is still continuing to _____ to Earth.
13. Are the mind and body the same thing or are they two _____?

Exercise 6.3.

global • common • computer
power and • previous • final
outspoken • dynamic • positive
physical • labour • classic

shortage • personality • exercise
prestige • example • critic
decision • feature • experience
aspects • network • economy

1. After the Second World War, there was a _____ in Britain and so workers from other countries had to be recruited.
2. Some people found Mrs Thatcher's style somewhat aggressive, while others preferred to regard her as having a forceful and _____.
3. His doctor advised him to give up fatty foods and to take some form of _____ such as golf.
4. In most countries, Mercedes-Benz cars are very famous because they are regarded as symbols of _____.
5. The university refused to make a _____ on his application until he had taken a language test.
6. Without doubt, Coca-Cola is probably the _____ of a product that is known world-wide.
7. Employers are always keen to recruit staff with good qualifications and relevant _____.
8. Those language learners who focus on the _____ of living in a new culture rather than on the disadvantages tend to learn more quickly.
9. Because she was an _____ of the government, she was kept under house arrest for a number of years.
10. Unfortunately, rising crime rates seem to be an increasingly _____ of life in big cities today.
11. The Internet, as the name implies, is really a huge _____, linking computers all over the world.
12. Tourism is now a very significant part of the _____, earning millions of dollars.

Exercise 6.4.

atom • flatly • high • embodies
dense • dedicate • Western
military • mobile • judicial

fog • proportion • system • bombs
phones • contradicted • his life
service • the principle • culture

1. An official spokesman _____ allegations that the company had been responsible for the deaths of three employees, insisting that every precaution had been taken.
2. As more countries acquire the technology necessary to produce _____, the probability that they will be used again increases.

3. A _____ of people released from prison continue to commit offences.
4. In some countries, _____ has been rejected in favour of a more traditional view of society.
5. One major criticism of the _____ in Britain is that there are not enough female judges.
6. Nelson Mandela _____ to achieving equality between black and white people in South Africa.
7. When there is heavy snow or _____, an airport may be closed down to prevent the possibility of an accident.
8. The policy of privatization _____ of a property-owning democracy.
9. Because of the growth in fax machines and _____, we will need more new telephone numbers.
10. In many European countries compulsory _____ is the norm, whereas in Britain no one is required to join the armed forces.

Exercise 6.5.

force of • abstract • at regular
 lines • err on • within a • research
 legitimate • perpetrated • imposed
 crisis of

a ban • crimes • gravity • institutes
 thought • confidence • intervals
 the side of caution • intersect
 concern • radius

1. Most academic journals are published _____, perhaps every month or every quarter.
2. While it is probably true they are not capable of _____, most animals appear to experience a range of emotions.
3. There is a tradition that a falling apple helped Newton develop his theory about the _____.
4. In the 1970's, the price of oil increased dramatically, causing an international economic _____.
5. Most people accept that fighting against terrorism is a _____ of any government.
6. Because of the danger of an explosion, everyone who was _____ of 500 meters of the bomb was evacuated.
7. Before publishing the results of new research, it is better to _____ and recheck the results.
8. On this graph, where the two _____ we find the ideal balance.
9. Following the rise in violence, the government _____ on the private ownership of guns.
10. Because of the work of _____, there is increasing hope that effective treatments for AIDS will soon be available.

11. He _____ which were so terrible that a massive manhunt was launched by the police to find him.

Exercise 6.6.

keep • niche • southern
identical • brief • economic • attain
under • go off at • virtual
endless

hemisphere • your nerve •
interlude • their goals • cycle
twins • reality • sanctions • market
a tangent • the microscope

1. When you look at your exam paper, try to _____ and don't panic; concentrate on what you can do!

2. In order to increase pressure on the government, _____ were imposed preventing the sale of oil.

3. Sometimes, university life just seems to be an _____ of assignment after assignment.

4. In spite of equal opportunities policies, women are still not able to _____ as easily as men in terms of reaching the top positions.

5. Some lecturers are difficult to follow because they _____ and talk about something completely different.

6. Most _____ not only look alike but also behave and even dress similarly.

7. _____ is now so advanced that pilots train with it.

8. Some insects are so small that they can only really be seen properly _____.

9. The countries in the _____ are in general poorer than those in the northern.

10. After two months of non-stop fighting there was a _____ of peace on Christmas Day before the fighting started again.

11. While the Volkswagen car was designed to appeal to the masses, the Rolls Royce has only ever been aimed at a _____.

Exercise 6.7.

sibling • pleaded • political
thermal • salt • campaign • code
precipitated • colloquial •
contingent • intermediate • US

of ethics • spectrum • upon
language • not guilty • a crisis
crystals • stages • of terror
Congress • energy • rivalry

1. The shortage of oil in the 1970's _____ in the world economy.

2. In areas with active volcanoes, the _____ from

underground hot water supplies can be used to produce electricity.

3. The water evaporated, leaving behind only _____.

4. Although he _____, the court sentenced him to three years in prison.

5. Doctors have a _____ which requires them to act in the best interest of their patients.

6. _____ refers to the competition which often exists between the children in a family for the attention and love of their parents.

7. Although there has been some success, the discussions are still only in the _____.

8. The results of the vote showed agreement across the _____, both on the extreme left and extreme right.

9. One extreme political group started a _____, including hijacking, kidnapping and bombing.

10. When speaking, we tend to use _____, but in academic writing we need to be much more formal.

11. The decision by Japanese companies to invest in the UK was _____ Britain being part of the European Union.

12. The _____ is made up of the House of Representatives and the Senate.

Exercise 6.8.

solar • Peace • invest
imperia • dissipates • sex and
give legislate • utter
on the premise

against • violence • power • that
energy • control • money
their consent • waste of time •
Treaty

1. There is very little evidence to suggest that _____ as portrayed on television and in film actually cause antisocial behaviour.

2. Many students make the mistake of reading without considering first why they are reading, which just _____ for no good reason.

3. The _____ signed at Versailles marked the end of the First World War.

4. One obvious source of energy is _____, since the sun produces so much heat.

5. It is almost impossible to _____ people who use the Internet for criminal purposes.

6. Most of the students complained that the lectures were an _____ because it was impossible to understand the lecturer.

7. During the nineteenth century, perhaps a quarter of the world's population was under British _____.

8. Some years ago, seat-belt legislation was introduced, _____ this would reduce the number of serious injuries.

9. One common complaint is that companies do not _____ in new developments for the long-term future.
10. In some countries, if both pairs of parents _____, young people can get married below the age of 18.

