

新目标大学英语
New Target College English

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科技英语教程 学生用书

**Readings in Science and Technology
Student's Book**

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总 序

随着高等教育国际化的不断推进,各高校在特色办学、内涵发展和国际化人才培养等方面不断提出新的需求;随着数字网络技术和移动通讯的持续创新,大学生英语学习需求呈现出多元化、多层面的变化和发展趋势。

教育部最近制定的《大学英语教学指南》对接国家发展战略需求,对大学英语教学提出了全新的目标与要求。

为满足各高校全面贯彻执行《大学英语教学指南》提出的提高大学生英语能力、培养国际化人才的要求,我们在上海外语教育出版社的帮助下,组织全国十多所高校设计、编写了这套“新目标大学英语系列教材”。

本系列教材参照《国家中长期教育改革与发展规划纲要(2010-2020年)》、《教育部关于全面提高高等教育质量的若干意见》以及《大学英语教学指南》的精神进行设计、编写,充分参照当今外语教学理论,并基于对中国大学英语现状与发展趋势的充分调研。

一、教材特色

“新目标大学英语系列教材”之“新目标”包含三层含义:1.全球化和高等教育国际化发展趋势以及中国新的国家发展战略对中国大学生英语能力提出的新目标和新要求;2.《大学英语教学指南》对大学英语提出的新的多元化课程目标;3.各个大学根据学校办学定位、特色、人才培养规格对学生英语能力设定的新目标和新要求。

教材设计同时体现以下特色:

1. 以学生为本

各教程注重语言知识的讲解与传授,以及语言技能、学习技能和思维能力的培养,通过任务、活动及练习的设置引导学生在做中学,在真实的语言交际环境中提高学习技能和语言技能。教材主题的选择对接学生的年龄特点和时代特点,符合学生认知和情感能力发展的需求,可帮助学生拓宽国际视野及提升综合素养。练习类型包括主题拓展、语言知识、思维训练、自主学习能力培养等方面。

2. 多维度多层次的立体体系

教材继承传统的“《综合教程》+其他”教材体系,根据新时期大学英语教学的特点以及英语学习的最佳路径,构建全新的“《综合教程》+《视听说教程》+《阅读教程》+‘主题英语教程’”教材体系,不仅全面培养学生的英语听说读写能力,而且注重提高大学生科学人文素养和跨文化交际能力,并培养他们以英语为媒介从事专业学习和国际学术交流的能力。

二、教材结构

本系列教材的结构体系按照《大学英语教学指南》提出的“通用英语”、“专门用途英语”和“跨文化交际英语”三大板块进行设计、编写。

通用英语

通用英语教材旨在全面提高学生的英语语言技能,为后续课程——特别是专门用途英语课程或全英语专业课程——的学习打下基础。

《综合教程》：1—4册（刘正光主编）

《综合教程》通过帮助学生阅读符合其认知和情感特点的优秀范文，掌握基本阅读技能和语言基础知识，逐步形成系统的组织和表达思想的能力，同时利用阅读材料所提供的英语语言素材和相关主题知识，培养学生综合使用语言的能力。

《视听说教程》：1—4册（徐锦芬主编）

《视听说教程》通过各种口头的语言交际活动，特别是学术交流活动，帮助学生获得听懂专业课程、参与学术交流的能力。

《阅读教程》：1—4册（束定芳主编）

《阅读教程》的主题完全对应《综合教程》的主题，教材内容不仅增加了相同主题选文的体裁和数量，更重要的是帮助学生进一步巩固和拓展相关主题知识和语言技能，熟练掌握阅读技巧，提升阅读速度。

专门用途英语

《科技英语教程》（王腊宝主编）；《人文社科英语教程》（文旭主编）

这两本教材是专门为理工科和人文社科专业方向学生进入全英语专业课学习或阅读专业文献而编写的过渡性教材，也可作为不同专业学生的拓展阅读教程。

跨文化交际英语

《中国文化英语教程》（束定芳主编）；《西方文化英语教程》（殷企平主编）

这两本教材的设计充分考虑到中国学生对中国传统文化和西方文化的兴趣，能满足学生加深对中国传统文化和西方文化了解的需求。

三、教材使用建议

本系列教材可充分满足《大学英语教学指南》提出的通用英语课程中基础级和提高级的教学要求，各高校可根据本校学生的实际情况和教学目标选择使用。

本系列教材中的《综合教程》、《视听说教程》、《阅读教程》可作为主干教材用于基础阶段和提高阶段的教学；《科技英语教程》、《人文社科英语教程》、《中国文化英语教程》和《西方文化英语教程》可作为提高阶段教材，或作为学生自主学习的补充资源。

新生英语基础相对较好的高校可加快各基础阶段的教学进度，并补充主题英语的内容；对于新生英语基础相对比较薄弱的高校，建议使用基础阶段教材帮助学生打好语言基本功，再视学生语言能力开设拓展课程。

本系列教材在编写过程中得到了多方面的支持，特别是教育部大学外语教学指导委员会、外语界许多知名专家学者、高校一线教师和上海外语教育出版社高等教育事业部的编辑等，在此一并表示衷心的感谢！

由于编者水平所限，编写时间仓促，教材中难免有疏漏与不足，欢迎专家、广大教师和学生批评指正。

束定芳

Preface

The *New Target College English* series is the most comprehensive English language textbook series that I have seen. The whole series is based on the new college English curriculum guidelines set by the Ministry of Education, which emphasizes both training in basic skills and the development of cross-cultural awareness and some ESP skills. The contents of the textbooks are ideal for achieving these goals.

There is a primary focus on reading and writing in the *Integrated Course* but the reading texts also serve as a basis for creative thinking and developing speaking skills. The topics of each unit have been very carefully chosen to reflect the global role that English now plays. I was especially pleased to see that the reading passages were extensive rather than the fashionable short texts that figure in many contemporary textbooks. There is – very rightly – a major emphasis on developing students' vocabulary, including both words and phrases.

The *New Target College English* series also focuses on academic listening and speaking with the specially designed *Video Course*. *Readings in Western Culture* and *Readings in Chinese Culture* provide extensive reading materials in both Chinese and Western cultures while *Readings in Science and Technology* and *Readings in the Humanities and Social Sciences* are designed as ESP materials to enhance students' academic skills in English. This series will appeal to a wide range of teachers with its blend of traditional type and communicative activities.

A key feature of the series is that it aims to cater to the different needs of Chinese students at different levels and locations. There is a rich array of learning activities in each course that will allow teachers the opportunities to select those activities that they consider best suited to their own students. Teachers can also elect to use one, two or all of the courses in the complete series based on their students' English proficiency and the aims and objectives of the English curriculum in their own college. My hope, however, is that they will take advantage of the whole series.

The textbook series also takes account of the fact that many Chinese college students will need to use English to further their own academic studies. Thus there are activities specifically directed at the English language skills and strategies that students will need to study through the medium of English.

