高等学校电子类专业英语

李鹏飞　吴树敬　来鲁宁　王玉雯

電子工業出版社

高等学校电子类专业英语

李鹏飞　　吴树敬
来鲁宁　　王玉雯

電子工業出版社

内 容 简 介

本书是为理工科大学生获得四级英语水平后，进一步巩固和提高英语水平，特别是提高阅读科技及本专业英语资料的能力而编写的，可作为英语电子类专业阅读教材。

全书共分15个单元，总阅读量约100,000词，可供54～72学时教学使用。本书分几个群落，每一群落含几个单元，反映一个主题。如：光电基础、机器人和自动控制技术，计算机与信息技术、光电通信和测试技术等。

高等学校电子类专业英语

李鹏飞　吴树敬

来鲁宁　王玉雯

责任编辑：张荣琴

电子工业出版社出版

北京市海淀区万寿路173信箱（100036）

电子工业出版社发行　各地新华书店经销

北京顺义李史山印刷厂印刷

*

开本：787×1092毫米 1/16　印张：17.25　字数：443千字

1995年12月第一版　1995年12月北京第一次印刷

印数：0,001-6500册　定价：22.00元

ISBN 7-5053-3025-X/TN・855

前　言

国家教委颁发的《大学英语教学大纲(理工科用)》中有关专业阅读阶段的要求规定：专业阅读阶段的教学是通过指导学生阅读有关专业的专刊和文选，培养阅读英语科技资料的能力，使其能以英语为工具获取有关专业所需要的信息。根据上述规定，我们近年来对英语专业这门课程的建设做了一定的努力和探索，对本科生的英语教学实行了四年不断线的方针。在所有专业的本科生完成了基础英语学习任务之后，三年级按学科大类为他们分别开设专业科技英语课，于四年级为其可设专业英语文献阅读课。这些作法的目的就是为了更加全面贯彻大学英语教学大纲，更扎实地提高学生应用英语的能力，从而进一步提高教学质量，为争取 2000 年使大学英语教学上一个新台阶创造有利条件。

本书为《专业英语》系列教材的第二分册(第一分册为机械类)，是为理工科(偏重光、电类专业)大学生在学完四级英语后，进一步巩固和提高英语水平，特别是提高阅读科技及本专业英文资料的能力而编写的，体现了很多专家对本课程的改革思想，目的是提高这门课的教学质量。本书既可作为光、电类专业学生"专业英语"课的教材，也可供学生及其他读者阅读提高之用。

本书共分为 15 个单元，几个单元为一群落，分别反映一个主题，如光电基础、机器人与自动控制技术、计算机与信息技术、光电通信和测试技术等。每个单元含 A、B、C 三篇文章。A 篇一般可作为重点讲授内容。根据各专业侧重点不同，A、B 篇也可调换位置使用。C 篇是为课上作快速阅读训练而设的。全书总阅读量约 100,000 词，可供 52～74 学时教学使用。本书的写作部分，有 6 个专题，分别在写科技论文的提纲(outline)、引言(introduction)、摘要(abstract)和结论(conclusion)等方面给学生一定的启发和指导。

本书课文是从国外书刊、杂志和科学文献中精选出来的。科学性、知识性、趣味性和文章语言的规范化是选材的标准。本书每篇课文之后均配有数量充足的理解和实践性练习，这些练习以培养学生迅速获取信息为重心，并适当注意了词汇学习、翻译技巧及写作训练等方面的提高。

为保证本书的编纂质量，编书期间聘请了周思永、李鸿屺、张炬、阎吉祥、金志立等英语水平较高的光、电方面的专家组成顾问组。本书所选用的文章多数是由他们提供并集体审定的。北京理工大学教务处领导陆晨同志作为本课程改革的负责人，做了大量的组织工作。周思永教授为本书审了稿。朱小燕副教授为本书的完稿出版也做了大量实际工作，北京理工大学外语系的陈大明、刘利君两位副教授参加了本书部分材料的搜集整理工作。借此机会，一并向他们表示衷心感谢。