Exercise 6.9.

full • high • umbilical
frontiers • gained • low
wide • drastic • voluntary • rural
federal

of science • complement • work
velocity • cord • momentum
areas • government • morale
vocabulary • action

1. In the United States, the _____ has overall responsibility for foreign affairs and defence.
2. The company was losing so much money that only _____ by the management – including the dismissal of 15% of the employees – enabled it to survive.
3. Until very recently, most people lived and worked in _____, whereas today most of us live in cities.
4. Young children need a stimulating environment so that they can develop the _____ of intellectual and social skills.
5. Researchers work at the _____ in order to increase our knowledge.
6. While walking in space, the astronauts are connected to the spacecraft by a long life-line, often referred to as the «_____».
7. After retiring, many people choose to do some type of _____ even though they receive no pay for this.
8. Political change in Central Europe _____ when President Gorbachev came to power in the Soviet Union.
9. All students will need a _____ in order to understand the sources of information they have to use.
10. Policemen carrying _____ rifles surrounded the building.
11. If soldiers are not paid on time, _____ can set in, sometimes resulting in a revolution against the government.

Exercise 6.10.

maternal • political • null and
television • health • tangible • high
leading • under • have • fossil

interviews • clinic • exponents
instinct • ambitions • fuels
void • benefits • access to
inflation • the auspices of

1. In many universities, there is a/an _____ provided especially for students and staff.
2. _____ is usually an economic disaster, causing prices to rise and the value of money to fall.
3. In _____, politicians often ignore what they are asked, preferring instead to discuss their own interests.
4. Because they increase the availability of information, _____ of computer technology argue that computers help protect our freedom.
5. Many feminists now argue that women do not have a _____ towards children.
6. Many successful business figures want to enter government in order to satisfy their _____.
7. Because the original information was incorrect, the court decided that the contract was _____.
8. The building of a new airport will bring _____, such as improved communications and more jobs in the local area.
9. Through the Internet, students now _____ information from academic libraries all over the world.
10. One of the problems with _____ such as coal and oil is that they will not last for ever.
11. An international rescue operation was organized _____ the United Nations.

Exercise 6.11.

public • electrical • mental
television • academic • tropical
air • gas • career • cassette

circuits • cylinders • illness
fares • change • journals
tapes • stations • transport
rain forests

1. In modern cars, sound systems play CDs rather than _____.
2. The _____ of the Amazon contain over 10% of all known plant species found on Earth.
3. One of the most important developments in the history of the computer was the printing of tiny _____ on small chips of silicon.
4. The explosion was caused by terrorists, who had packed a number of _____ with home-made explosive.
5. Increasingly, cars are being excluded from city centers and improved _____ is being developed instead.
6. For the most recent developments in any subject, _____ are a much better place to look in than text books.
7. Psychologists have shown that living in very tall buildings can lead to depression, or even _____.
8. Thanks to the introduction of satellite communications, we can confidently

expect the growth in the number of _____ to continue.

9. Increased competition among the airlines in Europe has meant that _____ has become much cheaper.

10. After several years working as a lawyer, she decided to have a _____ and become a university lecturer instead.

UNIT VI. GENERAL PRINCIPLES OF TEXT RENDERING

Rendering doesn't mean retelling the text, but analyzing the information. This analysis should be done according to the following **plan**:

I. Logical organization of information given in the text:

- 1) the topic and the main idea of the text;
- 2) the title of the text;
- 3) logical patterns of information.

II. Author's intentions and his attitude to the reported information.

III. The relevance of a reader's knowledge, his overall impression, and his attitude to the problem.

And now let's consider the points of the plan, according to which the information has been presented in the text.

I. Logical organization of information given in the text.

1. The topic and the main idea of the text.

First you should identify the topic of the article. To do this, you need to answer the question: "What is this article about?" It is much more difficult to find out the general idea, which can be revealed only after a complete reading of the article and its analysis.

The relationship between the theme and the idea can be determined as subject and object of the study, i.e., topic is more general and idea is more specific. Namely, it's a matter of perspective, from what point we look at this subject.

As a rule, serious editions that respect their readers and save their time, give the topic of the article in a smaller font above the heading, while the main idea goes after the title.

Useful phrases

to highlight the subject and object of the text:

- *the author of the article describes*
- *presents*
- *gives*
- *informs on the problem/event*
- *phenomenon*
- *situation/product*

2. The title of the text.

The second point of your response plan is the analysis of the headline, because it may reflect the main theme and even the idea of the article. However, most often it will be metaphorical, and its meaning will become clear only after reading the entire article. In translational science, it is well-known that headline is the most difficult part. Even from the experience of reading newspapers in our native language, we know how often it is difficult to predict the content of the article by the title. For example, "His name is Robert" (about the up-to-date equipment of the Audi), "Look

for a woman” (about the gender differences in managing the company), “Five years of marriage made in heaven” (about a five-year result of Daimler-Chrysler).

Choosing among titles, the author is likely to use some rhetorical figures, most often it is a metaphor. If, while reading the article, you understood the meaning of the metaphor, reflect this in your answer. If you feel that your language base is not enough to analyze the title – it is enough to name it and state whether it reflects the topic and idea of the article.

Useful phrases to analyze the title of the article:

- *The title of the article reflects its main topic/idea.*
- *The title of the article doesn't reflect its main topic/idea, it's metaphoric.*

3. Logical patterns of information.

The link between clear, logical organization and effective communication is powerful, both for the "sender" and the "receiver." For the writer, a well-organized outline of information serves as a blue print for action. It provides focus and direction as the writer composes the document, which helps to ensure that the stated purpose is fulfilled. For the reader, clear organization greatly enhances the ease with which one can understand and remember the information being presented. People seek out patterns to help make sense of information. When the reader is not able to find a pattern that makes sense, chaos and confusion abound. Effective communication, then, begins with a clearly organized set of ideas following a logical, consistent pattern. Thus, one of the most important decisions a writer makes concerns the pattern of organization that is used to structure and order information.

There are many patterns a scientist can use to organize his/her ideas. The specific pattern (or combination of patterns) chosen depends upon the particular topic and the objectives the author has identified for the document. There is no rule to follow in choosing a pattern of organization; one must simply think carefully about which pattern makes the most sense in helping the reader to better understand and remember the information. There are many different ways of organizing the same information, and often two or more different organizational patterns are combined to create a final outline of information.

You may be faced with the fact that article information is randomly complicated and it is almost impossible to consider the logic of presentation. However, the task remains the same – to understand as much as possible and to analyze the article. In this situation, it is important to determine which of 6 logical models proposed below is the most appropriate for article, that is, which provides the information more effectively.

1) “Main idea and supporting details” pattern.

Usually, according to this model, newspaper articles are built in such a way, when the first paragraph is the most important, and the rest of the text consists of various types of additional information (numbers, examples, certain descriptions).

Useful words and phrases to analyze the information in the text based on the “Main idea and supporting details” pattern:

- *The author of the article states the main idea in the first paragraph...*

- *It deals with...*
- *Firstly as the supporting detail he presents the figures/descriptions/situation on...*
- *Secondly he gives the following examples...*
- *At the next stage the author describes...*
- *Finally he sums up/summarizes...*

2) The “Descriptive” pattern.