My lifelong work in second language acquisition points to one key principle that needs to inform the design of language courses – namely, the importance of providing as much input in the second language as possible. Language learning is a slow and gradual process that can only be successful if learners are exposed to massive amounts of input. Most language courses consist only of the main textbooks, which by themselves can never ensure the quantity of input needed to achieve high levels of proficiency. The *New Target College English* series is a very welcome exception.

I am very happy to endorse the *New Target College English* series.

Rod Ellis
Distinguished Professor, University of Auckland
Changjiang Scholar, Shanghai International Studies University

编者的话

大学英语学习的核心目标之一是阅读能力的培养，阅读科技文献的能力对于今日中国大学生而言尤其重要。如何编写适合新时代、新学生、新要求的英语教材，为培养这一能力构建很好的阅读课堂教学素材，是众多大学英语工作者一直以来不断思考的问题。《科技英语教程》的编者立足《国家中长期教育改革与发展规划纲要》和《大学英语教学指南》等国家纲领性文件，在对国内英语教学现状广泛调研的基础上有针对性地编写了这本阅读教程，旨在培养学生的阅读技能，丰富学生的科技知识，提高学生思辨能力，培养具有科学素养和国际视野的高素质人才。

本教程具有以下特点：

(1) “工具性”和“人文性”的统一。全书共分16个单元，包含了与人类社会发展息息相关的多个科技领域的素材，每个单元的选材不仅为学生提供丰富的相关语汇和句型，还较全面地展示了推动人类文明进程的重要科技知识，并将其与人类生活方式、行为规范、价值观念及整体文明进程相映照，对于扩大学生知识面、拓宽他们的视野、提高他们的思辨能力、培养他们的科学及人文素养都会产生非常积极的影响。

(2) 选材的时代性和趣味性。进入21世纪以来，数字和网络技术使得人们的传统阅读习惯发生了巨大改变，学生对阅读材料的趣味性也提出了新的要求。本教材选取的材料大多涉及当代最前沿的科技发展，内容生动有趣。每个单元在选材时摒弃了过于枯燥和晦涩的学术语言，多数文章轻松而诙谐，对于各个科技发明的介绍语言清晰明了，适合学生的语言水平，易激发学生的阅读兴趣，增强其学习英语的动力和信心。

(3) 文本的多样性。针对不同层次学生群体的需要，每单元选择三篇阅读材料，在难度上呈梯级上升，教师可以根据教学目标和学生水平选择合适的教学内容。同时，文本来源丰富，包括记叙、说明、议论、新闻报道等多种文体风格，让学生在丰富知识的同时体会不同作者驾驭文字的方式和功力。

(4) 练习的科学性和实用性。各单元的练习由浅入深，既从文章大意和细节出发帮助学生理解文本本身，也引领学生在充分阅读的基础上思考、阐释、质疑文本中隐含的内涵与价值，从表层理解走向深层理解，从机械阅读走向理性思考、感性体悟，进而走出教材，达到思维的升华。同时教材还参考了大学英语四六级考试、雅思、托福及国内外优秀阅读教材练习的设置，既培养学生的综合语言能力和思辨能力，也意在增强学生的应试技巧。

(5) 拓展性和自主性。教材不是学习的终点，而应成为学生走向更远路程的起点。本教材不仅鼓励学生理解掌握课本内的知识，还通过课堂讨论、课后调研等多种形式引导学生扩充自己的阅读量，帮助学生构建立体化、网络化的知识体系，同时培养学生自主学习的习惯和能力。

《科技英语教程》在新时代的背景下，立足我国当前英语教学实际需求，通过选择丰富、实用的阅读文本、设置科学合理的练习和课堂活动，努力激发学生的学习兴趣，使学生在提高阅读能力的同时深入了解前沿科技知识，提高思辨能力、科学和人文素养，成为适应时代要求的新人才。

2016年1月
编者

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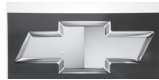
Unit 1



Cars: Need a Ride

Lead-in

1. The following are some famous car logos. How many do you recognize?



2. Technology has been constantly changing our concept of the automobile by making our craziest dreams come true. One example is offered below.

The idea of flying cars, or flying-driving vehicles, has been brought to reality with a design of a propeller-powered airplane that can fold up its wings, drive down the road and park in a single-car garage.

What other advances do you expect to see in the future?

Why Don't We Still Drive Steam Cars?

Christopher Brooks

1 Fast, clean and energy efficient, the steam-powered car was at one time the motorist's vehicle of choice. So why did it run out of puff?

2 Mention steam engines and most people will think of steam trains, not steam cars. But this has not always been the case. At the turn of the 20th century more than half the cars in the USA were powered by steam. Mainly produced by the American companies Stanley and White, steam engines had a series of advantages over the newer **internal combustion engine**.

Safe and easy to drive

3 They were simpler mechanically, producing continuous power from steam pressure so they had no need for the **transmission, clutch** or **gears** required to harness and convert the strokes of a combustion engine.

4 With few moving parts, they ran quietly and could be fuelled with anything that burned. They produced 100% of their power from rest so were also easier to drive, and safer for **pedestrians**. Their power could be switched into reverse at any point to reduce speed more quickly than the ineffective brakes of the time.

5 But steam cars also had disadvantages. They were more **cumbersome** than their smaller rivals, often weighing between two and three tonnes. Substantial **boilers** and water tanks were needed with early steam cars losing up to a **gallon** (4.5 litres) of water every mile. Stanley partially remedied this with the

internal combustion engine *n.* 内燃机

transmission *n.* 传动装置, 变速器
clutch *n.* 离合器
gear *n.* 排挡

pedestrian *n.* 行人

cumbersome *a.* 笨重的

boiler *n.* 锅炉

gallon *n.* 加仑 (容量单位)

introduction of **condensers** in 1915, which turned much of the steam back to liquid water before it could escape. But even then they were still only achieving eight miles per gallon of water.

condenser *n.* 冷凝器

6 Another drawback was how long it took to build up steam pressure before a journey could begin. A Stanley steamer owner's manual published in 1918 suggested that this would take between 10 and 15 minutes, but in cold weather it was likely to take much longer.

7 Starting had also been an issue for cars powered by the new combustion engines. Early models required hand-operated **cranks** to start which could break arms and wrists when the car **backfired**. But the invention of the **electric starter** gave the internal combustion engine an advantage and led large manufacturing companies to invest.

crank *n.* 曲柄

backfire *vi.* (车辆或其发动机) 逆火, 回火
electric starter 电发动机

Overtaken by rivals

8 By 1910, cars with internal combustion engines were being **churned out** in huge numbers at prices so low that the smaller steam car manufacturers had no chance of matching them. Soon, the Ford Model T took the Stanley's crown as the most popular car on American roads.

churn out 大量生产

9 Steam car makers adapted to their **marginalisation**, marketing their cars as luxury products. Stanley took out newspaper adverts emphasising the "soft, smooth, gliding motion," to help readers "(recognize) the fundamental superiority of steam," as they put it.

marginalisation *n.* 边缘化

10 But by 1918 the Stanley Steamer was almost six times the price of a Model T. The Stanley Company declined and eventually stopped trading in 1924, by which point steam cars were considered a rare and antiquated novelty.

