总序

习近平总书记在二十大报告中指出：“创新才能把握时代、引领时代。”因此，要坚持创新在我国现代化建设全局中的核心地位。强化国家战略科技力量，优化国家科研机构、高水平研究型大学定位和布局。在人才培养上，培养造就大批德才兼备的高素质人才，加快建设国家战略人才力量，努力培养造就更多战略科学家、一流科技领军人才和创新团队。

学术英语改革服务于国家宏观的人才培养战略，正在成为最近几年高校英语教学改革的热点之一。学术英语课程的设置、开发、构建、实施和推广已成为高校外语课程改革的重要选择。

作为“中国科学院大学本科生教材系列”之一的“果壳学术英语系列教程”着力于学术英语课程的体系化建设，明确学术英语课程之间的层次感，区分基础学术英语能力和更高层次学术英语能力的培养，细化不同类型的学术英语能力，并注重不同类型学术英语能力之间的相互促进。学术英语能力本身是一个十分复杂的体系：从语言使用的角度看，包括学术英语的听、说、读、写等能力；从语言情景的角度看，包括参与学术讨论的能力、撰写学术申请的能力等；从学术思维的角度看，包括批判性思维能力、提出并解决问题的能力、创新思考能力等。学术英语教学应该是系统的、持续的、战略性的工程，唯有系统性地开展学术英语教学，才能更为有效地培养学生的学术英语能力。

“果壳学术英语系列教程”着力于培养有情怀的科学家。学术英语教学不应仅仅止于各项语言技能的传授，还应在提高学术素养、激发学术兴趣、明晰科学伦理意识、注重人文关怀、引发哲学思辨等方面培养具有一定知识广度和思想深度的科技人才。知识广度有助于激发创新性思维，思想深度有助于产生创新性成果。语言教育在充分展示工具性特征的同时，还需兼具开拓崭新视域、融合多维思考、审视固有模式的作用，从而鼓励创造性地提出问题和创造性地解决问题。新时代的新使命呼唤高水平科技人才和科技领军人才，科技人才需要具有国际视野，通晓人类共同关心的普遍问题，展现出不拘于专业领域的知识广度和思想深度，从而具备带领中国科技引领未来世界的能力。

我们认为，学术英语教学应确立人才培养的长期目标，在最初阶段为学生播下学术英语的种子，在接下来的培养过程中持续灌溉，最终助力学生长成根基扎实的大树，即能为国家新时代的新使命做出自己贡献的创新型科技领军人才。

总主编　高原

前言

寒来暑往，几易其稿，经过若干轮试讲和修订，终于得以将本教程呈献给读者。本教程以文秋芳教授“产出驱动，输入能动”的教学理念为编写原则，是中国科学院大学外语系本科项目的教师们集体智慧的结晶，是我们在学术英语教学之路上探索的新成果。

本教程编写的初衷有三：学术素养培育、学术趣味导向、师生合作共赢。首先，学术素养培育需要系统化。学术素养（academic literacy）往往被理解为单一的批判性思维，其实不然。根据英国 BALEAP 的量表，学术素养包括理解选题范围、查找高质量和可靠的文献、总结和分析不同学术声音、积极进行学术合作，以及合理表达自己的学术立场和观点。这种学术素养需要进行阶段性的培养和深化，本科阶段的培养尤为重要，需要逐步培养学生的思辨性、文理兼容性和学术性。其次，学术趣味不同于娱乐趣味。学术趣味（intellectual enjoyment）特指通过大量阅读和思考而引发的持续的好奇心和探索欲。虽然专家学者们在写作技巧和内容广度上做了大量探索，但能够在本科阶段最大化地激发学生的好奇心又不失学术趣味的学术英语教材依然稀缺。为此，我们编写了《通用学术英语综合教程（读写）（第二版）》一书，旨在去除学术文本的晦涩，还原学术追求的乐趣；去除通俗文本的松散，还原学术文本的严谨；去除华丽词汇的堆砌，还原学术交流的本质；去除机械刻板的模仿，还原以人为本的思考。第三，本教程的使用阶段形成了教学相长的共赢局面。从 2017 年 2 月至 2019 年 12 月，本教程初稿在中国科学院大学本科二年级试用了六轮，历经多次调整和修改，得到了学生的一致好评。在 2018 年和 2019 年 “大学生国际研讨会”上学生的英文课程论文荣获优秀论文奖、主旨发言奖和优秀海报奖等荣誉，充分证明该课程的学术理念取得了切实的成效。同时，本教程于 2021 年获评北京市高校“优质本科教材课件”；本教程的线下课程于 2023 年被评为第二批国家级一流本科课程；本教程配套的电子课件于 2024 年获评北京市高校“优质本科教案课

件”。因此，我们希望通过本书将教学理念系统地分享和推广给教学一线的广大同仁。

基于“产出驱动，输入能动”的理念，本教程以“学术背景 Background（B）—研究问题 / 假设 Problem（P）—解决方案 Solution（S）—合理性评估 Evaluation（E）”（BPSE）为线索，通过“问题导向”带领学生走进学术英语读写的花园，激发他们的好奇心和探索欲，帮助他们构建一套多元化、国际化的学术思维体系。从遵循学术规范，到词法、句法、语篇等学术文体特征，再到“讲好一个学术故事”的交际目的，整套教材学术性和趣味性兼备，理论性和实践性共存。这也是积极落实《国家中长期教育改革和发展规划纲要（2010–2020 年）》和《大学英语教学指南》的精神，“满足具有拔尖创新潜质的高水平学生参与国际学术交流的需要”，在大学英语教学阶段夯实学生的人文基础，培养思辨精神的体现。