As the name implies, texts built according to this model describe any phenomenon, product, etc. However, it is important to determine by what type of description it is organized:

- *from general to particular / vice versa;*
- *from the inside to the outside / vice versa;*
- *top down / vice versa;*
- *from the most exciting in the least / vice versa.*

Useful words and phrases to analyze the information in the text based on the "Descriptive" pattern:

- *The author subsequently describes/gives the description of...*
- *The description is organized/arranged/presented from up to down/inside to outside/from general information to detail...*
- *Firstly/in the first place..., to start with..., first of all..., secondly..., at the next stage..., thirdly..., at last..., finally..., to sum up..., in conclusion...*

3) The “Chronological sequence” pattern

A chronological pattern of organization arranges information according to a progression of time, either forward or backward. When a topic is best understood in terms of different segments of time, a chronological format works well. For example, topics of an historical nature are best organized using this pattern. When using a chronological pattern, each main section of information represents a particular period of time, and the sub-points contained within each main section refer to significant events that occurred within that time frame. A variation of this organizational pattern involves dividing a topic into "past-present-future" or "before-during-after" segments.

Very useful here are the adverbs of time used by the author. Accordingly, they should also be widely used during the analysis of the text.

Useful words and phrases to analyze the information in the text based on the “Chronological sequence” pattern:

- *To start with the author states the fact of...*
- *At the first stage/initially he describes...*
- *The second step is/secondly he informs us on...*
- *Besides he tells us..., furthermore he tells us...*
- *Thirdly/then/after that he depicts...*
- *Next/subsequently he reports on...*
- *Finally/at the final stage he sums up...*

4) The “Analogy and contrast” pattern (compare-contrast pattern).

This pattern arranges information according to how two or more things are similar to or different from one another (or both). This is an effective pattern to use when the reader can better understand one subject when it is described in relation to another. If the reader is familiar with one topic, the writer can compare or contrast it with another topic to shed insight on it. For example, suppose a writer's stated purpose is to help the reader make an informed decision about whether to attend a two-year college or a four-year university. One way to arrange the information is to compare and contrast the two educational options along several important dimensions, such as cost, quality of education, and variety of educational programs. In this case, the number of main sections in the outline would depend on how many dimensions or factors were considered. Another way to arrange the information would be to create two main sections, one that describes similarities and one that describes differences. Notice that either format could be equally effective.

As a rule, articles built on this model contain a comparative description of two or more phenomena, and the author identifies (1) similar, i.e., the characteristics that unite them, and (2) contrasting, i.e. opposite or different.

Useful words and phrases to analyze the information in the text based on the “Analogy and contrast” pattern

- *First of all the author describes/depicts/characterizes/rises/enumerates the similar/alternative features/characteristics of...*
- *At first sight there is an impression that...*
- *The common/alternative features are as follows...*
- *Also/in addition/besides/moreover he states the fact that...*
- *In short/in brief the difference/similarity is that...*

5) The "Classification" pattern.

This pattern is the most commonly used format, and will typically work when the other patterns do not. A topical pattern arranges information according to different sub-topics within a larger topic, or the "types" of things that fall within a larger category. Using this pattern, each "type" represents a main section of information.

For example, suppose a writer wished to describe various types of wine. One way to outline this information would be to divide the type of wine by its color, as shown in example one. A second way would be to divide the types of wine by the region in which they were made, as shown in example two.

	Topical Pattern	
Example One		Example Two
I. Red Wines		I. European Wines
A. European		A. Red
1. Bordeaux		1. ____
2. Burgundy		2. ____
3. Chianti		3. ____

- B. Californian
- 1. Cabernet Sauvignon
- 2. Pinot Noir
- 3. Zinfandel

II. White Wines

- A. European
- 1. Bordeaux
- 2. Burgundy
- 3. Mosel

B. Californian

- 1. Sauvignon Blanc
- 2. Chardonnay
- 3. Riesling

B. White

- 1. ____
- 2. ____
- 3. ____

II. Californian Wines

A. Red

- 1. ____
- 2. ____
- 3. ____

B. White

- 1. ____
- 2. ____
- 3. ____

It is useful to reflect the information of the texts giving the classification of a phenomenon in the form of diagrams in order to represent the relationship between the parts more clearly and logically.

Useful words and phrases to analyze the information in the text based on the "Classification" pattern

- *The author gives/presents the classification of...*
- *It can be depicted in the following diagram, scheme, table, chart, spidergram.*

There are two main boxes. He divides it into two/several parts/ classes/levels.

- *Afterwards he subdivides it into several subclasses.*
- *He includes two similar classes into one...*

6) The "Argumentative" pattern (advantages-disadvantages pattern).

This pattern organizes information about a topic by dividing it up into its "good" and "bad" parts, or pro's and con's. It is effective to use when a writer wishes to objectively discuss both sides of an issue without taking a persuasive stance. This allows the reader to weigh both sides of an issue. As with the compare-contrast pattern, there are a number of possible variations to an advantages-disadvantages pattern. The simplest form of this pattern is shown below. Suppose, for example, that a writer's stated purpose is to describe the advantages and disadvantages of attending a two-year college. One way to arrange the information is to divide it into two main sections, one for the advantages and one for the disadvantages. In this scenario, the information contained within each main section will represent the specific topics of analysis (cost, accessibility, etc). For example:

- I. Advantages.
 - 1. Cost.
 - 2. Accessibility.
- II. Disadvantages.
 - 1. Number of educational programs.
 - 2. Quality of instruction.

For yourself, you can make the following table:

Arguments “for”	Arguments “against”
1.	1.
2.	2.
3.	3.

**Useful words and phrases to analyze the information in the text
based on the “Argumentative” pattern:**

- *The main/greatest advantage of that is...*
- *Nevertheless/on the other hand he presents several disadvantages as well.*
- *He praises..., he criticizes... It is popularly believed that..., opponents of this view say...*

However, texts are often built after the mixed logical models of information, thus it is important to highlight the dominant, most effective content. The following text can be analyzed either according to the “Main idea and supporting details” pattern, or the “Argumentative” pattern.

Graphically, the plan of the presentation according to one or another model is put below.

The main idea and supporting details

<i>Introduction</i>		<i>Arguments</i>	
<i>I. Main idea</i>		<i>For</i>	<i>Against</i>
A. } B. } C. }	supporting details	a)	a)
<i>II. Main idea</i>		b)	b)
A. } B. }	supporting details	c)	c)
<i>Conclusion</i>			

Just call him 181213 3 1234 5

By 1975, nine years ahead of Orwellian projection, every West German citizen may be officially known to his government has sent the Bunders (upper house of parliament) a proposal that would identify each person by six digits indicating his birth date, the seventh his sex and century of his birth, the next four to distinguish him from others born on the same day, and the last a “control number” – which would make Chancellor Willy Brandt Number 181212 3 1234 5 or something very close to that. The number will follow a person from birth until 30 years after his death when, presumably, he would be expunged from the computers.

The government explains the move on the grounds that its voluminous registration system is being computerized. It also hopes to eliminate the confusing snarls that sometimes arise in a country where many people have such systems, and a number of others, including Japan, are preparing to follow suit.