由于时间和作者水平有限，书中如有不当之处，敬请读者批评指正。

编者

于北京理工大学

LESSON 1

Text A
The Magic of Microelectronics

The integrated circuit(IC) is the offspring of the electronic integrated circuit and is so called because all of its circuit elements are bonded together rather than separately wired to each other after being manufactured. Invented fewer than 20 years ago, the IC has already become one of the marvels of the 70- year- old electronics industry, and it is being used widely in dozens of industries and consumer products. Yet the range of uses of this electronic device is considered to be merely on the threshold of an almost limitless potential. Ultimately, it promises to direct virtually every function of sensing, to control commucications and information processing, and to exercise an influence on almost every human activity.

An integrated circuit looks like nothing more than a tiny silver- gray square or chip of metal, perhaps one-half of a centimeter on a side, and not much thicker than a sheet of paper. It could easily fall to the floor and be swept up with the dust. Yet this useless- looking chip represents the most highly skilled technology at every step of its manufacture. At today's level of development, it might comprise 10, 000 separate electronic elements. It replaces many separate circuits, each of which, until recently, formed a network of interlaced wires, resistors, and capacitors, shield coils and vacuum tubes, all hand- soldered into place.

This conglomerate use of separate components was the state of the electronics industry until the development in 1947 of the successor to the vacuum tube: the smaller and more compact transistor. Until then, the heart of the electronic circuit was the "Fleming valve", or vacuum tube, invented in 1904 by Sir John Ambrose Fleming, a British electrical engineer. For 40 years this device underwent constant improvement and, by 1947, came in so many different shapes and sizes and performed so many different functions that it seemed absurd to suppose it could ever be replaced. In reality, for all its sophistication of design, the vacuum tube is inherently unstable, power-hungry, and subject to burnouts and internal short circuits. It also takes up a lot of space.

These are among the shortcomings of the vacuum tube that led to the development of the transistor by Bell Telephone Laboratories engineers who were seeking a more dependable performer to replace the millions of electromechanical relays then used in central telephone stations. Essentially, their transistor was a solid-state version of the vacuum tube-but much smaller, almost indestructible, and considerably more reliable.

The key to the transistor's rapid development was the use of silicon instead of wire as the basic conductive material. This element, which comprises 28 percent of the earth's crust, is not only stable over a wide range of temperatures, but also offers dependable manufacturing control.

It was not long until transistors were being manufactured in great quantities and in as many different configurations as were their predecessor vacuum tubes. They found wide use in space technology, computers, transistors radios, hearing aids, medical instruments, walkie-talkies, television sets——in fact, wherever precise control and modulation of electrical signals were required.

But even in its solid, smaller form, the transistor remained a single component which still had to be combined with other components such as resistors and capacitors to make up a complete electronic circuit. Each component still had to be hand-wired or separately mounted in place.

It was during the early 1950's that the need for ever smaller electronic components became really insistent. Space technology, in which a kilogram of rocket payload was being equated to about $44, 000, was one factor. Large computers called upon to perform hundreds of millions of calculations a second, and global microwave transmission systems added their pressures toward miniaturization and the increased speed of response it provided. Finally, as many millions more circuits were required to satisfy a growing range of applications, there was the added incentive of manufacturing economics possible if a smaller, more easily reproducible form of circuit could be developed.

A practical and original answer was discovered in 1958 by Jack S. Kilby, an electrical engineer assigned to research on the problem by Texas Instruments Inc. of Dallas, Texas. Kilby thought of combining, or intergrating, the entire group of components of an electronic circuit into a single miniaturized device. The result was the IG, combining for the first time the multiple functions of coils, transistors, capacitors, and resistors in one complete unit all on a single, tiny bit of material.