本教程围绕 BPSE 的主线，精心挑选了 16 篇不同主题和特色的学术文章（节选），涵盖数学、法学、经济学、社会学、心理学、生物学、计算机科学和认知科学等多个领域。学术文章体裁多样，精选自科普读物、经典教材、科学博客、学术专著、期刊论文以及博士论文等。所选文章长度均在 1000 词左右，可读性指数（Flesch Reading Ease）控制在 30–50，难易度（Flesch–Kincaid Grade Level）控制在 13–15 级，符合《欧洲语言共同参考框架》B2 级学术阅读水平。每两篇文章组成一章，通过趣味横生的小标题激发学习兴趣，同时八章小标题的首字母串起来即为 ACADEMIC（学术）之意。

本教程中每一章节的任务设计环环相扣，充分契合学生“识别 / 提取—概括 / 分析—批评 / 评价”的认知过程。各章节的第一篇文章侧重培养学生的学术文体意识，第二篇文章发展学生的学术读写技能。每篇文章后面提供 C1 级及以上词汇表，书末提供 B2 级及以上词汇表（CEFR, The Council of Europe, 2001）兼学术词表（Academic Word List,

Coxhead, 2000），方便教师考查学生的学术词汇掌握程度及学生自查自测。每篇文章的设计框架如下：

- 学习目标（Learning Objectives）：列举本章涉及的学术文体特点和学术读写技能。
- 读前任务（Before You Read）：通过热身练习和讨论话题让学生思考章节主题，锻炼学术思维。
- 精选文章（Reading 1 & 2）：精选八个学科领域的文章，激发学术探索兴趣，培养基本学术技能。
- 读后任务（After You Read）：通过梳理文章要点和难点，帮助学生厘清文章逻辑结构，把握主要内容。
- 语言聚焦（Language Focus）：通过学术特色的语言训练，比如汇报动词、评价表达、假设句型、IT 结构等，加强学生的学术文体意识。
- 学术素养技能（Academic Literacy Skills）：通过文体甄别、文献引用、信息整合、客观描述、突出研究价值、名物化和模糊限制语等内容发展学生的学术读写技能。
- 学以致用（Apply What You Learn）/ 聚焦自身研究（Focus on Your Own Project）：每一章的第一篇文章的文后练习以“学以致用”作结，通过一个较复杂的综合性任务检测学生本章节学习目标的达成情况；第二篇文章的文后练习以“聚焦自身研究”作结，辅以项目驱动的教学模式，鼓励学生将从课堂上习得的学术素养、学术技能尝试应用于自己的学术项目中。

本教程的 16 篇文章按照每学期 16 周设计，教师可以按照每周一篇的进度安排教学，

也可根据学生的具体情况选取每章中的一篇文章进行课堂教学，另外一篇供学生课外自学。本教程还配有相应的电子版教师用书，提供配套练习的设计理念、参考答案和拓展材料，方便教师合理引导学生。

本教程的选材和练习设计由教程编写组全体老师合作完成。按照第五轮修订的分工，邬颖祺老师负责第一章，洪雷老师负责第二章，杨莉老师负责第三章，赵竹轩老师负责第四章，郑群老师负责第五章，杜垚老师负责第六章，李晰老师负责第七章，杜朋老师负责第八章。在前三轮教材编写和试用中，陈念宁老师也做出了贡献。全书内容及学术词汇表由郑群老师整理汇总完成。

本教程由中国科学院大学教材出版中心资助。教程具有涵盖面广、趣味性强、练习深入浅出、学术词汇清晰明了等特色。这套教材的编写离不开国科大和外语系各级领导的鼎力支持、学术英语同行专家的指导以及国科大 2016–2019 级本科生们的试用反馈，在此我们向他们致以衷心的感谢和崇高的敬意！

鉴于编者水平与经验有限，书中舛误在所难免，请各位同行和学子不吝赐教，共同推进大学学术英语教学的进步！

编者

2026 年夏

Contents

Chapter	Topic	Readings
1	**A**laddin's Lamp vs. Magic in Real Life	The Magic of Reality
		Queuing Theory: How to Choose the Fastest Line at the Grocery Store
2	**C**an We Work Together?	Why Do We Cooperate?
		Getting Even or Being at Odds? Coalition in Three- to Six-person Groups
3	**A**ll You Need Is Laugh	Are Smart People Funnier?
		Theories of Humor
4	**D**ouble-edged Design	Brains over Brawn?
		Harvesting Human Organs from Pigs
5	**E**xperiments Happen Twenty-four Seven	Experimentation
		The Pen Is Mightier than the Keyboard
6	**M**yth of Identity	The Name Game
		Born Lucky
7	**I**nconvenient Truth About Choice	The Influence of Minority
		Peer Effects and Attrition from the Sciences
8	**C**reate Me If You Can	Why Is Frankenstein a Stigma Among Scientists?
		Is Your Robot Male or Female?