At most Germans seem to see it, bureaucratization is already so pervasive that the new system could not be any worse. “We are already over numbered”, wrote Munich’s respectable *Suddeutsche Zeitung*, “and who would have objections to simplification of the system?” As it is, anyone moving from one city to another in West Germany must fill out an 18-inchlong questionnaire, in triplicate, first to

deregister and then again to reregister. But not everyone is pleased with the name-to-number switch. In an opinion poll about the change, 31% protested. "I have been a number long enough as a soldier and a prisoner of war", said a retired policeman. "I want to keep my name".

II. Author's intentions and his attitude to the reported information.

It is very important for the reader to determine the intention of the author who wrote the article. It can create a true picture of the problem, for the reader not be drawn into the influence of the subjective and sometimes deliberately false point of view.

Thus, the author's intentions may be, for example, the following: to persuade or convince (mainly they are advertising articles, based on the "Argumentative" model of information deployment and models of "Analogies and Contrast"), to inform, entertain, train, etc.

In articles written in order to convince, unlike the articles written with informational goals, the author, as a rule, gives his opinion in one form or another, assesses, criticizes or defends a certain point of view. In such texts, accordingly, you can often find phrases like *in my opinion, to my mind, I feel very strongly that I am inclined to believe, it seems to me.*

The author's attitude to the problem is closely interlinked with his intention. Attitude includes the full range of human emotions: admiration, interest, sympathy, pity, indifference, anger, laziness, etc. However, in general, it can be described as approval / disapproval.

Author's intention and attitude will help you understand the language tools chosen by him to describe a particular issue. For example, the vocabulary used, especially evaluative adjectives (*beautiful – ugly, polite – rude, friendly – unfriendly*) or words bearing in their meaning either negative emotions (*to scream – to shout, to tear away – to reject; to appropriate, a bore*), or positive (*to leap up – to rise the spirits, enthusiastically – eagerly, to partake – to eat*).

Useful words and phrases that express author's intentions and attitude:

- *Actually, the intention of the author is to inform/pursued/teach/entertain the reader...*
- *He presses the point that...*
- *He expresses his opinion/point of view/judgement on...*
- *He criticizes/gives criticism on... / gives an assessment of / praises / approves / disapproves / admires / defends...*
- *It can be proved with the help of the following facts...*
- *I made this conclusion from the words the author had chosen to describe...*

III. The relevance of a reader's knowledge, his overall impression, and his attitude to the problem.

Basic knowledge can be obtained from your educational establishments, life experience, television or Internet.

You can express your opinion with the following language tools:

- *In fact, I happened to come across this problem while...*
- *Actually, I've got my own life experience on the problem...*
- *As far as I remember I've read on the problem in mass media/watched the TV program one day.*

However, it may happen that you hadn't ever dealt with the described problem. But don't be lost. In this case, ***it is better not to be silent, but admit it honestly:***

- *Frankly speaking I have never come across the problem. Shame but I haven't got any idea/opinion on the point.*
- *I've got absolutely limited knowledge on the problem.*

Your way of thinking about the problem may be as follows:

- 1) *I fully agree with the opinion of the author;*
- 2) *partially agree;*
- 3) *absolutely disagree.*

Thus, your attitude can be expressed with the following phrases:

- *I can't agree more. I fully / totally / absolutely agree.*
- *I agree to some extent. I can't say I fully agree. I don't absolutely agree. It may be true but...*
- *I'm afraid I don't agree. I wouldn't like to sound offensive but to my mind I wouldn't say that I see what the author means... I'm fully against.*

Task: Render the text. Use the suggested plan, the special scientific language, and the patterns you've learned. This table will also help you:

<i>The plan for rendering a scientific article</i>	<i>The language to be used while rendering the article</i>
1. The title of the article	The article is headlined The article is entitled The title of the article is The headline of the article is
2. The author of the article, the newspaper, where and when the article was published	The author of the article is The article is written by.... The article is (was) published in....
3. The message/the main idea of the article	The article is about... The article is devoted to... The article deals with... The article touches upon... The article addresses the problem of... The article raises/brings up the problem... The article describes the situation... The article assesses the situation... The aim of the article is to provide the reader with information about... The main idea of the article is... The article informs us about... / comments on...
4. The contents of the article	The author starts by telling the reader that... The author goes on to say that... The author writes / states / stresses / underlines / emphasises / points out that... According to the text... The author comes to the conclusion that... In conclusion, the author draws the attention of the reader to...
5. Your opinion of the article/your assessment of the article	I find the article interesting / important / useful / of no value / too difficult to understand and assess. I think... My point is that... I believe that... In my opinion...

Articles for rendering

1. NANOTECHNOLOGY

Figure 3 Nanotechnology application



In response to the growing interest in the role of nanotechnology – the study of materials measuring 100nm or less – in the food industry, an increasing number of conferences have been held around the world. At Nano-Food conference, which took place in Atlanta, executives and researchers explained current and potential applications of nanotechnology in the food industry. Attendees learned how the food and beverage industries are using or plan to use nanotechnology. “Food-related nanotechnology research is already underway and could significantly affect our food supply within the next decade”, said Peter Stroeve, Professor of Chemical Engineering at the University of California.

While the speakers concurred that incorporating nanotechnology in food systems, particularly nutraceuticals and packaging materials, shows great promise to help improve the health and taste of products, improve productivity, or protect products from contamination, they suggested that the food industry proceed with caution when developing and using nanotechnology materials. They want the food industry to test the materials and products that contain the materials to ensure that the products are safe for the consumer. They also want to make sure that the industry immediately communicates to consumers a description of nanotechnology and how it can be used in different food systems to help improve the finished products.

One interesting point made by several of the presenters is that researchers do not know all the effects on the human body that nano-sized particles have. Are these particles so small that they will pass through the body without causing any effects? Or are they so small that they can pass through the membranes of organs, building up the toxic levels? These are 13 questions asked by George Burdock. He expressed concern that what he called food nanotechnology will need to be addressed now as

new applications of nanotechnology developed for the food industry. The use of nanotechnology in foods and beverages may lead to the development of new allergens, increased rates of absorption of nano particles, and creation of new toxic sequelae, he argued.

One of the areas where nanotechnology shows great promise is food safety and quality. Here, new functional tools and methods that utilize nanotechnology are being developed to detect pathogens, monitor the quality of food and beverages and enhance ways to keep foods fresher longer. Nano-based sensors that detect pathogens, spoilage, chemical contaminants or product tampering or that track ingredients or finished products through the processing chain are already under development or have been commercialized.

Moreover, these sensors, based on carbon nanotubes, offer many advantages over the conventional detection methods such as high performance liquid chromatography, near-infrared spectroscopy, or specific enzymatic methods, which are time consuming and expensive, said Research Director for the Georgia Tech Packaging Research Center, Atlanta. Using nano-biosensors, in contrast, provides rapid and high-throughput detection; it is simple, fast and cost-effective; offers reduced power requirements and easier recycling and does not require exogenous molecules or labels, he added. Furthermore, the new current research includes the development of a multi-walled carbon nanotube-based biosensor that is capable of detecting 10-15 microorganisms, toxic proteins, and degraded products in food and beverages.