Integrated circuits first appeared in products for the consumer. Battery- operated electronic calculators, digital clocks, and wrist watches were among the early products. The "chip" controls the electric range, oven, and clothes dryer, generates the sound of the electronic organ, and stores phone numbers and then connects them automatically. These and other applications were made possible by declining manufacturing costs. For example, in 1959 a silicon transistor cost as much as $20. 00. Today, a faster, more reliable transistor fabricated as part of a complex memory chip costs only 0. 1 cent.

The integrated circuit has reduced by many times the size of the computer of which it forms a part, thus creating a new generation of portable minicomputers. As a lightweight, portable instrument, the minicomputer is not confined to a fixed position but can be taken to, or placed in, locations where it can solve difficult problems.

In fewer than 10 years the growing range of applications of the IC in the design of industrial products has been phenomenal. Experts now predict that the IC has brought in an era of change so fundamental and wide-sweeping that it already has the characteristic of a second industrial revolution.

Exercises

1. Comprehension

Choose a), b), c) or d) to complete each unfinished statement, making it closest in meaning to the relevant part of the text.

1. According to the passage, the IC ______________.
   a. was discovered 40 years ago
   b. was made to replace the electronic intergrated circuit
   c. was manufactured by a separate wire
   d. has a history of fewer than 20 years
2. It is believed that the IC ______________.
   a. has a great potential in its range of uses
   b. has been fully developed
   c. is the only wonder of electronics
   d. can be utilized in several industries
3. Though an integrated circuit ______________.
   a. is very important to our industry, it is too difficult to manufacture
   b. has a special looking, it is easy to make
   c. looks nothing special, it requires the most highly skilled technology to manufacture
   d. is very small the thin, it can be made by machines
4. The Fleming valve ______________.
   a. is the offspring of the vacuum tube
   b. has made great contributions to improving the vacuum tube
   c. is the forebears of the vacuum tube
   d. has only four serious shortcomings
5. The main reason for the rapid development of the transistor ______________.
   a. is in its small size
   b. lies in the shortcomings of the vacuum tube
   c. is that it can be used in central telephone stations
   d. is the use of sillicon as the basic conductive material
6. The transistor ______________.
   a. has some shortcomings that should be improved
   b. is an ideal electronic circuit
   c. is ideal in space technology
   d. is bigger but more stable than the vacuum tube

7. To satisfy a growing range of applications, it is necessary ______________.
   a. to produce a smaller circuit
   b. to mass-produce the transistor
   c. to find out ways of reducing the manufacturing costs of the transistor
   d. to train more skilled workers
8. The passage is mainly talking about ______________.
   a. the invention of the IC
   b. the history of developing the integrated circuit and its significance
   c. the contributions of the IC
   d. a second industrial revolution

2. Processing

Fill in the blanks with an illustative/defining/equivalent word or phrase, using the information obtained from the text.

1. The integrated circuit differs from ______________ in which all of its ______________ are bonded together.
2. By 1947, the vacuum tube was considered unreplaceable because of its ______________ and ______________.
3. Transistors can be used in any fields where ______________ and ______________ were required.
4. To develop a smaller, more ______, ________, Jack S. Kilby thought of __________ group of components of an __________ into a __________.
5. It is possible for one chip to comprise __________ separate __________.

3. Questions and Answers

Ask as many WH-questions as possible about the given word or phrase and answer one of them in writing according to the text.

1. the vacuum tube
2. the transistor
3. shortcomings of the vacuum tube and the transistor
4. the integrated circuit
5. industrial revolution

4. Translation

A. Put the following sentences into Chinese.

1. This conglomerate use of separate components was the state of the electronics industry until the development in 1947 of the successor to the vacuum tube : the smaller and more compact transistor.
2. In reality, for all its sophistication of design, the vacuum tube is inherently unsta-

ble, power-hungry and subject to burnouts internal short circuits.