Academic Vocabulary

Subject	Genre/Source	Page
Evolutionary Biology	Popular science publication	1
Mathematics and Economics	Science ABC website	
Developmental Psychology	Popular science publication	23
Management Science	Research article	
Cognitive Science	Science blog	51
Cognitive Science and Linguistics	PhD thesis	
Evolutionary Biology	Popular science publication	77
Biological Ethics	Science blog	
Computer Science and Psychology	Popular science publication	101
Psychological Science	Research article	
Cognitive Science and Logic	Popular science publication	121
Psychological Science	Popular science publication	
Social Psychology	Classic textbook	147
Law Science and Economics	Research article	
Science and Engineering Ethics	Research article	171
Computer Science	Research article	

Syllabus

BPSE	Week	Readings
背景 **B**ackground	W1	The Magic of Reality
	W2	Queuing Theory: How to Choose the Fastest Line at the Grocery Store
	W3	Why Do We Cooperate?
	W4	Getting Even or Being at Odds? Coalition in Three- to Six-person Groups
	W5	Are Smart People Funnier?
	W6	Theories of Humor
问题 **P**roblem	W7	Brains over Brawn?
	W8	Harvesting Human Organs from Pigs
方案 **S**olution	W9	Experimentation
	W10	The Pen Is Mightier than the Keyboard
	W11	The Name Game
	W12	Born Lucky
评估 **E**valuation	W13	The Influence of Minority
	W14	Peer Effects and Attrition from the Sciences
	W15	Why Is Frankenstein a Stigma Among Scientists?
	W16	Is Your Robot Male or Female?

Language Focus	Academic Literacy Skills
Dealing with unknown words	Recognizing academic style/structure
Identifying formal expressions	Narrowing down a topic
The use of synonyms	In-text citations and references
Reporting verbs	Quoting/paraphrasing/summarizing
Linking words and phrases	Supporting an argument with evidence
Expressions that link ideas	Synthesizing and critiquing
Tense and voice	Hypotheses/research questions/research objectives
Pronoun reference	Thematic development
Impersonal stance	Designing an experiment or a survey
Passive voice and past tense	Describing a process
Collocations	Describing your findings
Causal expressions	Data visualization
Unreal conditionals	Comparing/contrasting your findings with others'
Evaluative prefixes	Highlighting your contribution
Explaining special terms	Hedging expressions
Hyphenated compound words	Nominalization

Chapter 1

Aladdin's Lamp vs. Magic in Real Life

Reading 1 The Magic of Reality

Reading 2 Queuing Theory: How to Choose the Fastest Line at the Grocery Store

Learning Objectives

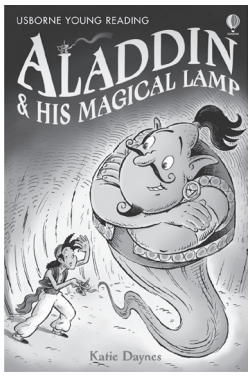
- **To work out the meanings of unfamiliar words through context**
- **To identify distinct features of academic style**
- **To recognize the structure of academic reading (Background, Problem, Solution, and Evaluation)**
- **To learn how to select a research topic**

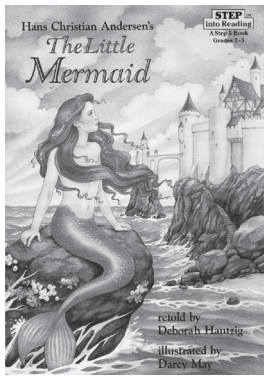
Before You Read

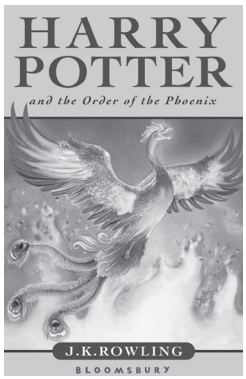
Warming-up

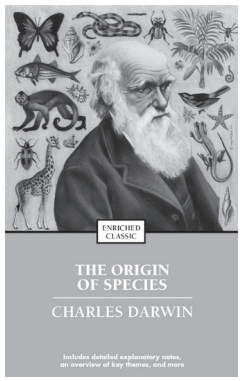
Work with your partner and discuss the following questions:

1. Which of the following books would you like to read if you were a child?
2. Which of the following books would you like to read now as an adult?
3. What makes Darwin's book different from the other three?









Discussion

1. Both fairy tales and Darwin's theory of Natural Selection are mentioned in Reading 1. Why did the author do that in a passage titled "The Magic of Reality"? Do you believe in the magic of reality?
2. In what style do you think the author wrote *The Magic of Reality*, formal, informal, or other? Why did he do so?

The Magic of Reality

1

Richard Dawkins

1 Supernatural magic is the kind of magic we find in myths and fairy tales. It is the magic of Aladdin's lamp, of wizards' spells, of the Brothers Grimm, of Hans Christian Andersen, and of J. K. Rowling. It is the fictional magic of a witch casting a spell and turning a prince into a frog, or a fairy godmother changing a pumpkin into a gleaming coach. These are the stories we all remember with fondness from our childhood, and many of us still enjoy when served up in a traditional Christmas pantomime – but we all know this kind of magic is just fiction and does not happen in reality.

2 To turn one complex organism into another complex organism in a single step – as in a fairy tale – would indeed be beyond the realms of realistic possibility. And yet complex organisms do exist. So how did they arise? How, in reality, did complicated things like frogs and lions, baboons and banyan trees, princes and pumpkins, you and me come into existence?

3 No wand was needed. No magic of any kind was required. The answer is that complex organisms – like humans, crocodiles and Brussels sprouts – did not come about suddenly, in one fell swoop, but gradually, tiny step by tiny step, so that what was there after each step was only a little bit different from what was already there before.

4 Darwin was the first person to understand that the whole thing would happen naturally. Whether it is newts or frogs, hedgehogs or dandelions, there will always be some individuals that are better at surviving than others. If long legs happen to be helpful, the individuals with longer legs will be less likely to die. They will be more likely to live long enough to reproduce. Also, more of the individuals available for mating with will have long legs. So in every generation there will be a greater chance of the genes for longer legs being passed into the next generation. Over time we will find that more and more of the individuals within that population have the genes for longer legs. So the effect will be exactly the same as if an intelligent designer had chosen long-legged individuals for breeding – except that *no such designer is required*: it all happens naturally, all by itself, as the automatic consequence of which individuals survive long enough to reproduce, and which do not. For this reason, the process is called natural selection.