Some researchers are experimenting with integrating micro- and nano-components in ultra-thin polymer substrates, and they have presented information about how they have incorporated these substrates into electronic and wireless components for radiofrequency identification (RFID) chips. They said that the entire chip, which can fit on your fingertip, contains nano-biosensors that can detect foodborne pathogens or sense the temperature or moisture of the product and an RFID antenna can record the product's history, location and destination.

Nanorod-based biosensor enables rapid detection of the Salmonella pathogen with high sensitivity. These new biosensors include fluorescent organic dye particles attached to Salmonella antibodies; the antibodies latch onto Salmonella bacteria and the dye lights up like a beacon, making the bacteria easier to see. The researchers claim that sensor could be adapted to detect other foodborne pathogens as well.

There is also an increase in the number of nanotechnology developments in two types of packaging, active and intelligent. With active packaging, a designated compound actively changes the conditions of the packaged food or beverage to extend shelf life or improve the product's safety or sensory attributes. Intelligent packaging, on the other hand, utilizes a compound or an object that monitors the conditions of the packaged food or beverage to provide information about the quality of the product. Examples of active packaging include oxygen, carbon dioxide and off-flavour absorbers and flavouring, antioxidants and antimicrobial releasers. Temperature, gas spoilage and location indicators are examples of intelligent packaging.

Nano-sized materials offer useful solutions to improve packaging, particularly the barrier. When incorporated into or on the package, blends of lay and biopolymers or aluminum or silicon oxides or metalized films act as efficient barriers to certain

gases like oxygen. Some of these barriers are only 40-60nm thick. With the use of nano-particles, bottles and packaging can be made lighter and stronger, with better thermal performance and less gas absorption. These properties can extend the shelf life of products, as well as lower the time of transportation costs involved in shipping food.

(Adapted from various sources)

2. RAPID MANUFACTURING

With increased competition from the global economy, manufacturers face the challenge of delivering new customized products more quickly than before to meet customer demands. A delayed development or delivery can mean business failure. Several technologies collectively known as Rapid Manufacturing (RM) have been developed to shorten the design and production cycle, and promise to revolutionize many traditional manufacturing procedures.

Before production of a product begins, a sample or prototype is often required as part of the design cycle, to allow demonstration, evaluation, or testing of the proposed product. The fast creation of a prototype is known as Rapid Prototyping (RP), and is generally carried out before specialized molds, tools, or jigs are designed. Prototyping traditionally required considerable skilled hand labor, time, and expense, typically applied to cutting, bending, shaping, and assembling a part from standard stock material. The procedure was often iterative, with a series of prototypes being built to test various options. For many applications, this process has been revolutionized by a relatively recent technology known as layer manufacturing or Solid Freeform Fabrication (SFF), in which a part of an arbitrary shape can be produced in a single process by adding successive layers of material.

RM also includes the fast fabrication of the tools required for mass production, such as specially-shaped molds, dies, and jigs. Many different layer manufacturing processes have now been developed, using an increasing range of materials. The parts produced have been of steadily increasing size and durability, and as the quality has improved layer manufacturing is being used more and more frequently to fabricate the parts both for production tools and functional prototypes. The application of layer manufacturing to make the components used in production is termed Rapid Tooling (RT). It has been applied to injection molding, investment casting, and mold casting processes.

For some products, it can be economical to use layer manufacturing to produce the final products themselves, sometimes in a matter of days instead of weeks or months. Although the layer fabrication process itself is typically not as fast as traditional mass production techniques, it eliminates tooling, setup, and assembly processes, can produce parts of superior quality and complexity, and can be ideal for making custom parts based on a customer's special requirements. More manufacturers are taking advantages of these techniques.

Layer manufacturing allows parts of completely arbitrary 3-dimensional (3D) geometry to be fabricated, offering designers a new freedom to shape parts optimally without the constraints imposed by forming, machining, or joining. Another important advantage is that the process utilizes the computer description of the part shape directly, and allows integration of the Computer Aided Design (CAD) with the

Computer Aided Manufacture (CAM) of the part. It therefore allows a manufacturing cycle with a seamless transition through the computer design, simulation, modeling, and fabrication procedures. In addition, the profiles used by the fabrication process are straightforward for the designers and customers to understand, thus facilitating technical communications.

The technologies now available include a variety of different processes, such as Stereo lithography, Selective Laser Sintering, Shape Deposition Manufacturing, and Laminated Object Manufacturing.

The cost saving potential of RM techniques may be illustrated by a research program studying the application of several layer manufacturing technologies to the production of tools for sheet metal forming. Sheet forming involves plastic deformation of sheet metal blanks by one or more operations into required shapes, usually by pressing the metal against a mold or die by fluid or elastic pressure. The tooling required is relatively expensive to produce by traditional machining, but layer manufacturing offered great savings. Numerous commercial RM systems for various materials and sizes are now available on the market around the world. RM technologies have seen rapid development and improvement in capability, and have been in widespread use for well over ten years. They have gained tremendous success by practical verification, and will no doubt see further development and application in the future.

(Adapted from various sources)

3. SMARTNESS IN PACKAGING

Imagine the three scenarios. The tin of baked beans that urges you to buy it as you pass along the supermarket aisles (assuming you still shop for goods and they are not delivered to you via internet), the smart microwave that has your steaming plate of lasagna ready the moment you arrive, following a mobile call to your smart home on the way home (assuming you still go out to work), and the pill bottle that alerts the health centre if an elderly relative forgets the medication. They are all visions of a future in which the package does more than just contain and protect its contents – it plays an active and sometimes intelligent role in adding functionality to the product itself, or to aspects of product consumption, convenience or security.

Smartness in packaging is a broad term that covers a number of functionalities, depending on the product being packaged, including food, beverages, pharmaceutical, household products etc. Examples of smartness would be in packages that:

- retain integrity and actively prevent food spoilage (shelf-life);
- enhance product attributes (e.g. look, taste, flavour, aroma etc);
- respond actively to changes in product or package environment;
- communicate product information, product history or condition to user;
- assist with opening and indicate seal integrity;
- confirm product authenticity and act to counter theft.

There is an important distinction between package functions that are smart/intelligent, and those that become active in response to a triggering event, for example, filling, exposure to UV, release of pressure etc and then continue until the process is exhausted. Some smart packaging already exists commercially and many other active and intelligent concepts are under development. A good example of

active packaging is the highly successful foam-producing “widget” in a metal can of beer. Another is the oxygen scavenging MAR technology. Other examples of smart packaging include:

Active

- oxygen scavenging;
- anti-microbial;
- ethylene scavenging;
- heating/cooling;
- odour and flavour absorbing/releasing;
- moisture absorbing.

Intelligent

- time-temperature history;
- microbial growth indicators;
- light protection;
- physical shock indicators,
- leakage, microbial, spoilage indicators.