3. It was not long until transistors were being manufactured in great quantities and in as many different configurations as were their predecessor vaccum tubes.
4. As a lightweight, portable instrument, the minicomputer is not confined to a fixed position but can be taken to, or ptaced in, locations where it can solve difficult problems.
5. Experts now predict that IC has brought in an era of change so fundamental and wide- sweeping that it already has the characteristic of a second industrial revolution.

B. Translate the following sentences into English, paying special attention to the uses of passive voice' .

1. 人们把电视称为现代电子学的一大奇迹。
2. 他喜欢游泳而不喜欢滑冰。(rather than)
3. 集成电路就是把所有的电路元件集成在一块半导体芯片上。
4. 如果人们能把溶解在海水中的盐分离,海水就可作为饮用水。
5. 集成电路体积小,成本低,因此它的使用范围越来越广。(so that)

5. Vocabulary

Choose the definition which best fits these words or phrases as they are used in the passage.

1. bonded

   a. bound　　b. stuck　　c. integrate　　d. disintegrated
2. conglomerate

   a. concentrated　　b. intensive　　c. accumulative　　d. many parts stuck together
3. absurd

   a. ridiculously unreasonable　　b. unbelievable　　c. congruous　　d. rational
4. configurations

   a. function　　b. arrangements　　c. shapes　　d. lines
5. insistent

   a. persistent　　b. continuous　　c. consistent　　d. urgent
6. incentive

   a. motive　　b. courage　　c. pressure　　d. inclination
7. fabricated

   a. equilibrated　　b. manipulated　　c. manufactured　　d. comprised
8. phenomenal

   a. existing　　b. remarkable　　c. gracious　　d. rhetorical
9. brought in

   a. earned　　b. led to　　c. propelled　　d. introduced

Text B

Preface to the Book "Electronics and Telecommunications

"We have now reached a stage when virtually anything we want to do in the field of communications is possible: the constraints are no longer technical, but economic, legal or political. Thus if you want to transmit the Encyclopedia Britannica around the world in one second, you can do so."

——Arthur C. Clarke

Looking around us and observing the technological developments in electronics and telecommunications all over the world, one is inclined to agree with the futurologists that we have almost reached the Information age and the Information revolution——a revolution much more significant than the Industrial revolution of the last century. The changing social needs and the development of new technologies are bringing the evolution of new communication capabilities in the form of videotex, electronic mail, high-speed FAX, teleconferencing and interactive CATV. These are also leading to automated offices and wired homes, where most of the future information will be generated, processed and utilized for running the industries, business and the government, and for education and recreation. At the same time, the spectacular developments in solid state electronics, computers, digital switching and transmission, have brought in the Digital revolution leading to universal digital connectivity. It is also evident that communication is getting more and more integrated with computers and data networks, and eventually, we shall have a fairly integrated general purpose computer-communication (C&C) network. These C&C networks with their flexibility and multiservice facilities will then lead to the Integrated Services Digital Network (ISDN), which is the desired goal of the current developments in telecommunications.

The futuristic ISDN will not only provide the global digital connectivity through digital switches and digital transmission, but also the required signal processing, data compression, data protection and storage. Technological advances in devices may eventually result in the complete 'system on-a-chip', requiring completely new approaches to the system design. As a consequence of the above wide ranging developments, the academicians will have to develop new unified theories for end-to-end information systems, including models of humans as information processors. We shall thus need in future more information and communication theorists than we need now; and these theorists will have to be trained in a wide variety of disciplines and technologies.

Most of the technological developments in digital communication has been very rapid and has taken place only during the last two decades. As a result, the senior professionals and academics have not been able to keep pace with these developments and therefore, have an urgent need to update their knowledge in these areas. Moreover, it is very necessary that our electrical engineering students, specialising in communication, must have a strong base in digital communications systems as well. Unfortunately, a comprehensive book giving the 'state-of-the-art' information on Digital Communication is not available so far. To fulfil the need of such a book, the present volume has been written, presenting a review of the recent developments in important areas of digital communication.