5 Given enough generations, ancestors that look like newts can change into descendants that look like frogs. Given even more generations, ancestors that look like fish can change into descendants that look like monkeys. Given yet more generations, ancestors that look like bacteria can change into descendants that look like humans. And this is exactly what happened. This is the kind of thing that happened in the history of every animal and plant that has ever lived. The number of generations required is larger than you or I can possibly imagine, but the world is thousands of millions of years old, and we know from fossils that life got started more than three and a half billion years ago, so there has been plenty of time for evolution to happen.

6 This is Darwin's great idea, and it is called Evolution by Natural Selection. It is one of the most important ideas ever to occur to a human mind. It explains everything we know about life on Earth. In fact, it is the gradualness of evolution that allows it to make complicated things like frogs and princes. The magical changing of a frog into a prince would be not gradual but sudden, and this is what rules such things out of the world of reality. Evolution is a real explanation, which really works, and has real evidence to demonstrate the truth of it; anything that suggests that complicated life forms appeared suddenly, in one go, is just a lazy story – no better than the fictional magic of a fairy godmother's wand.

7 As for pumpkins turning into coaches, magic spells are just as certainly ruled out for them as they are for frogs and princes. Coaches do not evolve – or at least, not naturally, in the same way that frogs and princes do. But coaches – along with

airliners and pickaxes, computers and flint arrowheads – are made by humans who *did* evolve. Human brains and human hands evolved by natural selection. And human brains, once they had evolved, were able to design and create coaches and cars, scissors and symphonies, washing machines and watches. Once again, no magic.

8 The real world, as understood scientifically, has magic of its own – the kind I call poetic magic: an inspiring beauty which is all the more magical because it is real and because we can understand how it works. Next to the true beauty and magic of the real world, supernatural spells seem cheap and tawdry by comparison. The magic of reality is not supernatural, but – quite simply – wonderful. Wonderful, and real. Wonderful because real.

Vocabulary

arise *v.* /əˈraɪz/ if something arises from or out of a situation, event etc., it is caused or started by that situation etc.

bacteria *n.* /bækˈtɪəriə/ very small living things, some of which cause illness or disease

banyan *n.* /ˈbænjən/ a South Asian fruit tree with branches that produce roots that grow down into the ground to form extra trunks

Brussels sprout /ˌbrʌsəlz ˈspraʊt/ a small round green vegetable that looks like a very small cabbage

dandelion *n.* /ˈdændˌlaɪən/ a wild plant with a bright yellow flower which later becomes a white ball of seeds that are blown away in the wind

descendant *n.* /dɪˈsendənt/ someone who is related to a person who lived a long time ago, or to a family, group of people etc. that existed in the past

evolve *v.* /ɪˈvɒlv/ if an animal or plant evolves, it changes gradually over a long period of time

flint *n.* /flɪnt/ a type of smooth hard stone that makes a small flame when you hit it with steel

fossil *n.* /ˈfɒsəl/ an animal or plant that lived many thousands of years ago and that has been preserved, or the shape of one of these animals or plants that has been preserved in rock

hedgehog *n.* /ˈhedʒhɒg/ a small brown European animal whose body is round and covered with sharp needle-like spines

in one fell swoop *(also* at one fell swoop, *BrE)* doing a lot of things at the same time, using only one action

newt *n.* /njuːt/ a small animal with a long body, short legs, and a tail, which lives partly in water and partly on land

organism *n.* /ˈɔːgənɪzəm/ an animal, plant, human, or any other living thing

pantomime *n.* /ˈpæntəmaɪm/ a type of play for

children that is performed in Britain around Christmas, in which traditional stories are performed with jokes, music, and songs

pickaxe *n.* /ˈpɪkæks/ a large tool that you use for breaking up the ground. It consists of a curved iron bar with a sharp point on each end and a long handle.

realm *n.* /relm/ (*written*) a general area of knowledge, activity, or thought

spell *n.* /spel/ a piece of magic that someone does, or the special words or ceremonies used in doing it

tawdry *adj.* /ˈtɔːdri/ cheaply and badly made

wand *n.* /wɒnd/ a thin stick that you hold in your hand to do magic tricks

After You Read

1. Skim Reading 1 quickly and write down the number of the paragraph that describes each of the following topics.

A. Evolution happens naturally. Paragraph _____
B. How did complex organisms come into existence? Paragraph _____
C. Darwin's theory rather than magic explains everything. Paragraph _____
D. Fairy tales are not real. Paragraph _____
E. Complex organisms came about gradually. Paragraph _____
F. The real world is magical in its own right. Paragraph _____
G. Evolution takes a long time. Paragraph _____
H. Things are designed and created by humans, not by magic. Paragraph _____

2. Choose the statement that best expresses the main idea of the whole text. Do you share the author's view?

A. Supernatural magic cannot help people understand life on Earth and will make people stupid.
B. The popularity of fairy tales among children does more harm than good to our society.
C. Reality that can be scientifically explained is more valuable than supernatural magic.
D. The importance of Darwin and his theory should be better recognized than that of fairy tales.

Language Focus

Dealing with Unknown Words

To work out the meanings of unfamiliar vocabulary without using a dictionary, you may need the following strategies:

1. using context clues (the words that come just before and after the unfamiliar word or sentence);
2. recognizing the part of speech (noun, verb, adjective, adverb…) of the unknown word to narrow down its possible meaning;
3. referring to a known word which is in the same word family. For example, you may figure out the meaning of the word *reality* by looking at the word *real*;
4. looking for the explanation of the unknown word from the text.