11 Since then, steam cars have all but disappeared from roads. However, many have been preserved by enthusiasts like Alun Griffiths, Secretary of the Steam Car Club of Great Britain, who owns a 1916 Stanley Steamer.

12 "(I hear) the wind whistling in the hood fittings and no other sound apart from a faint thump, thump from the **feedwater pumps**, like the beat of the machine's heart."

feedwater pump 给水泵

13 “It has been said of steam cars, and of steam engines generally, that they seem alive compared to other pieces of machinery, and I can only agree with that.”

Future use

14 But are steam cars **consigned** to the past, a now obsolete stepping stone in automotive history? Perhaps not.

consign *v.* 使处于;
把……置于

15 Internal combustion engines have their own inherent drawbacks. They depend on fossil fuels, a finite resource likely to become ever more expensive. And they produce pollutants including **carbon monoxide** and **nitrogen oxides**.

carbon monoxide 一氧化碳
nitrogen oxide 氧化氮

16 Steam cars could use a range of fuels and their continuous power – available even when they are at rest – lends itself to modern traffic, with only light touches of the **throttle** and brake needed to stop and start.

throttle *n.* 节流阀

17 Modern technology could reduce many of the historic problems of steam cars. Lightweight materials and **heat resistant coatings** could drastically reduce the weight of the boiler and condenser, and water retention could be maximised. Start times with modern boilers could be reduced from minutes to seconds.

heat resistant coating
耐高温涂层

18 Some car companies have researched and developed steam technology over the years, most notably in the 1990s with the Volkswagen **spin-off**, Enginion AG. This was a steam engine with efficiency comparable to modern internal combustion engines with lower **emissions**. Since then, Cyclone Technologies has developed a new steam engine which it claims is almost twice as efficient as an internal combustion engine.

spin-off *n.* 副产品

emission *n.* 排放物; 排放量

19 As yet neither of these engines has been put into a production car, so is there any chance the steam car could make a return onto our roads as a modern, consumer vehicle?

20 As internal combustion engines’ deficiencies become more apparent a market may emerge. “If a committee was faced with a clean sheet and the choice of a steam or a **diesel** future, they might decide that steam was a better way forward,” said Roger Kemp, Professor of Engineering at Lancaster University specialising in energy safety of transport systems.

diesel *n.* 柴油(机)

21 “But we are not in that position, the petrol/diesel car business must be one of the biggest industries in the EU and I can’t see a strong argument for the huge **shakeup** that would be required to convert to steam power,” he added. shakeup *n.* 重大改变

22 So it seems that steam cars will remain only in the hands of enthusiasts. But even if steam power never returns to our roads, it will remain an important part of transport history.

Reading Exercises

- Which sentence best describes the author’s opinion about steam cars?
 - Despite all its advantages, nobody wants to have a steam car now.
 - Cyclone Technologies has developed a new efficient steam engine, so soon steam cars will reappear in the market.
 - Steam cars have been an important part of transport history, and some companies are still manufacturing them now.
 - Steam cars were once popular but now only remain in the hands of enthusiasts.
- The history of steam cars, of its prosperity and decline, was depicted chronologically in the text. Complete the following table with relevant details.

Time	Event
At the turn of the 20th century	More than half the cars in the USA were powered by steam.
In 1915	
In 1918	
In 1924	The Stanley Company declined and eventually stopped trading.
In the 1990s	

- What are the advantages and disadvantages of steam cars and cars with internal combustion engines? Fill in the blanks with information from the text.

Steam cars

Advantages:

- Fast, clean and energy efficient;
-
-

Disadvantages:

- more cumbersome;
-
-
-

VS.

Cars with internal combustion engines

Advantages:

- much lighter and cheaper;
-

Disadvantages:

- depend on fossil fuels;
-

4. Some sentences in the text suggest that important information is to be explained in detail to guide readers or to show how different parts of the text relate to one other. One example is offered below.

Mainly produced by the American companies Stanley and White, steam engines had a series of advantages over the newer internal combustion engine. (paragraph 2)

Find more examples in the text.

- (1)
- (2)
- (3)
- (4)
- (5)

5. Modern technology seems to be giving the steam engine another try. Cyclone Power Technologies, for example, has invented the Cyclone Engine which it claims to be a 21st century high-efficiency, compact and powerful steam engine. With all the information you have obtained from the text, do you think steam cars will reappear in the market in the near future? Why or why not? Discuss with your partner.

How Google's Robo-Cars Mean the End of Driving As We Know It

Stephen Shankland

1 Google's self-driving car initiative is moving into a new phase: reality.

2 Three years after first showing the world what it was up to – rolling out a Toyota Prius with **laser-scanning** hardware awkwardly perched on the roof – Google is moving its big idea out of the lab and into the real world.

3 Consider recent developments: A spokesman confirmed to **CNET** that the company was in what were described as productive talks with automakers involving Google's self-driving technology. Separately, Google is reported to be crafting a partnership with auto supplier Continental. And there's even the possibility of Google-powered robo-taxis sometime in the future.

4 Where is this all leading? The answer, naturally, is complicated. After all, we're talking about an effort to force the biggest change in the auto industry since the first Model A drove out of Henry Ford's factory a century ago. And the automakers aren't about to let Google plow through their turf unless it helps their businesses. **They** have their own plans with self-driving cars, and some execs scoff at Google co-founder Sergey Brin's wide-eyed remarks about making self-driving cars commercially available by 2017.

5 "We do not think someone will have a fully autonomous production vehicle that soon," said Daniel Flores from General Motors' advanced technology group. "Vehicles that can drive

laser-scanning *a.* 激光扫描的

CNET 科技资讯网（美国旧金山一间媒体公司，集中报道科技新闻）

themselves are years – maybe decades – away. The technology will develop in steps to allow the vehicle to do more and act incrementally as **sensors** get more robust and costs come down.”

sensor *n.* 传感器

6 That might be, but such talk isn't about to diminish Google's ambitions. Google is leading the charge on this one. It's prodding the auto industry – not to mention **regulators** and the insurance business – to push the whole effort at a **Silicon Valley** pace.

regulator *n.* 监管部门

Silicon Valley 硅谷

7 Already Nevada, Florida, and California have legalized driverless-car testing on public roads, with a lobbying nudge from Google. And although plenty of other efforts are under way – from **GM** to Nissan and Audi – Google has the highest profile, something that surely rankles the old guard.

GM (General Motors Corporation) 美国通用
汽车公司

8 “Google's embarrassed the car industry by getting out ahead on this and getting all the attention,” said Roger Lancot, an automotive analyst with Strategy Analytics.

9 Let's not lose sight of something else: Anyone who's watched Google's swift rise in its 15-year history knows there's also a big potential side benefit. Google talks about making the roads safer, but the company's core business has plenty to gain from freeing up drivers from that task of, well, driving. How much? Americans on average spend 18.5 hours a week in a car, which adds up to a lot of time **they** could be checking Gmail, editing Google Docs, watching YouTube videos, and clicking ads.