The book consists of ten chapters, and discusses such topics as: principles of digital modulation, source encoding, data transmission through cables and optical fibres, digital radio including satellite communication, data networks and digital switching, information theory and coding, survival of communication including spread-spectrum techniques, and future trends including ISDN. Conceptually, a system point of view has been taken in discussing the various topics, and the total range of digital signal processing necessary in a digital network, has been brought out in subsequent chapters, thus presenting a continuity of thought from end-to -end. The main emphasis has been on the 'state-of-the-art' and to discuss important results in the context of present-day developments in digital communication networks. Most of the information contained in the book are now available only in published journals. The book also contains an exhaustive bibliography.

The book is an outgrowth of the author' s teaching and research activities in the area of digital communication over the last three decades. Further the author has been called upon, over the years, to give many series of lectures in various international and national workshops. The book is actually compiled out of these lecture notes, presently edited and updated. It is hoped that the book will fulfil the need of a reference volume for the faculty and the professionals; and the exhaustive bibliography would help the reader to continue further reading in the area of his interest. The book may also be used in teaching courses in digital communication systems by selectively choosing the topics of interest. The contents of the book is mainly complementary (but in a few cases overlapping) to the topics in 'principles of Digital Communication by Das, Mullick and Chatterjee. By choosing selectively from the two books, two/three semester courses at the senior level may easily be organised. Although the book is primarily addressed to the professionals, it is no doubt that the senior students and academics will also find it useful and informative.

In writing the book, the author has drawn largely from the published materials in recent journals and some of the recent books in communication. As such, the author is indebted to a large extent to his predecessors and the researchers; and the acknowledgements have been made in proper places in the text. The author has spent a lifetime at the Iindian Institute of Technology, Kharagpur and recently at the Indian Institute of Technology, Kanpur, and as such, he is largely indebted to his innumerable students, some of them colleagues later on, for the intellectual enrichment he derived through their interaction in classrooms, laboratories and research projects over all these years.

Exercises

1. Comperhension

Read each of the following statements carefully and decide whether it is ture or false according to the text.

1. The world has developed so fully that we can do anything we want to, especially in the field of communications.
2. The technological developments in electronics and telecommunications throughout the world have shown that Information age has arrived.
3. Compared with the Industrial revolution, the Information revolution is much more important, but the Digital revolution is the most important.
4. As communication is getting more and more integrated with computers, we may invent computer-communication network and the Integrated Services Digital Network to replace the pressent simple communication tools.
5. With wide ranging developments in telecommunications, more information and communication theorists will be needed to develop new unified theories.
6. In digital communication, the technology is quite complicated, which leads to a standard development, and thus will take a long time to fulfil the development.
7. There is no doubt that if the senior professionals can not keep up with the developments in digital communication. the developing speed will be slowed down, and there will be an inestimable loss.
8. The passage suggests that the author will give the 'state-of-the-art' information on Digital Communication in his book.

II. Processing

Fill in the blanks with an illustrative /defining/ equivalent word or phrase, using the obtained information from the text.

1. In the field of communications the technolgy has been advanced to such a stage that we can not find any ______________ but ________, ________ or ________.
2. The evolution of new communication capabilities includes ____________, ____________, ____________, ____________ and interactive ____________.
3. The Digital revolution has taken place because of the conspicuous developments in ____________, ____________, ____________ and transmission.
4. The Integrated Services Digital Network, the desired goal of the current developments in ____________ will provide the universal ____________ through ____________ and ____________, but also the required ____________,

____________, ____________ and ____________.

5. According to the author it is very necessary for those who want to specialise in ____________ to have a strong base in ____________.

Ⅲ. Questions and Answers

Answer the following questions with the information obtained from the text.