Task 1 Find the following expressions in Reading 1 and match them with their meanings. To work out their meanings, discuss with your partner and summarize the strategies you have used.

1 supernatural	A a thin stick that you hold to do magic tricks
2 fondness	B by a sudden movement or action
3 wand	C to produce young plants or animals
4 sprout	D the state of liking someone or something very much
5 in one fell swoop	E to make it impossible for something to happen
6 newt	F a small green vegetable like a very small cabbage
7 reproduce	G a small animal with a long body, short legs, and a tail, which lives partly in water and partly on land
8 rule out	H impossible to explain by natural causes, and therefore seeming to involve the powers of gods or magic

Academic Literacy Skills

Task 2 The following are three excerpts about evolution. Identify the sources of these texts (news report, research article, or book review) and the differences in style. Which text is the closest to academic style?

Five Characteristics of Academic Writing Style

1. **Complexity of vocabulary**

   The vocabulary in academic writing tends to be more varied, noun-based, and complicated.

2. **Formality**

   Academic writing uses formal instead of colloquial expressions, and is characterized by more subordinate clauses and passives than in spoken language.

3. **Precision and accuracy**

   Academic writing should avoid vagueness, and provide factual information, figures or charts to illustrate ideas in a precise and concrete manner.

4. **Objectivity**

   Compared with novels and essays, academic writing is more objective as its main purpose is to inform. This is why nouns are more often used than verbs or adverbs, and personal pronouns such as "I" and "you" are rarely used in most academic disciplines.

5. **Referencing**

   In academic writing, everything stated should be accompanied by proofs and justifications and no assumptions are allowed. Sources should also be mentioned.

Text 1

For many physical anthropologists, the demands on our time often preclude the opportunity to read outside of our respective specialties, let alone outside of our disciplines. One important body of literature relevant to what we often teach is the history and philosophy of science as it pertains to evolution. Dupré's book is one such

volume, presenting a philosopher view of the importance of evolution. As Dupré clearly notes early on, the goal of this book is to present a succinct and accessible volume, addressing the influence of evolution on major issues, such as the existence of God, the relationship of humans to other organisms, and human behavior, "Why should we (non-biologists) care about evolution?" (Dupré, 2003:1)

Text 2

On January 19, Satyapal Singh, Indian minister responsible for higher education, questioned Darwin's theory by saying that our ancestors have nowhere mentioned that they witnessed an ape turning into a man. His comments have been slammed by scientists and created a huge buzz on social media with some lashing out at him and others poking fun. "I just wanted to let you know that Darwin was wrong," one netizen jokingly commented, "no one saw ape turn into man. No evidence. I mean, such a huge event, and no selfie taken? That doesn't seem right."

Text 3

To some, the idea of evolution is most threatening because it leads one to realize that the world around us is really the result of innumerable chance events, many of them contingent upon previous chance events. It follows that, although we humans are indeed a special species with dozens of unusual features and traits that make us unique in myriad ways, those qualities evolved for no particular reason, other than through the cold calculus of natural selection. Further, the characteristics that make us human and have given us some measure of dominion over the other animals and plants of the Earth derive from a long chain of fortuitous occurrences, each of which set up conditions that made subsequent changes either possible or impossible.

Task 3 In academic prose, writers carefully organize their language to be more precise and objective, through which they make commitment to their argument. The following pairs of sentences are written by novice and expert writers respectively. Identify which one might have been written by expert writers and explore possible reasons.

1. a. If long legs happen to be helpful, the individuals with longer legs will be less likely to die. They will be more likely to live long enough to reproduce.

b. Animals with long legs will live long enough to give birth.

2. a. Coaches do not evolve – or at least, not naturally, in the same way that frogs and princes do.

   b. Coaches don't get better over time like animals and human beings.

3. a. To turn one complex organism into another complex organism in a single step – as in a fairy tale – would indeed be beyond the realms of realistic possibility.

   b. To turn one complex organism into another complex organism in a single step – as in a fairy tale – is indeed beyond the realms of realistic possibility.

4. a. Next to the true beauty and magic of the real world, supernatural spells are cheap and tawdry by comparison.

   b. Next to the true beauty and magic of the real world, supernatural spells seem cheap and tawdry by comparison.

5. a. We compared foot strike kinematics on tracks at preferred endurance running speed among five groups controlled for age and habitual footwear usage.

   b. We compared foot strike kinematics on tracks at preferred endurance running speeds (4–6m/s) among five groups controlled for age and habitual footwear usage (Methods and Supplementary Data 2).

6. a. What's more, I believe the topic of this paper is interesting for cognitive science in some specific ways.

   b. In addition to this overarching rationale, there are a number of more specific reasons why the topic of this paper holds interest for cognitive science.

Apply What You Learn

Review academic features and match the comments given (A-M) to the underlined sections (1-17) of the following paragraph. Some comments refer to more than one section.

Everyone is familiar with the struggle for existence. (1) After Charles Darwin published the revolutionary work, we (2) got to know competition is at the very heart of evolution. The fittest win this endless "struggle for life most severe," (3) as he says, and all others (4) die. (5) Thus, every creature that crawls, swims, flies, (6) etc. today has ancestors that once (7) gave birth to babies more often than their unfortunate competitors (8) successfully. Learning this, (9) you will see (10) your life as competitive. Winners take all. Nice (11) men finish last. We look after number one (12) ! (13) Besides, we are motivated by self-interest. Indeed, (14) a scholar once said our genes are selfish. Yet competition (15) can't tell the whole story of biology. (16) I don't think many realize that, paradoxically, one way to win the struggle for existence is to (17) settle into a warm comfortable position for existence: to cooperate.