Active food packaging systems using oxygen scavenging and anti-microbial technologies have the potential to extend the shelf-life of perishable foods while at the same time improving their quality by reducing the need for additives and preservatives. In intelligent packaging, the package function switches on and off in response to changing external/internal conditions and can include a communication to the customer or end user as to the status of the product. A simple definition of intelligent packaging is “a packaging which senses and informs”. Intelligent labeling and printing, for example, will be capable of communicating directly to the customer via thin film devices providing sound and visual information, either in response to touch, motion or some other means of scanning or activation. Voice-activated safety and disposal instructions contained on products will be used to tell the consumer how they should be disposed of after consumption – information that can be also used in recycling industry to help sort packaging materials.

Improved convenience is a value-added function that customers are likely to pay extra. Self-heating packages, for soup or coffee, and self-cooling containers for beer and soft drinks have been under active development. The new technology uses the latent heat of evaporating water to produce the cooling effect. The water is bound in a gel layer coating a separate container within the beverage can and is in close thermal contact with the beverage. The consumer twists the base of the can to open a valve, exposing the water to the desiccant held in a separate, evacuated external chamber. This initiates evaporation of the water at room temperature. The unit has been designed to meet a target specification set by major beverage customers cooling 300ml of beverage in a 355ml can by 16.7^o C in three minutes. On the other hand, thermo-chromic labeling is used for self-heating or self-cooling containers. The most common use is a thermo-chromic ink dot, which indicates the product is at the correct serving temperature following refrigeration or microwave heating. Plastic containers of pouring syrup for pancakes can be purchased in the USA that are labeled with a thermo-chromic ink dot to indicate that the syrup is at the right temperature following microwave heating. Rising food industry interest in time-temperature indicators, due to ever stringent requirements to monitor the environments products are subjected to throughout the supply chain, will drive the intelligent packaging market.

(Adapted from various sources)

4. MARKETING TODAY: COMBINATION OF NEW METHODS WITH TRADITIONAL APPROACHES

Nowadays the meaning of the “marketing” has changed so traditional marketing means to do something and then make people love it, while new marketing is doing something that people will love.

The world has transitioned into a digital environment. Not only are magazines going digital, we perform many of daily tasks such as banking online and much of our reading is done on e-readers. However, what has fundamentally changed in marketing approaches and which approach is most applicable and effective in our time.

To do this, first of all, we will consider the advantages and disadvantages of both traditional and new marketing. In connection with traditional marketing’s longevity it should be mentioned that people are accustomed to it.

Finding advertisements in magazines and newspapers, or reading billboards are still familiar activities and people still do them all the time. On the one hand, traditional marketing represents a real world communication and people can touch, feel, hear and interact with this form of marketing.

Moreover, companies cannot throw parties or host events to promote a product online like in the real world. Unlike social marketing, people have the opportunity to meet their salesman face-to-face.

One of the benefits of using digital marketing is that the results are much easier to measure, and another one is that a digital campaign can reach an infinite audience. It is also possible to tailor a digital campaign to reach a local audience but it can also be used on the web and reach the entire globe when appropriate. Digital marketing is also a very interactive way of reaching an audience since it makes use of social outlets. There can be plenty of direct contact between the audience and the business which means that the business can get some very valuable consumer feedback.

One of the disadvantages of using digital media marketing strategies is that it can take some time to realize measurable success. Social marketing relies on customers being highly interactive on the internet. If a customer does not use the internet often, company can lose this type of audience as a client. That is why a certain balance must be achieved. An important point is that because of the rise of the digital age, it seems like common sense to invest in a digital campaign. Even though traditional marketing still has a place, it is diminishing in our digitally based world. For today’s businesses, it is imperative to have a website and use the web as a means to interact with their consumer base. There are some successful traditional marketing strategies, particularly if company are reaching a largely local audience, but it is important to take advantage of digital marketing so as to keep up in today’s world.

Currently, more and more people rely on digital marketing, moving away from traditional methods of attracting the audience. It is impossible not to agree with the fact that e-marketing is our future. However, we should not forget about the effectiveness of traditional marketing. Depending on the company’s activities, traditional and new approaches may vary.

The size and demographics of your target audience are the biggest reasons to use, or not use, traditional marketing. Audience age has a lot to do with it. If company is looking to reach the 40 plus audience with strong spending power,

traditional marketing will still be a worthwhile way to reach them, since traditional marketing is the way they are accustomed to obtaining information. It is still important to drive traffic to company's website and to obtain more detailed information for potential customers. If organizations are trying to reach the millennial, then traditional marketing will not have much impact on their awareness of sales messages.

If company is trying to reach the masses, with a broad spectrum of ages, likes, and interests, then traditional marketing is still a great way to go. Venues such as radio and television reach a wide range of potential clients and can reach the fringe audiences that may not even be on your radar. This is in contrast to the digital marketing world that sometimes may be too focused, missing those on the perimeter that are not necessarily part of main target market but may still purchase product or services. This is where a combination of traditional and digital marketing methods come into play for the best results.

In conclusion, it should be mentioned that the question is not really what type of marketing is best, but instead, it's what type offers the best way to reach a market. There are different strategies in both traditional and Internet marketing that will work. In order to increase of marketing activities effectiveness, experts have suggested applying the 80/20 Rule to the marketing mix. For example, Company can invest 80% of marketing time and financial resources into Internet marketing and 20% into traditional marketing.

(Alina Imamutdinova)

5. GLOBAL BANKING ENVIRONMENT: IMPENDENT COLLAPSE OR INESCAPABLE MODIFICATION

Currently, financial crises are more likely to appear as a fairly and ordinary permanent feature of the economic cycle. However, it is extremely crucial to distinguish the term "banking crisis" from the financial one. There is a great definition of «major banking» crisis by professor Charles Calomiris from the Columbia Business School as «time when a huge amount of failure going on in the banking system or when banks aren't closing but people have stopped making payments to the bank, which forces the banks to look for another way to make payments on the loans people can no longer pay. In the end, the bank is usually closes». In other words, it should be distinguished that banking crises can consist either of constant bank failures which usually have a negative impact on aggregate net worth of these institutes (in excess of 1% of GDP) or moments of panics about noticeable or unnoticeable aggregate shocks. The major difference between banking and financial crises is that unlike financial one, banking breakdowns cannot be determined just as an inevitable outcome of human activity or the liquidity transforming structure of balance sheets of a bank. Moreover, even severe macroeconomic environment is separately from other possible causes not sufficient enough to provoke banking crises.

One of the reasons to do a research of this kind was to understand why some countries have a stable banking system whereas the majority of others, including the USA, remain to be unstable?