1. What is the Information revolution? What functions can it perform?
2. Communication is getting more and more integrated with commputers and data networks and in the end the C and C network will be devised. Do you know anything about the C and C network? If possible, please explain its features in detail.
3. What is ISDN? Why is it called the future trend?
4. What does the 'state-of-the-art' mean? Why does the author stress it in his book?
5. In the author' s mind digital communication systems are very important. Do you agree or disagree? Give your reasons.

Ⅳ. Write a brief introduction about the author' s book. Remember your introduction must be based on the preface.

Text C

Television: The Modern Wonder of Electronics

Television, or TV, the modern wonder of electronics, brings the world into your own home in sight and sound. The name television comes from the Greek word tele, meaning "far", and the Latin word videre, meaning "to see". Thus, television means "seeing far". Sometimes television is referred to as video, from a Latin word meaning "I see". In Great Britain, the popular word for television is "telly".

Television works in much the same way as radio. In radio, sound is changed into electromagnetic (invisible light) waves which are sent through the air. In TV, both sound and light are changed into electromagnetic waves. Experiments leading to modern television took place more than a hundred years ago. By the 1920s, inventors and researchers had turned the early theories into working models. Yet it took another thirty years for TV to become an industry.

As an industry, TV provides jobs for hundreds of thousands who make TV sets and broadcasting equipment. It also provides work for actors, technicians, and others who put on programs. As an art, television brings the theater and other cultural events into the home. Its influence on the life of average Americans is incalculable; it can influence their thoughts, their likes and dislikes, their speech, and even their dress. It can also add to their store of knowledge. Through advertising, television helps businesses and manufacturers sell their products to millions of persons. Television has brought political campaigns closer to the voters than in former days. Educational TV stations offer teaching in various subjects ranging from home nursing to art appreciation. Many large schools and universities have "closed-circuit" television equipment that will telecast lectures and demonstrations to hundreds of students in different classromms; and the lecture can be put on video tape to be kept for later use. Some hospitals use TV to allow medical students to get close-up views of operations.

In 1946, after World War Ⅱ, TV began to burst upon the American scene with a speed unforeseen even by the most optimistic leaders of the industry. The novelty of seeing TV pictures in the home caught the public 's fancy and began a revolution in the world of entertainment. By 1950, television had grown into a major part of show business. Many film and stage stars began to perform on TV as television audiences increased. Stations that once telecast for only a few hours a day sometimes telecast around the clock in the 1960s.

With the development of programming also came the introduction of television in full color. By the middle 1960s, the national networks were broadcasting most of their programs in color. The obvious appeal of television, whether in color or black-and-white, can be documented by the increasing number of TV sets in homes around the country. By the mid-1960s, 90 percent of the households in the United States had at least one TV set, and 12 precent had two or more sets. TV had become a part of the daily life of the adults and children of America.

The programs that people watch are not only local and national ones. Since the launching of the first communications satellite, more and more programs are televised "live" from all over the world. Television viewers in San Francisco were able to watch the 1964 Olympic Games in Tokyo by means of a communications satellite named Syncom. The Olympic Games in Mexico City and Munich, Germany, were also telecast live, as were parts of the historic visit of President Nixon to the People 's Republic of China. And live telecasts now come from outer space. In 1969, the first astronauts to land on the moon televised their historic "moon walk" to viewers on the earth. Since then, astronauts have regularly sent telecasts to the earth.

It looks as if the uses of television--in education, entertainment, and communication--appear to be endless. Certainly it is one of the major modern wonders of electronics in our changing world.

Exercise

Comprehension

Read each of the following statements carefully and decide whether it is true or false according to the text.

1. Televison, called the modern wonder of electronics, which comes from the Latin word, means "seeing far".
2. Television works just like the radio, in which sound is transformed into electromagnetic waves through the air.
3. Scientists started the experiments of modern television more than a hundred years ago, but its working models were successfully made in 1920s.
4. As an industry, television has made incalculable profits.