10 “They're trying to free people's time so they can dedicate themselves to the Internet and Googling around,” said Alberto Broggi, a professor of computer engineering at the University of Parma in Italy named an IEEE senior member for his autonomous vehicle work. “They're motivated by great innovation, but the bottom line ... is business.”

The computerization of cars

11 Motivation aside, a big change is under way, and **it** requires us to start thinking of cars very differently. Vehicles that drive themselves are the clearest example of what happens when cars transform into full-scale, general-purpose computing systems. But it's not the only example. Self-driving and connected cars will bristle with sensors, negotiate with traffic lights, talk to each

other about safety conditions, join into train-like platoons, and become members of intelligent **urban transit networks**.

urban transit network
城市交通网络

12 Historically, the car industry has focused on passive safety – items like seatbelts and airbags. With the arrival of active safety technology that lets vehicles take pre-emptive action, cars will use data to help them decide what to do when drivers aren't paying attention or don't know what to do.

13 A lot of this boils down to communication. Sure, cars are getting more computing smarts, but so much of what's promised requires more data, and **that** requires ways to transmit it. How will that happen? As with personal computing, it will be a bit of a mess, with multiple networking technologies for multiple needs.

14 Computing today uses a handful of networks for different circumstances – WiFi, 3G, 4G, and Bluetooth among them. When automotive computing becomes a facet of personal computing, you can expect those standards to carry over. But then you can add some new network technologies designed to serve vehicles. The biggest are the **802.11p** and the accompanying higher-level dedicated short-range communications (**DSRC**) standards, which govern how vehicles communicate with each other (V2V) and with infrastructure (V2I).

802.11p 无线局域网标准，主要用于车载电子无线通信
DSRC 专用短程通信（一种高效的无线通信技术）

15 That technology, which rides the 5.9GHz **frequency range** for radio communications, can be used for things like collision avoidance, managing traffic at intersections, and linking cars into coordinated, fuel-efficient groups called platoons. Carmakers, however, are worried about interference on the 5.9GHz band if the **US Federal Communications Commission** permits other uses of the **spectrum**.

frequency range 频率范围

Traditional mobile networks

US Federal Communications Commission 美国联邦通信委员会
spectrum *n.* 频谱

16 The current mobile-phone networks will find an eventual place in cars for passengers' entertainment and personal communications, but safety legislation will give the technology a head start in cars. That legislation will require emergency-call (e-call) technology in all vehicles in Europe by 2015 so cars can automatically dial for help after a crash.

17 After **that**, it's an easy next step to other wireless services that carmakers could charge for: "c-calls" for concierge-like help finding something like a nearby hotel and "b-calls." Another perk of e-call technology: It can be used to track the location of stolen cars.

18 Whether people's **smartphones** or the car itself will provide links to the network is an open question. "That's the debate going on at every car manufacturer," said Cyril Deschanel, head of machine-to-machine communications technology for Vodafone in southern Europe.

smartphone *n.* 智能手机

19 Adding mobile networks to cars raises the payment problem. Will people sign up for new data plans for their cars, or will they add new usage to existing mobile contracts by letting their cars use their phones' network? Are you ready to pay for a second, third, or fourth data plan? Infrequently used technologies like e-call aren't much of a burden to carriers, but somebody's going to have to pay if kids are streaming videos into the backseat.

20 One thing is all but certain: smartphones and cars will have to cooperate. The Car Connectivity Consortium's MirrorLink, for example, standardizes the interface so that a vehicle's large, bright, conveniently placed screen can act as a display for software running on the phone.

21 The big three apps make obvious sense for such cooperation: Those for **navigation**, playing music, and handling phone calls. If the technology spreads, it could lead to a super-personalized world. Bringing your phone into a rental car, for instance, would customize it immediately so you'd know how to operate it. A big perk of the approach: phones, apps, and mobile networks change fast, so relying on them helps sidestep the problem of slow-changing cars falling behind the technology curve. Everything would update the way an app does on your phone now.

navigation *n.* 导航

Reading Exercises

1. An introductory sentence for a brief summary of the text is provided below. Complete the summary by selecting the **THREE** statements that express the most important ideas in the text.

Google is making an effort to force the biggest change in the auto industry with its self-driving technology.

-
-
-

- A. Google is seeking partnership with automakers that are convinced of the potential of this technology.
- B. Some companies scoff at Google's remark, but that doesn't diminish Google's ambitions.
- C. Google's embarrassed the car industry by getting out ahead and getting all the attention.
- D. Historically, the car industry has focused on passive safety – items like seatbelts and airbags.
- E. Self-driving cars will transform into full-scale, general-purpose computing systems that use new network technologies which free drivers from driving.
- F. Despite some concerns, smartphones and cars will have to cooperate.

2. Decide what the following words refer to in the text.

- (1) The word **they** in paragraph 4 refers to _____.
- (2) The word **they** in paragraph 9 refers to _____.
- (3) The word **it** in paragraph 11 refers to _____.
- (4) The word **that** in paragraph 13 refers to _____.
- (5) The word **that** in paragraph 17 refers to _____.

3. A number of people voiced different opinions about Google's ambitious endeavor. Some remarks are taken from the text. Match the person with the remark he made.

Daniel Flores from General Motors' advanced technology group

They're trying to free people's time so they can dedicate themselves to the Internet and Googling around.

Roger Lanctot, an automotive analyst with Strategy Analytics

That's the debate going on at every car manufacturer.

Alberto Broggi, a professor of computer engineering

Vehicles that can drive themselves are years – maybe decades – away.

Cyril Deschanel, head of machine-to-machine communications technology for Vodafone in southern Europe

Google's embarrassed the car industry by getting out ahead on this and getting all the attention.

4. According to a recent study conducted among 2,000 U.S. adults, about 88% said they would be concerned about riding in a driverless car, most of whom worried that the system could fail. Apart from safety concerns, what are the other factors that you think may prevent Google's self-driving cars from hitting the mainstream market?

How Biodiesel Works

M. Scott Hess

1 If you've read or watched the news lately, you've probably come across some article, **snippet** or sound bite related to oil and oil prices. Even in your daily routines, there's a good chance of someone mentioning it. Whether it's in **automotives**, economics, history, geography or politics, oil has managed to filter into almost every aspect of our daily lives. It's one of the most discussed (and controversial) commodities that consumers rely on daily.

snippet *n.* 片段

2 All of this talk about oil sparks continued interest in gasoline **alternatives**. Things like electric cars and **hydrogen** fuel cells are being talked about as feasible alternatives to oil. As technology improves, these concepts could become reality. But what about now?

automotive *n.* 汽车

alternative *n.* 替代物
hydrogen *n.* 氢

3 Lost in the mix are the **biofuels**, fuels made from biological ingredients instead of **fossil fuels**. These starting ingredients can range from corn to **soybeans** to animal fat, depending on the type of fuel being made and the production method.

biofuel *n.* 生物燃料

fossil fuel 化石燃料

soybean *n.* 大豆

4 Generally speaking, **biodiesel** is an alternative or additive to standard diesel fuel that is made from biological ingredients instead of **petroleum** (or crude oil). Biodiesel is usually made from plant oils or animal fat through a series of chemical reactions. It is both non-toxic and renewable. Because biodiesel essentially comes from plants and animals, the sources can be replenished through farming and recycling.

biodiesel *n.* 生物柴油

petroleum *n.* 石油

5 Biodiesel is safe and can be used in diesel engines with little or no modification needed. Although biodiesel can be used in its pure form, it is usually blended with standard diesel fuel. Blends are indicated by the abbreviation Bxx, where xx is the

percentage of biodiesel in the mixture. For example, the most common blend is B20, or 20 percent biodiesel to 80 percent standard. So, B100 refers to pure biodiesel.