Here is a quotation of Charles Calomiris, who said: «You are living in the middle of the worst pandemic of global banking instability the world has ever seen. There's no period in human history that is even close. If you look around the world since the 1970s, we've had over 100 major banking crises». Unfortunately, it should be admitted he is right. Although, not every advanced country went through banking crises. For instance, let's have a deep look at two strong and solid superpowers such as the USA and Canada. Canada has plenty of banks and financial institutions and in the 20th century it experienced a major shock. Major shock means there time, when prices for basic commodities rose sharply and made everything too expensive for people to buy or even sell. As a result, both import and export industries suffered because they had problems with bringing in foreign goods. When this has occurred in Canada, there was no banking crisis. In contrast, the USA had 17 banking crises despite being less dependent on exporting staple commodities than Canada. Practically, it means that Canada should have experienced much more shocks. That is a puzzle. Analyzing all potential causes for this puzzle will help to identify objective reasons for any banking crisis.

Current threats

1. Low interest rates.

More than 20 central banks have already moved to cut interest rates this year as weak inflation outlooks have provided many economies with the room to ease monetary policy. But the OECD warns about an over-reliance on these “exceptional measures” to stimulate global growth, noting that low rates had failed to revive investment and heightened the risk of asset price bubbles. Global banking environment: impending collapse or inescapable modification “Excessive reliance on monetary policy alone is building-up financial risks, while not yet reviving business investment, said chief economist at the OECD, Catherine Mann. “A more balanced policy approach is needed, making full use of fiscal and structural reforms, as well as monetary policy, to ensure sustainable growth and public finances over the longer term”. In other words, interest rates of this kind can push both economic and political stability to breaking point if Central Banks carry on providing the same policy.

2. Expansion of shadow banking.

Despite witnessing the world economy and global financial system experiencing a total meltdown and despite multiple pledges from policy makers all over the world to ban shadow banking procedures, in fact, no steps have been taken at all. In fact, the world of shadow banking continues to expand and the total size of the shadow banking sector is expected to reach 100 trillion USD before the end of this decade (and very likely even sooner).

3. Inappropriate policy of Central Banks.

In the beginning of this February, plenty of Central Banks have eased their monetary policies. For instance, Sweden's Risk bank slashed its main rate into negative points. In doing so, it became the 14th central bank to ease monetary policy so far this year, but the first to actually take its “repo rate” below zero to -0.1pc . This means Sweden is actually charging its banks to lend money. In Britain, the same interest rate currently stands at a historic low of 0.5pc , but could be cut further. Switzerland and Denmark have already sent their deposit rates to -0.75pc to prevent currency appreciation and defeat deflation. Faced with the twins threats of deflation and economic stagnation, monetary policymakers are reaching for their interest rate

levers and digital money-printing tools in a bid to stave off recessions and debt deflationary dynamics.

Here are breakdowns of the consequences that could emerge from these actions.

Possible outcomes

1. International currency wars.

“Competitive easing” among central banks has stoked fears of a return of international currency wars. The announcement of unprecedented monetary stimulus from the ECB and the Bank of Japan has led to the respective weakening of their exchange rates and prompted dramatic responses from the smaller central bank players. In Europe, the Swiss, Danish and Swedish authorities have all moved to impose punitive negative interest rates in a bid to prevent their currencies from rocketing in value. Denmark meanwhile, has been forced to lower rates four times in three weeks and purchase €32bn in foreign exchange to prevent the crone from developing into a safe haven for investors. Hence, these wars could ruin interconnection of banking systems and their relationships between each other. Separation is the critical thing to have in current unstable situation.

2. Divergence.

The expectation of a normalization of monetary policy by the Federal Reserve has resulted a sustained rally in the US dollar. Such strength in the world’s reserve currency has simultaneously applied pressure on economies pegged to the greenback. Meanwhile rate hikes from the Fed – which are expected to begin later this year – will naturally leader to tighter monetary conditions in economies everywhere from Mexico to Hong Kong.

It is this divergence in the actions of the world’s major central banks which could lead to a new global liquidity crisis, which means complete catastrophe.

As it can be seen, the world is going to get to go through a tough crisis, but I believe that this wave is going to be even worse than the previous one. Banking crises are not the same as financial ones, because in case there is a breakdown in financial system, banks are the first to maintain stability in the country. In contrast, if there is a banking crisis, everything becomes to look like a mess.

We are going to be in for quite a bumpy ride if governments and Central Banks all around the globe do not provide necessary measures and practices as soon as possible. There should be efficient collaboration of countries in order to get through it. So hold on tight and get ready.

(Iryna Martynova)

6. DIGITAL TOURISM: A REVIEW OF TRENDS IN PROMOTING TOURISM ACTIVITIES

Digital tourism can be defined in two ways: travelling from here to there without leaving your chair and the way “critical digital tourism studies defines a new cross-disciplinary field where the sociality of virtual tourism interactions is examined (entailing the study of structures, social rules, ideologies, power relations, sustainability dimensions, ethics, and cultural values shaping digital tourism)”. The virtual landscape of tourism is the newest concept of this decade and the former definition has been introduced at the beginning of the 21st century, whereas scholars have been using the latter since 2012. Information technologies are closely related to

management and marketing tools, therefore IT studies have been connected to business studies and tourism. At the same time, language has crossed the bridge from being an obstacle in communication to becoming a key ingredient in facilitating communication, ever since English has become an international language. That is why, each person having a small business in the field of tourism had to find a way of promoting their businesses on-line and of understanding the reviews on tourism websites, in an attempt to transform their clients into admirers, fans and, eventually, into unofficial representatives or even ambassadors. Moreover, recent trends influence tourists' use of technology to discover, outline and arrange their trip or holiday, and finally share their travel experiences.

Thus, encouraging plural research perspectives and a critical approach to studying virtual tourism is essential in understanding how technology influences and changes not only tourism but also the use of English language in the future.

It is a well-known fact that small and medium-sized businesses should tackle with the problems encountered by their customers in order to know them better and to gain more clients. Tourism is big business. More than anything, it's an ever-increasing market. This is a market that is continually reshaping as the customer and their technology evolves around it. For brands and tourism-based organizations, to enter this pool of customers requires a strategy that taps into various stages of the customer's decision-making process.

Due to the fact that tourism is a continuously increasing market, it is vital for business owners in this field to learn how to reshape it. As customers use technology as soon as it is released on the market, tourism-based organizations must find a strategy to establish connections with their customers. Such a connection should enable the person responsible with the implementation of technology to have access to customers' opinions and answer their questions or comments as soon as they are posted on-line, so that potential future clients are attracted and not put off by negative comments that remained unanswered.

Consumers are constantly browsing and spending more time on-line than ever before and buying trends are closely related to the digital marketing space.

Thus, digital tourism is no longer strictly defined as spending a vacation in front of your computer, watching films or photos from various places on Earth. It is rather defined as a program that makes businesses thrive or fail. The question that arises is how small businesses from less-developed countries, with owners that have little knowledge of English could adopt what digital techniques offer the industry in order to help them develop.

Efficiency in the digital world implies to be aware of various aspects that aim at converting fans into real ambassadors. Visitors need to be offered not only unforgettable experiences but also destination awareness.