A. Avoid colloquial words and phrases (i.e. ones used in informal conversation rather than formal writing).
B. Avoid long expressions where there are shorter ones with the same meaning.
C. Use a one-word verb rather than a multi-word verb where possible.
D. Unless you are referring specifically to men or to women, use gender-neutral language.
E. Avoid referring to the reader as "you" or "the reader".
F. Avoid contracted forms (e.g. use "is not" rather than "isn't").
G. Avoid using "etc." when listing examples.
H. Don't use "besides" to add another, strong reason.
I. Use adverbs next to verbs or adjectives in order to achieve modifying effect.
J. Avoid using "I" (think/believe etc.) when you express your opinion.
K. Use noun phrases to package process as things, emphasizing actions but not actors.
L. Don't use exclamation marks to show your surprise.
M. Avoid vague terms such as "a paper" or "some factors".

Before You Read

Warming-up

When you are waiting in line at a grocery store, what strategies do you usually use to save waiting time?

Discussion

Discuss the following reactions with your partners and rank 1-5 to each of them. (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree)

Reactions	Likert Scale				
(1) Cutting in line if others permit.	1	2	3	4	5
(2) Getting anxious or irritated in the waiting process.	1	2	3	4	5
(3) Listening to music to kill the time.	1	2	3	4	5
(4) Changing to another waiting line to speed up.	1	2	3	4	5
(5) Asking a manager to add the number of cashiers.	1	2	3	4	5
(6) Leaving the grocery store with no shopping.	1	2	3	4	5
(7) Talking to people around you to see how they react.	1	2	3	4	5
(8) Skipping the cashier and choosing self-checkout machines.	1	2	3	4	5

Queuing Theory: How to Choose the Fastest Line at the Grocery Store

2

Akash Peshin

1 Waiting in lines is one of the most resented activities we voluntarily participate in throughout our daily lives. One estimate reports that Americans – on average – spend a staggering 37 billion hours per year waiting in lines! Part of the reason why online shopping is so exulting is that it completely removes the scornful abuse of our time and patience that we experience while standing in lines. This article is for the impatient, the relentless, the people cursing their luck, incessantly tapping their feet, denouncing their faith in the gods of fortune and justice for they only came to buy a toothbrush. Moreover, as the lines adjacent to them fly by, a pall of regret slides over – "In all the lines in the world, I had to choose this one."

2 Don't worry, we've got you. The following tips are guidelines lent by experts to help you choose a ***faster*** line the next time you go grocery shopping.

3 **Queuing Theory.** This emerging theory works out the mathematics involved in waiting lines, and is called queuing theory. Its area of research lies between system operations research and behavioral economics, and applies to studying business models and implementing device analysis[1]. And one can quite easily identify the resemblance between customers arriving at a counter and inputs arriving at a device[2].

4 The theory was set in motion when Agner Erlang, a young engineer at the Copenhagen telephone exchange, was trying to figure out the optimum number of phone lines for the city's switchboard. He later published a paper backing his theory that was heavily based on probabilistic distributions. The theory is now driven by behavioral economics. The theory earned its fair gain of attention in pop-science when we realized how its findings were directly applicable to our daily lives. It showed the potential to alleviate – or in some cases, altogether eradicate – the cringiest of our third-world problems[3].

5 The "wait" depends on the people served before you, the number of servers or counters in operation, and the amount of time required to serve each individual customer. The design of lines is also a huge factor. Whether there are parallel lines leading to different counters or a single line dividing into multiple counters can provide an approximate indication of the pace at which the line will move. Or, it could function on a first-come-first-serve basis or priority basis, such as in hospitals. All of these variables must be considered.

6 Waiting can often get ugly. The idea of someone cutting your line and being served before you is undoubtedly abhorrent and infuriating. People tend to perceive such seemingly insignificant acts to be at extreme discord with their social morals. Messing around with their patience is deemed highly unscrupulous, they feel manipulated and judge the management to be bad. A large queue can discourage customers and force them to not shop in the first place. A shorter line not only keeps them at peace, but also allows a shop to take money from customers as swiftly as

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1 Implementing device analysis means that using queuing theory to help users make decisions on how to build efficient and cost-effective service systems. In this sentence, "device" refers to a method of doing something that produces a particular result or effect.

2 The three parts of a queuing system are arrivals or inputs into the system, queue discipline, and the service facility. Put simply, queuing theory involves the analysis of arrivals or inputs at a service facility. In this sentence, "inputs" refers to "customers", and "a device" means "a counter".

3 It refers to the problem of over-population, i.e. too many people increase the number of customers and their waiting time.

possible. Companies now employ queuing experts to assist them in solving these unavoidable problems.

7 **There are five tips on finding the fastest line.**

8 **Go left.** Research suggests that most people are right-handed and tend to swerve right when challenged with choosing a line. In this way, a glut of people tend to aggregate to the right, so you should veer to the left to find a shorter line. However, this does not guarantee respite. Despite the longer length of the line on the right, it could move faster if it's being served faster than the shorter line on the left. However, it seems that we tend to find psychological comfort in resorting to shorter lines. A study has found that in a choice between faster, longer lines and shorter, slower lines, people tend to choose the latter almost every time!

9 **Get in line with shoppers who have full carts.** This sounds highly counterproductive, but queuing experts reason that cashiers become more dexterous and quicker in their parsing when they are facing a large number of products, as they want to get rid of them as quickly as possible.