6 Biodiesel isn't just a catch-all term, however. There is also a formal, technical definition that is recognized by **ASTM International** (known formerly as the American Society for Testing and Materials), the organization responsible for providing industry standards. According to the **National Biodiesel Board** (NBB), the technical definition of biodiesel is as follows:

a fuel comprised of **mono-alkyl esters of long chain fatty acids** derived from vegetable oils or animal fats, **designated** B100, and meeting the requirements of ASTM D 6751.

Fats and Biodiesel

7 Part of what makes biodiesel so appealing and interesting is that it can be made from numerous natural sources. Although animal fat can be used, plant oil is the largest source of biodiesel. You've probably used some of these in the kitchen. Scientists and engineers can use oils from familiar crops such as soybean, **rapeseed**, **canola**, palm, cottonseed, sunflower and peanut to produce biodiesel. Biodiesel can even be made from recycled cooking grease!

8 The common thread shared by all biodiesel sources is that they all contain fat in some form. Oils are just fats that are liquid at room temperature. These fats, or **triacylglycerols** (sometimes called **triglycerides**) are made up of **carbon**, hydrogen, and **oxygen** atoms bound together and arranged into a specific pattern. These triacylglycerols are pretty prevalent. In addition to household vegetable oils, they're also in common things like butter and **lard**. You may have seen a triglyceride count listed if you've been to a doctor and had some blood work done.

9 **A** Forming the **vertical** backbone of this E is a **molecule** known as **glycerol**. **B** Glycerol is a common ingredient used in making such things as soap, **pharmaceuticals** and cosmetics. **C** Attached to this glycerol backbone and forming the horizontal elements of the E are three long chains composed of carbon, hydrogen, and oxygen. **D** These are called **fatty acids**.

ASTM International 美国材料与试验协会

National Biodiesel Board 美国国家生物柴油委员会

mono-alkyl esters of long chain fatty acids 长链脂肪酸单烷基酯
designate *v.* 标注

rapeseed *n.* 油菜籽
canola *n.* (加拿大)油菜

triacylglycerol *n.* 三酰甘油
triglyceride *n.* 甘油三酸酯
carbon *n.* 碳
oxygen *n.* 氧

lard *n.* 猪油

vertical *a.* 垂直的
molecule *n.* 分子
glycerol *n.* 甘油
pharmaceutical *n.* 药品

fatty acid 脂肪酸

10 So how do these triacylglycerols end up in a car, truck or boat? Biodiesel is not pure vegetable oil. Although raw vegetable oil has been used to fuel diesel engines in the past, it has usually caused problems. The raw fat or oil must first undergo a series of chemical reactions in order to become fuel. There are a few different ways to make biodiesel, but most manufacturing facilities produce industrial biodiesel through a process called **transesterification**. In this process, the fat or oil is first purified and then reacted with an alcohol, usually **methanol** (CH₃OH) or **ethanol** (CH₃CH₂OH) in the presence of a **catalyst** such as **potassium hydroxide** (KOH) or **sodium hydroxide** (NaOH). When this happens, the triacylglycerol is transformed to form esters and glycerol. The esters that remain are what we then call biodiesel.

transesterification *n.*
酯基转移
methanol *n.* 甲醇
ethanol *n.* 乙醇
catalyst *n.* 催化剂
potassium hydroxide
氢氧化钾
sodium hydroxide
氢氧化钠

11 Currently, the largest biodiesel market is **fleet** vehicles. According to the National Biodiesel Board, there are over 100 such fleets using biodiesel in the United States. These include federal and public organizations such as the U.S. Postal Service, the U.S. Air Force, U.S. Army, NASA, the U.S. Department of Energy, Duke Energy, and Florida Power & Light. Many public transportation services are also looking to biodiesel in order to complement petroleum usage. City buses such as Cincinnati Metro are also using biodiesel. Potential future targets include areas such as marine and agricultural applications and home heating.

fleet *n.* 舰队

12 As public awareness grows, biodiesel and biofuels in general could easily find their way into dinner conversations. Political support is also on the rise and, in the wake of legislation such as the 1998 **EPACT** amendment, alternative fuel sources will be a necessity in the not-so-distant future.

EPACT (美国能源部发布的) 能源政策法

Reading Exercises

1. Some words are listed below. Find out their definitions or explanations from the text.
 - (1) biodiesel
 - (2) B20

(3) triacylglycerol / triglyceride

(4) glycerol

2. All of the following are mentioned in the text as an advantage of biodiesel EXCEPT

A. that biodiesel is environmentally friendly.

B. that biodiesel can help reduce dependency on fossil fuels.

C. that biodiesel is safer than conventional diesel.

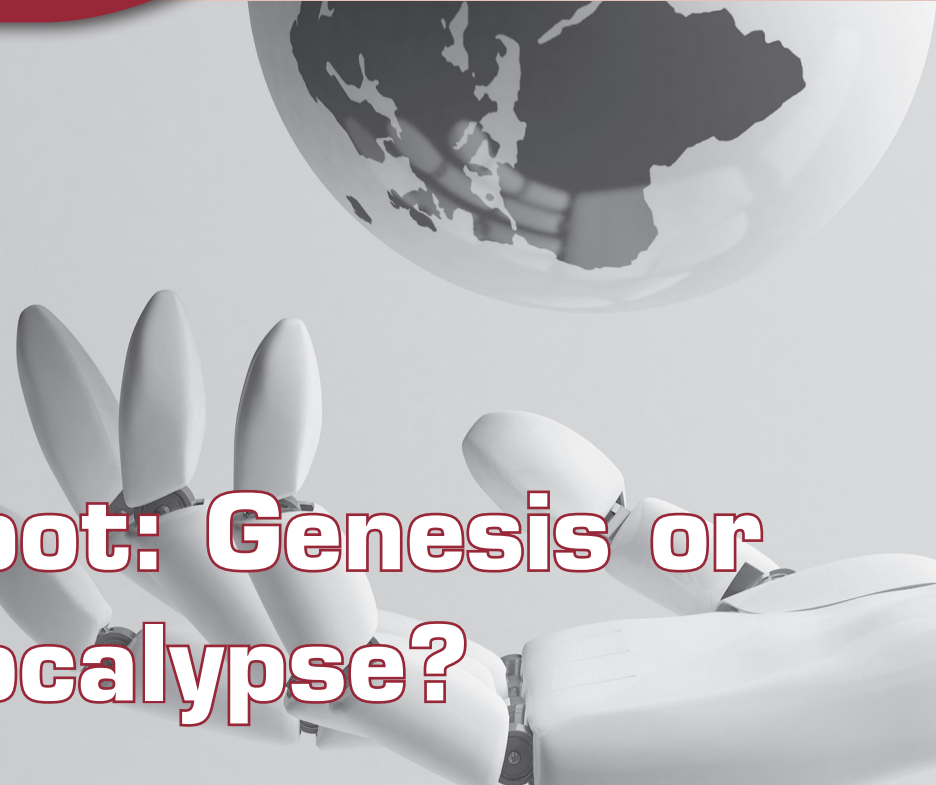
D. biodiesel is less costly than standard diesel.