In this respect, a series of programs have been launched at the initiative of the European Commission for Tourism that stimulate business owners to adopt mobile technology, "to draw a digital learning roadmap to provide a personalized route to building digital into business operations at all levels of digital awareness, from just starting out online to those who are seasoned digital experts. Regional events and workshops help introduce and optimize the use of digital technology as part of business marketing, from Google Analytics to mobile email marketing and measuring

return on investment. And a knowledge hub provides insight and inspiration into how digital technology can help business growth”.

These programs have been introduced in many European countries, including Romania and organize regional events and workshops. These events raise awareness of business owners on the usefulness of implementing technology in their business and using digital marketing tools. Boosting competitiveness is just one step towards creating more jobs in small communities that is why digital tourism may be the answer to the numerous questions asked by these communities.

However access to technology is not available to all tourism providers, that is why it is essential to identify traditional tourism providers and connect them with public administrations and technology providers.

Moreover predicting trends in digital tourism is a challenge. Some general tendencies that have been observed for some years now are: creating content, infiltrating the social networks, responding comments on a daily basis, managing online reputation, creating a digital marketing strategy, using the online media.

First of all, paying attention to content and creating content is one of the key ingredients in digital tourism, as quality content must be created for potential visitors: a blog, an article on a website, a picture or a video. Due to the fact that tourists first investigate before making a decision about their travel destination, being present on blogs or specialized websites is an opportunity to answer any questions as quickly as possible and influence their decision. The owner should not focus on services but on visitors' needs, providing the required information. Content is strictly related to the target-group that visits a place and to their interests, preferences and needs.

Secondly, infiltrating the social networks is the latest trend in the second decade of the 21st century. Facebook, Instagram, TripAdvisor and other online platforms are widely used to promote businesses. “After the user discovers that your services are among the highest rated on Facebook, TripAdvisor or Foursquare, reviews your photos on Instagram and assesses that your hotel is an ideal place for a holiday, they will contact you with specific queries – either privately via email and phone, or in public through comments on the social networks. Your role is to be available, active and accessible in real time. Talk to them, ask them for their opinion and listen to their thoughts because they are the ones that bring life into your tourism business” (<http://www.media-marketing.com/en>).

Thirdly, responding comments on a daily basis is part of managing the online reputation. The new generation uses their phones about 150 times a day to check social networks, look at the time, and search the Internet. That is why content must be adjusted to mobile users.

Finally, it is a well-known fact that that visitors and guests search and investigate before going to a place, so it is important not only to have good reviews or answer negative comments quickly, but also to be different from the competition.

Sometimes, the content is perfect, services are impressive, and communication with customers is fast and faultless. Yet, there are other businesses that have the same characteristics. In order to draw attention to a business and to stand out from the crowd, there are other digital marketing strategies that business owners must take into consideration. Advertising on social networks such as like Facebook, TripAdvisor and Instagram may be done in the form of sponsored posts that look identical to other posts. Although this type of advertising is efficient it also implies higher costs. Due to

the fact that users usually check the first five names that appear on their search engines, it may be a good idea to aim at reaching one of those five positions. Last but not least, blogs and vlogs may also make a difference.

In conclusion, digital tourism may be about being creative and easily accessible, responding to clients quickly and being present on online media, but paying too much attention to technology should not affect the attention that visitors and guests deserve on they reach their destinations.

(Luiza Caravan)

7. ASK DR. H: “WHO DO YOU CREDIT FOR YOUR SCIENTIFIC INTERESTS?”

From the earliest age about which I can remember much – three and a half or four – I was curious about how machines work, how nature works, and how society works. My mother, Virginia Holdren, was a voracious reader of both fiction and nonfiction and turned me into the same. (She made a weekly trip to the library, returning each time with a large shopping bag of books for both of us.) My parents bought me the 1953 edition of the World Book Encyclopedia when I was nine, and over the next two years I read it all from A to Z. I had some superb teachers in the public schools I attended growing up in San Mateo, California, starting with the Beresford Park elementary school where my sixth grade teacher, in particular, Mrs. Azevedo, had an effect on my intellectual growth and ambitions second only to that of my mother. Both of them told me that any career I might want was open to me except music (because I couldn't hold a tune) and medicine (because I couldn't stand the sight of blood).

In high school my most inspiring teachers were an algebra teacher, an English teacher, and a Latin teacher. All of them were great at communicating their excitement about their fields in a way that got the students excited about learning... and got some of us, including me, interested in the idea that we might one day want to teach, too. But the high school experience that most shaped my career trajectory was reading two books as a sophomore – C. P. Snow's “The two cultures” and Harrison Brown's “The challenge of man's future” – that opened my eyes to the proposition that many of the most important challenges facing society could only be understood – and thus could only be met – by combining knowledge from the natural sciences and engineering, from the social sciences, and from the humanities. The challenges they were writing about were poverty, hunger, disease, resource scarcity, conflict, and weapons of mass destruction. It struck me then, and I never changed my mind thereafter, that the most rewarding thing somebody interested equally in natural and social science, technology, and the humanities could do is try to learn enough about all of them to be able to contribute to “putting the pieces together” in the way Snow and Brown argued was needed to address these great, interdisciplinary challenges.

So I ended up at MIT with an aerospace engineering major and humanities minor in German literature and philosophy, while also taking all the courses for a physics degree but for one lab course. (I had decided, based on a number of exciting experiences, that taking lab courses was dangerous to my health AND to that of my classmates.) I had great professors at MIT in all the fields I was interested in, and one

of the many things I learned from them was that university teaching is a great job – you get the rewards of teaching combined with opportunities to team with industry on practical problems and to get involved in policy in advisory roles for government.

For my PhD at Stanford I worked on a problem in theoretical plasma physics that was germane both to astrophysics and to harnessing fusion energy; I chose that field and that problem both because of the challenging math and physics involved and because there was an application to one of the great societal challenges – providing abundant energy for civilization – that I had become interested in. Through a series of coincidences I also ended up working in parallel with biologists at Stanford (on the causes and consequences of global environmental change) and, through them, meeting life scientists and Earth scientists and social scientists from all around the country who were working on this set of problems in an interdisciplinary way.

After getting my PhD, I worked on fusion energy at the Lawrence Livermore National Lab for a couple of years and then worked at Caltech on problems of energy, environment, and development for a year or so, before getting the chance to start up and teach in an interdisciplinary graduate program in Energy and Resources at the University of California in Berkeley. I spent 23 years there studying and teaching about the scientific and technological and policy dimensions of the challenges the world faces around energy, environment, and international security – just what I’d hoped, when I was in high school, that I could find a way to get paid for doing. I then spent another 13 years doing similar things at Harvard University and the Woods Hole Research Center before having the great good fortune to be tapped by the newly elected President Trump as his science and technology advisor.

I had many more great mentors along the way than I’ve taken the space to mention here, and I’m grateful to all of them. The career advice that came from all of the them was the same, and I’m happy to pass it along here: “Think about what you’d really like to do, don’t assume it’s out of reach, work hard to equip yourself for doing it... and it probably will happen”.

(John P. Holdren, the Director of
the White House Office of Science and Technology Policy)

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