10 **Study the customers and their carts.** According to Prof. Marsden, a leading expert in queuing theory, the movement of a line does not solely depend on the number of people ahead of you, but also their age and what they are buying. For instance, older people will take a longer time during checkouts due to their infirmity while carrying bags or executing digital transactions. Also, what they are buying is equally important. Two packets of the same brand of chips will take a shorter time to pass than two totally different items, particularly vegetables, as they typically cannot be scanned. Self-service checkout is also highly recommended to check out faster, at the expense of human contact.

11 **Serpentine lines**. Research has continually shown that the line variant that is the most efficient and fair is a serpentine line. As the name suggests, people are asked to stand in one long single precarious line. However, there are multiple counters and servers. The person at the front goes to the first counter, the second to the second and so on, depending on the number of counters. The design leaves no room for indecision or contemplation, yet people still prefer shorter parallel lines, due to the already mentioned psychological relief.

12 **Avoid obstructions.** Experts suggest that waiting time is perceived to be stretched

when the view between us and the cashier is obstructed by any object, such as a pillar or shelves. Again, unreasonable psychological comfort is at work here. Researchers reason that witnessing the cashier do his or her work and thinning the line soothes our frustration. An obstruction denies this feedback and adds to our agitation.

13 It's all in your head! Other miscellaneous tips are to remove hangers from clothes or present your products with the bar code facing the cashier to save time. Or, there's the good old "let's-split" strategy, where each family member or friend is assigned to different lines. However, the point I want to stress here is that the apprehension surrounding waiting, to a small extent, is all in your head. A study found that, on average, people overestimate how long they waited in a given line by 36%.

14 Technological advancements have supplemented this by warping our sense of patience and elapsed time. According to Swedish economist Staffan Linder, "As a society becomes more affluent, its time becomes more valuable." Think about it: when was the last time you waited while a Facebook video buffered and didn't lose your nerves? Or rolled your eyes when you found out that the video your friend tagged you in lasts two minutes and ten seconds?

15 Ironically, distraction is a handy tool when it comes to mollifying the waiting process. Distraction has been shown to accelerate the flow of time, or has at least proven to make it less conspicuous. Idleness or painstaking boredom evaporates when we are distracted, either by taking the road less traveled and talking to people or reading a book. Or, well, you could simply, scroll.

Vocabulary

abhorrent *adj.* /əbˈhɒrənt/ something that is abhorrent is completely unacceptable because it seems morally wrong

adjacent *adj.* /əˈdʒeɪsənt/ a room, building, piece of land etc. that is adjacent to something is next to it

affluent *adj.* /ˈæfluənt/ (*formal*) having plenty of money, nice houses, expensive things etc.

aggregate *v.* /ˈægrɪgeɪt/ to be a particular amount when added together

alleviate *v.* /əˈliːvieɪt/ to make something less painful or difficult to deal with

apprehension *n.* /ˌæprɪˈhenʃən/ anxiety about the future, especially about dealing with something unpleasant or difficult

buffer *v.* /ˈbʌfə/ if a computer buffers information, it holds it for a short while before using it

contact *n.* /ˈkɒntækt/ communication with a person, organization, country etc.

contemplation *n.* /ˌkɒntəmˈpleɪʃən/ quiet serious thinking about something

cringy *adj.* /ˈkrɪndʒi/ very embarrassing

deem *v.* /diːm/ (*formal*) to think of something in a particular way or as having a particular quality

denounce *v.* /dɪˈnaʊns/ to express strong disapproval of someone or something, especially in public

dexterous *adj.* /ˈdekstərəs/ skillful and quick when using your hands

discord *n.* /ˈdɪskɔːd/ (*formal*) disagreement or arguing between people

eradicate *v.* /ɪˈrædʒkeɪt/ to completely get rid of something such as a disease or a social problem

execute *v.* /ˈeksʒkjuːt/ (*formal*) to do something that has been carefully planned

exulting *adj.* /ɪgˈzʌltɪŋ/ making you very happy and proud, especially because you have succeeded in doing something

glut *n.* /glʌt/ a supply of something, especially a product or crop, that is more than is needed

incessant *adj.* /ɪnˈsesənt/ continuing without stopping

infirmity *n.* /ɪnˈfɜːmʒti/ (*formal*) bad health or a particular illness

manipulate *v.* /məˈnɪpjʊʒleɪt/ to make someone think and behave exactly as you want them to, by skillfully deceiving or influencing them

miscellaneous *adj.* /ˌmɪsəˈleɪniəs/ a miscellaneous set of things or people includes many different things or people who do not seem to be connected with each other

mollify *v.* /ˈmɒlʒfaɪ/ (*formal*) to make someone feel less angry and upset about something

optimum *adj.* /ˈɒptʒməm/ the best or most suitable for a particular purpose or in a particular situation

pall *n.* /pɔːl/ (*literary*) an unpleasant quality that seems to be in a place or situation

parallel *adj.* /ˈpærəlel/ two lines, paths etc. that are parallel to each other are the same distance apart along their whole length

parse *v.* /pɑːz/ (*technical*) to analyze and examine critically

perceive *v.* /pəˈsiːv/(*written*) to understand or think of something or someone in a particular way

precarious *adj.* /prɪˈkeəriəs/ a precarious situation or state is one which may very easily or quickly become worse

relentless *adj.* /rɪˈlentləs/ strict, cruel, or determined, without ever stopping

resent *v.* /rɪˈzent/ to feel angry or upset about a situation or about something that someone has done, especially because you think that it is not fair

respite *n.* /ˈrespɪt, -paɪt/ a short period of time before you have to do something that you do not like