3. In paragraph 9 there are four squares ■ marked A, B, C and D. Which square indicates where the following sentence should be placed?

One way to visualize these triacylglycerols is to think of a capital “E”.

4. Apart from biodiesel, what else do you think can serve as alternative fuels? Discuss with your partner.

Unit 2



Robot: Genesis or Apocalypse?

Lead-in

1. How can robots help us? Two examples are given below. Can you offer more?

Doctors can use robots to perform surgeries.

ROBOTS

Housewives can use robots to help around the house.

2. Aside from the benefits, does robot technology raise any concerns? Discuss with your partner.

Nasa's Robonaut 2 Scrubs Up for Space Surgery

Tom Espiner

1 It won't panic in an emergency; its hands don't ____ (1) ____ after too little sleep; it won't miss a family after months away from base – in fact it doesn't even need to ____ (2) ____.

2 Nasa's Robonaut 2 has the makings of the perfect space surgeon. The humanoid has already been posted to the International Space Station and the only ____ (3) ____ is its **motor** skills are somewhat **rudimentary** at the moment.

3 In truth, it can't even walk in zero ____ (4) ____ yet, and perhaps its most impressive physical **feat** to date has been to catch a floating ____ (5) ____ of duct-tape. But Nasa has high hopes for the new recruit, and techniques being developed by a team on the ground could mean the machine can eventually perform life-saving operations on its team-mates. "The idea is for him to be the best **medic**, ____ (6) ____, and **physician**," Dr Zsolt Garami of the Houston Methodist Hospital tells the BBC. "Our plan is to use Robonaut as a **telemedicine** doctor in ____ (7) ____ areas."

4 As Robonaut's name suggests, it is not alone. There are currently ____ (8) ____ versions of the android with more in development. One of them is being trained on ____ (9) ____ to find a pulse in a dummy's neck using **ultrasound**, then to stick a needle into a **vein**. "You want to avoid hitting the **carotid artery**," Dr Garami says. The robot has great ____ (10) ____ for precise work, he says. For example, once it can give an injection, it will be able to find the same spot on a human body and use the same angle for the needle again.

motor *a.* 运动的

rudimentary *a.* 未成熟的

feat *n.* 功绩; 壮举

medic *n.* 医生

physician *n.* (内科) 医生

telemedicine *n.* 远程医疗

ultrasound *n.* 超声波

vein *n.* 静脉

carotid artery 颈动脉

5 He sees the robot eventually being used to perform intricate medical operations like **endovascular** surgery, where a patient is operated on through their large **blood vessels**.

endovascular *a.* 血管内的
blood vessel 血管

Robot cleaner

6 But in the short term Robonaut 2 faces a more mundane role as the space station's cleaner. "The robot has to earn its stripes," Robonaut project leader Ron Diftler tells the BBC. The machine has already been given "very boring tasks" on the International Space Station such as monitoring air flow from vents, he adds.

7 Robonaut 2 was shipped up to the space station as just a **torso**, head and arms. It is still waiting for a pair of legs to arrive on a forthcoming supply mission, but afterwards the robot should be able to begin to clean handrails, wipe down interior surfaces and other basic jobs.

torso *n.* 躯干

8 The next stage is for it to learn to walk in, then to go outside the station to do maintenance tasks. Its legs will have seven joints and cameras in the feet, so it will be able to "see" where it is going. Eventually, the robot will perform "dull, dirty, and dangerous" jobs in inhospitable places, Mr Diftler says.

Robot control

9 Robonaut 2 can be remotely controlled by a ground crew member using a virtual-reality face mask and gloves. The human controller can see what the robot sees, and manoeuvre it using gestures. Hand and neck position data from the virtual-reality kit are transmitted from the Houston command centre into space, and a **video feed** and data are beamed back. It can also be controlled through keyboard commands on a laptop.

video feed 视频反馈

10 The robot has five eyes as part of its vision system, and can "see" the same wavelengths of light as a human, plus **infrared light**. It has two **high-resolution** visible light cameras that transmit **stereoscopic** video to its operators, and two back-up cameras. It's "mouth" is actually an infrared camera to aid its depth perception. There is no room in its head for a brain, so the **aluminium** and steel robot "thinks" with its stomach, which is packed with powerful processors.

infrared light 红外线
high-resolution *a.* 高分辨率的
stereoscopic *a.* 立体的

11 The fingers have **tendons** that run into the forearm of the robot in a similar way to the human arm. When the robot

aluminium *n.* 铝

tendon *n.* 筋, 腱

touches an object, tiny sensors on the fingers measure the force the robot is applying, and allow for a soft touch.

12 Robonaut 2 has not been designed to have super-human strength, but it's strong by human standards – it can lift and move a 20lb (9kg) weight around in Earth's gravity with one arm.

Time lag

13 One of the main challenges in surgical telemedicine is the time lag between the surgeon's movements and what the robot does, according to telepresence expert Gordon Mair from the University of Strathclyde. "If you were to make an **incision**, there would be a certain amount of time before the robot did it," he explains.

incision *n.* 切口

14 This could seriously affect an operation, as even a second's delay could mean the robot makes too deep or shallow an incision. The signal takes time to transmit over long distances, with the time lag becoming longer as the distances get bigger. The time lag for signals between Earth and the International Space Station can be up to a couple of seconds, and can cut out for much longer periods, Mr Diftler adds. For missions to Mars, the lag could be 20 or 30 seconds, making the problem worse.

15 One possible way around the issue would be for astronauts inside the station to control the robot. It could offer them an extra pair of hands, for example helping apply pressure on a wound during an operation.

16 The robot could also be programmed to act autonomously during parts of an operation, with a controller commanding it to go through a sequence of stages. Robonaut 2 already has some capabilities to act by itself in various tasks. For example, Mission Control can tell it to pick something up, and it can use its vision system to locate the object, identify it, then reach out and grab it.

17 The **automaton** has a long road ahead of it before it can become an autonomous surgeon, but Nasa's big plans may see the robot go from space station toddler to medic on Mars.

automaton *n.* 机器人

Reading Exercises

1. There are ten blanks in paragraphs 1–4, each representing a missing word. Select the appropriate word for each blank from the list below.

gravity	remote	breathe	lengthened	nurse
potential	nasty	problem	think	pleased
Earth	shake	rarely	four	roll

2. Complete the following sentences with information from the text.

- (1) Nasa's Robonaut 2 has _____, and techniques being developed by a team on the ground could mean _____.
- (2) In the short term Robonaut 2 plays a more mundane role as _____. Eventually, the robot will perform _____.
- (3) Robonaut 2 can be remotely controlled by _____. It can also be controlled through _____.
- (4) One of the main challenges for Robonaut 2 is _____. One possible solution would be _____. The robot could also _____.

3. Judge according to the text whether the following statements are true (T) or false (F).

- (1) Nasa's Robonaut 2 is shipped to the International Space Station because there are patients waiting to be treated. ()
- (2) At present Robonaut 2 has learned to walk in and go outside the station to do maintenance tasks. ()
- (3) The human controller can see what the robot sees, and use gestures to control it. ()
- (4) Time lag could seriously affect an operation, but the lag would be shorter for missions to Mars. ()
- (5) The controller can command the robot to act autonomously during parts of an operation, such as telling it to pick up something. ()

4. Over the past decade, some 2,000 surgical robots have been sold in the U.S., and the number of robotic procedures has soared by 30 percent each year. While robotic surgery is considered generally safe, it's important to weigh the pros and cons carefully before accepting it. Find more information and then discuss with your partner as to whether you would willingly take robot-assisted surgery.

5. The problem-solution pattern is common in writing. In this passage, for example, the author points out time lag as a problem affecting robot surgery:

One of the main challenges in surgical telemedicine is the time lag between the surgeon's movements and what the robot does, according to telepresence expert Gordon Mair from the University of Strathclyde. (paragraph 13)

Then he offers two solutions:

One possible way around the issue would be for astronauts inside the station to control the robot. (paragraph 15)

The robot could also be programmed to act autonomously during parts of an operation, with a controller commanding it to go through a sequence of stages. (paragraph 16)

To help the reader understand, one solution is explained in detail:

For example, Mission Control can tell it to pick something up, and it can use its vision system to locate the object, identify it, then reach out and grab it. (paragraph 16)

Now think of a situation in which you are faced with a problem that you must solve, and then write a passage of about 100 words using the problem-solution pattern.

Quadriplegic Woman Moves Robot Arm with Her Mind

Charles Choi

1 A woman **paralyzed** from the neck down is now able to use a robot arm to give high fives and help her eat chocolate, representing what may be the most advanced mind-controlled **prosthetic** hand developed for humans yet, researchers said.

paralyzed *a.* 瘫痪的

2 Although scientists had worked on robotic limbs that monkeys could move with their minds, these new results mark the first time a person could steer thought-controlled prosthetics better than monkeys have, investigators added.

prosthetic *a.* 义肢的, 假体的

3 “This is a spectacular leap toward greater function and independence for people who are unable to move their own arms,” said researcher Andrew Schwartz at the University of Pittsburgh. “This technology, which interprets brain signals to guide a robot arm, has enormous potential that we are continuing to explore.”

4 “As we move forward, we might find this is applicable to other types of traumatic brain injury,” researcher Elizabeth Tyler-Kabara at the University of Pittsburgh told LiveScience. “The populations that we can apply this to might be as wide as our imagination is.”

Genetic disease paralyzes

5 The woman, Jan Scheuermann, a mother of two children, once ran a successful business planning parties with murder-mystery themes. In 1996, she noticed her legs seemed to drag behind her, and within two years, her legs and arms weakened to the point that she required a wheelchair and an attendant to help her with dressing, eating, bathing and other daily activities.

6 Scheuermann suffers from **spinocerebellar** degeneration, a genetic disease where connections between the brain and muscles slowly deteriorate. She is now **tetraplegic** (also called **quadriplegic**), meaning that she is paralyzed from the neck down, and cannot voluntarily move her arms or legs. “I can’t even shrug my shoulders,” Scheuermann said. “But I have come to the conclusion that worrying about something is experiencing it twice. I try to dwell on the good things that I have.”

spinocerebellar *a.* 脊髓小脑的

tetraplegic/quadriplegic *a.* 四肢瘫痪的

7 A friend of Scheuermann’s pointed out a 2011 video about research at the University of Pittsburgh on a man with **tetraplegia**, Tim Hemmes, that gave him the ability to move objects on a computer screen and reach out with a robot arm to touch his girlfriend.

tetraplegia *n.* 四肢瘫痪

8 “Wow, it’s so neat that he can do that,” Scheuermann recalled thinking as she watched Hemmes. “I wish I could do something like that.” She had her attendant call the researchers and say, “I’m a quadriplegic. Hook me up, sign me up! I want to do that!”

Brain-controlled prosthetic

9 The scientists developed **microelectrode** arrays that connect brain cells to **electronic circuitry** – square grids just 16 square millimeters large with 96 points that penetrate the brain’s surface by about one-16th of an inch. They scanned Scheuermann’s brain to determine exactly where to put these electronics, and in February, they **implanted** the devices into her left motor **cortex**, the part of the brain that controls movement of the right arm and hand.

microelectrode *n.* 微电极
electronic circuitry 电子线路

implant *vt.* 移植
cortex *n.* 大脑皮层

10 These implants were linked to a robotic limb Scheuermann has named Hector, which is capable of joint and wrist movements comparable to that of a human hand. “The prosthetic arm we used was very sophisticated, with many of the same arm and hand segments as that of its human counterpart,” Schwartz told LiveScience.

11 Two weeks after implantation, on just the second day of training with the prosthetic, Scheuermann was able to move it freely using just her mind. Within a week of training, she could reach in and out, left and right, and up and down using the arm.

“What we did in the first week they thought we’d be stuck on for a month,” Scheuermann said.

12 Scheuermann took part in a 13-week-long comprehensive training and testing program to control the **prosthesis** along seven degrees of freedom – types of motions the prosthetic’s joints could perform, such as flexing the wrist back and forth, moving it from side to side, and rotating it clockwise and counterclockwise. Coming to the lab three times per week, she rapidly learned to reach and grasp blocks, cones and balls with the prosthesis, developing fluid and rapid control over skillful movements almost similar to that of a person with regular abilities. “I would definitely do this again,” Scheuermann told LiveScience. “I think I am very blessed for this coming into my life.”

prosthesis *n.* 假体, 义肢

Reaching for chocolate

13 Scheuermann had told the research team, “I’m going to feed myself chocolate before this is over.” Using Hector, Scheuermann savored some chocolate as the scientists applauded her feat. “One small nibble for a woman, one giant bite for BCI (brain-control **interfaces**),” Scheuermann said.

interface *n.* 界面; 接口

14 In the end, Scheuermann could use the prosthetic to reach for objects, adjust the opening of the prosthetic hand to grasp items of various shapes and sizes, and move them to desired locations. She was able to complete requested tasks with a success rate of up to 91.6 percent, and more than 30 seconds more quickly than she did at the start of the program.