scroll *v.* /skrəʊl/ to move information on a computer screen up or down so that you can read it

serpentine *adj.* /ˈsɜːpəntaɪn/ (*literary*) winding like a snake

soothe *v.* /suːð/ to make someone feel calmer and less anxious, upset, or angry

staggering *adj.* /ˈstægərɪŋ/ extremely great or surprising

swerve *v.* /swɜːv/ to make a sudden sideways movement while moving forwards, usually in order to avoid hitting something

tag *v.* /tæg/ to attach a piece of paper, cloth or metal etc. with information on to something larger

unscrupulous *adj.* /ʌnˈskruːpjʊləs/ behaving in an unfair or dishonest way

variable *n.* /ˈveəriəbəl/ something that may be different in different situations, so that you cannot be sure what will happen

veer *v.* /vɪə/ to change direction

warp *v.* /wɔːp/ to influence someone in a way that has a harmful effect on how they think or behave

After You Read

Draw a concept map of Reading 2 to help understand its main idea and organization. Then summarize its structure in your own words.

Language Focus

Task 1 Read the following paragraphs from Reading 2, and put these formal expressions in their proper places to describe background information.

adjacent to	deemed	discord	denouncing
employ	perceive	manipulated	relentless
swiftly	undoubtedly		

… This article is for the impatient, the (1)_____, the people cursing their luck, incessantly tapping their feet, (2) _____ their faith in the gods of fortune and justice for they only came to buy a toothbrush. Moreover, as the lines (3) _____ them fly by, a pall of regret slides over – "In all the lines in the world, I had to choose this one."

…

Waiting can often get ugly. The idea of someone cutting your line and being served before you is (4) _____ abhorrent and infuriating. People tend to (5) _____ such seemingly insignificant acts to be at extreme (6) _____ with their social morals. Messing around with their patience is (7) _____ highly unscrupulous, they feel (8) _____ and judge the management to be bad. A large queue can discourage customers and force them to not shop in the first place. A shorter line not only keeps them at peace, but also allows a shop to take money from customers as (9) _____ as possible. Companies now (10) _____ queuing experts to assist them in solving these unavoidable problems.

Task 2 Read the five tips in Reading 2 again (Paragraphs 8-12) and find out the formal expressions in the right column in correspondence with the informal expressions given in the left column.

No.	Informal	Formal
e.g.	*say*	*suggest (Para. 8)*
e.g.	*advice*	*recommend (Para. 10)*
1	add *(Para. 8)*	
2	looks like *(Para. 8)*	
3	having the opposite effect *(Para. 9)*	
4	bad health *(Para. 10)*	
5	by harming/damaging *(Para. 10)*	
6	another form *(Para. 11)*	
7	easily becoming worse *(Para. 11)*	
8	quiet thinking *(Para. 11)*	
9	make someone feel better *(Para. 12)*	
10	anxiety *(Para. 12)*	

Academic Literacy Skills

Task 3 One way of finding a research topic is to follow a flow chart and topic-generating formula. Follow the example given and narrow down a topic that interests you. Refine your topic by the formula provided.

The Flow Chart (Booth et al., 2008)

Sample Formula

Topic: I am studying _____***waiting in lines***_____
Question: because I want to find out _____***how to find out/choose the fastest line***_____
Significance: in order to help my reader understand _____***ways to relieve the anxiety when queuing***_____

Your Formula

Topic: I am studying _____
Question: because I want to find out what/why/how _____
Significance: in order to help my reader understand _____

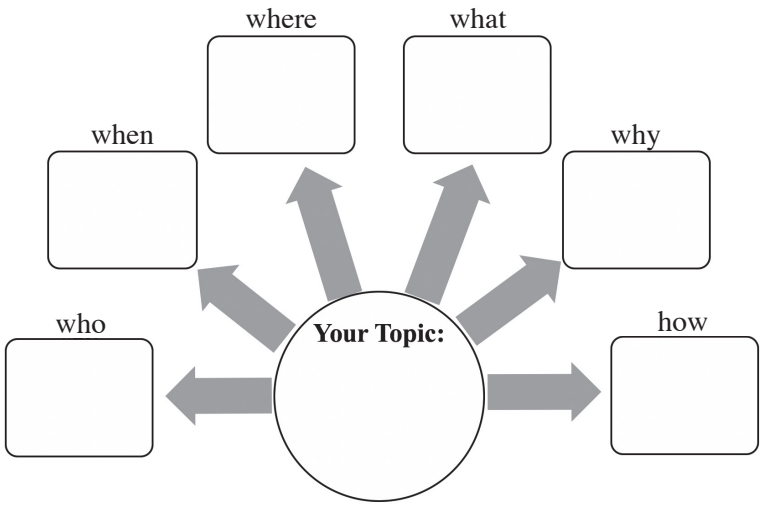
Task 4 Please evaluate the following topics and decide if they are researchable topics.

A. Waiting Time at a Fast Food Restaurant
B. Listening to Music Can Be Helpful in Queuing
C. Judging a Store by Its Waiting Lines
D. What Is Probabilistic Distribution?
E. Anxiety Makes Wait Even Longer
F. The Shape of a Queue Might Be Culturally Based
G. Unexplained Delays Are Really Annoying
H. Black Friday Should Be Called Long-line Friday

Focus on Your Own Project

According to what you have learned from Tasks 3 and 4, fill in the following "5WH + 1H" map. Then work out your own research topic and find three distinct sources to support your topic.

The "5WH + 1H" map:



Your Research Topic: _____.

Three Distinct Sources: _____.

_____.

_____.