15 The unprecedented speed at which Scheuermann adapted to the prosthesis is partly due to an innovative new way of connecting the participant’s brain to the prosthesis. Brain-machine interfaces work by converting brain signals to computer signals. The researchers previously monitored the signals that brains give out when people move their arms, and designed the behavior of the prosthetic to match Scheuermann’s brain activity when she thought about moving her arm as intuitively as possible. “The result is a prosthetic hand, which can be moved far more accurately and naturalistically than previous efforts,” Schwartz said.

16 Future research might seek to include sensors into the prosthetic so that patients might, for instance, be able to tell the difference between hot and cold, or smooth and coarse surfaces. The prosthetics might also incorporate wireless technology, removing the need for connecting wires between the patients and the prosthetic.

17 “We’re hoping this can become a fully implanted, wireless system that people can actually use in their homes without our supervision,” said researcher Jennifer Collinger at the University of Pittsburgh and the VA Pittsburgh Healthcare System. “It might even be possible to combine brain control with a device that directly stimulates muscles to restore movement of the individual’s own limb.”

18 Currently, the implants are scheduled to be removed after two more months of testing, because the **FDA** approved such tests with the understanding they were of limited duration. “We can and have applied for an extension, which was approved and are currently assessing whether to continue beyond the date that was originally planned,” Schwartz said. “This is the ride of my life,” Scheuermann said. “This is the roller coaster. This is skydiving. It’s just fabulous, and I’m enjoying every second of it.”

FDA 美国食品与药品监督管理局

19 “What we need are volunteers,” researcher Michael Boninger at the University of Pittsburgh told LiveScience. “What we need is funding.”

Reading Exercises

1. Read the five statements below, each of which contains information given in paragraph 4, 5, 6, 9 or 12. Identify which paragraph the information is derived from and write the corresponding number in the table.

	Statement	Paragraph
(1)	The scientists put microelectrodes in Scheuermann’s brain to connect brain cells to electronic circuitry.	
(2)	Scheuermann used to be a happy mother and a successful business woman.	

(3)	Scheuermann's paralysis was caused by a genetic disease.	
(4)	Mind-controlled prosthetics may be applicable to a much larger population.	
(5)	Scheuermann took part in a comprehensive training and testing program to help control her robot arm and the result was fabulous.	

2. Complete the following sentences with information from the text.

- (1) The technology of thought-controlled prosthetics interprets _____ to guide _____.
- (2) Spinocerebellar degeneration refers to _____.
- (3) Scheuermann is tetraplegic, meaning that _____.
- (4) The microelectrode arrays that connect brain cells to electronic circuitry are _____.
- (5) Researchers implanted microelectrodes into Scheuermann's left motor cortex that controls _____.
- (6) The FDA approved such tests which were supposed to be of limited _____, but the researchers have applied for _____.

3. Some words in the text have similar meanings. Match the words on the left with their synonyms on the right.

- | | |
|-------------|--------------|
| paralyzed | incorporate |
| a robot arm | prosthesis |
| scientists | implant |
| weaken | researchers |
| put | spectacular |
| scheduled | deteriorate |
| include | quadriplegic |
| fabulous | planned |

4. Science fictions thrill us with imagination. Sometimes their fantastic predictions become reality because of modern technology. A robot limb is just one example.

The *Star Wars* hero Luke receives a perfect arm replacement in *Empire Strikes Back*. Now the mind-controlled prosthetic arm from a company founded by Segway inventor Dean Kamen has been approved for use by US medical authorities and is affectionately called "Luke".

Think about the sci-fi movies you have watched. What fantasies would you like to happen in real life?

Killer Robots: Natural Evolution, or Abomination?

Erik Schechter

1 Ask some technologists and they will say that **lethal** autonomous weapons – machines that can select and destroy targets without human intervention – are the next step in modern warfare, a natural evolution beyond today’s remotely operated **drones** and unmanned ground vehicles. Others will decry such systems as an **abomination** and a threat to international humanitarian law (IHL), or the law of armed conflict.

lethal *a.* 致命的

drone *n.* 无人机

abomination *n.* 令人憎恶的人或事物

2 The U.N. Human Rights Council has, for now, called for a **moratorium** on the development of killer robots. But activist groups like the International Committee for Robot Arms Control (ICRAC) want to see this class of weapon completely banned. The question is whether it is too early – or too late – for a blanket prohibition. Indeed, depending on how one defines “autonomy,” such systems are already in use.

moratorium *n.* 暂停

3 From stones to arrows to **ballistic missiles**, human beings have always tried to **curtail** their direct involvement in combat, said Ronald Arkin, a computer scientist at Georgia Institute of Technology. Military robots are just more of the same. With autonomous systems, people no longer do the targeting, but they still program, activate and deploy these weapons.

ballistic missile 弹道导弹

curtail *v.* 削减

4 “There will always be a human in the kill chain with these lethal autonomous systems unless you’re making the case that they can go off and declare war like the **Cylons**,” said Arkin, referring to the warring **cyborgs** from *Battlestar Galactica*. He added, “I enjoy science-fiction as much as the next person, but I

Cylon *n.* (《太空堡垒卡拉狄加》中的) 机器人

cyborg *n.* 半机械人
Battlestar Galactica 美国科幻电影《太空堡垒卡拉狄加》

don't think that's what this debate should be about at this point in time.”

5 Peter Asaro, however, is not impressed with this **domino** theory of agency. A philosopher of science at The New School in New York, and co-founder of ICRAC, Asaro contends robots lack “meaningful human control” in their use of deadly force. As such, killer robots would be taking the role of moral actors, a position that he doubts they are capable of fulfilling under international humanitarian law. That's why, he says, these systems must be banned.

domino *n.* 多米诺骨牌

Choosing targets, ranking values

6 According to the law of armed conflict, a combatant has a duty to keep civilian casualties to a minimum. This means using weapons in a discriminating fashion and making sure that, when civilians do get killed in action, their incidental deaths are outweighed by the importance of the military objective — a calculation that entails value judgments.

7 In terms of assessing a battlefield scene, no technology surpasses the ability of the human eye and brain. “It's very aspirational to think that we'll get a drone that can pick a known individual out of a crowd. That's not going to happen for a long, long, long, long time,” said Missy Cummings, director of MIT's Human and Automation Laboratory, and a former F-18 pilot.

8 Still, a fully autonomous aircraft would do much better than a person at, say, picking up the distinctive electronic signature of a radar signal or the low rumbling of a tank. In fact, pilots make most of their targeting errors when they try to do it by sight, Cummings told LiveScience.

9 As for a robot deciding when to strike a target, Arkin believes that human ethical judgments can be programmed into a weapons system. In fact, he has worked on a prototype software program called the Ethical Governor, which promises to serve as an internal constraint on machine actions that would violate IHL. “It's kind of like putting a **muzzle** on a dog,” he said.

muzzle *n.* (防止动物咬人的) 口套

10 As expected, some have voiced much skepticism regarding the Ethical Governor, and Arkin himself supports “taking a pause” on building lethal autonomous weapons. But he doesn't