5. Unfortunately at the beginning television has made great influence only on the life of average Americans.
6. Nowadays television can offer various services to almost all fields in our life.
7. Throughout the 1960s, television stations in the U. S. telecast 24 hours every day.
8. Live telecasts have come into being since the first communications satellite was launched.

Lesson 2

Text A

A Journey to Driverless Reality

Progressing from Cugnot's steam powered design to today's fossil fuel driven automobile, the 21st century will see commercialisation of methanol engines, gas turbine engines, electric motors and other alternative means of vehicle power.

Not only has the means of automobile power changed since the 18th century, so too has its design. Considerations of fuel conservation, the reduction of environmental pollution, greater safety, better serviceability and improved handling and comfort have been the reasons.

While not ignoring continuing improvements in mechanical design, electronics has made a huge contribution in enabling car designers to meet these design challenges now and for the future.

As an indication of how big electronics has become in the automobile industry, the Detroit Free Press recently reported that the world automakers spent up $25bn on electronics last year and expect to spend up to $28.5 bn next year.

Today, electronics account for up to 25% of the overall value of a luxury automobile while the average vehicle normally contains electronics worth around 10% which is expected to double over the next few years.

The increasing use of electronics in automobiles is also raising the overall level of reliability in vehicles. According to US company, JD Power and Associates, the number of defects per hundred vehicles in the US dropped from 167 in 1987 to 141 last year. It attributed to the continual decrease of vehicle defects as being directly related to the continual increase of car-makers using electronics.

The past

Utilisation and testing conditions of automotive electronics today are comparable to those in aviation. The nature of automobiles requires electronic components to be subjected to extremely high loads, operate at temperatures ranging from $-30°$ to $+100°C$, and be able to withstand vibrations, shocks and other environmental influences such as moisture. Furthermore, the outputs which must be controlled or temporarily switched are often relatively high.

Before the early'60s electronic components were not considered reliable enough for automobile purposes and were also affected by electromagnetic interference and noise. To combat these uncertainties, component manufacturers began to burn-in components and design protection for semiconductors and circuitry.

Therefore the early' 60s heralded a rapid move by the automobile industry into the use of solid state electronic devices. An example was Ford in 1961 which installed an all solid state radio in its vehicles and later in 1973, solid state ignitions were incorporated into its cars. BMW Australia says the transistorised voltage regulator for alternators was BMW's first practical use of electronics in its vehicles.

In the early'70s, the US Muskie Law was passed in California, heralding a new age in automobile design considerations. The realisation that car emissions would have to be dramatically reduced in order to protect the environment and concern for the declining world reserves of fossil fuels resulted in the tight restrictions of the law which set down future fuel economy standards and exhaust emissions regulations. Japan also issued regulations and it became obvious that conventional automobile principles of the time could not meet these standards. It was fortunate for the car industry, the laws were passed around the same time as a technological revolution began with semiconductors—the microprocessor.

Microprocessors enabled automobile designers to integrate car systems to meet the new standards. The original systems utilised microprocessors of relatively low performance by today's standards but were nevertheless the leading edge technology of the day.

An example of the implications of the laws was Toyota which was producing twin-cam engines for its vehicles at the time laws came into effect. The laws virtually eliminated Toyota's engines from use. A solution was found in an Electronic Fuel Injection(EF1) system based on microprocessors. The devices accurately measured the intake air volume of the engine and commanded the injection of the precise amount of fuel needed. Fuel efficiency and the level of exhaust emissions was dramatically improved enabling the engine to meet the new standards.

During the'70s, microprocessors were developed with increased capacity, offering greater processing speed and memory. Nissan introduced a microcomputer into its Cedric model in 1979. Called the ECECS(Electronically Concentrated Engine Control System), it was also installed in Nissan's Silvia model in 1979. The Salvia model was additionally equipped with a drive—computer(a simple information system for navigation).

In 1984, Toyota developed a custom-designed single-chip 8-bit microcomputer for being used in engine control systems. This microcomputer was subsequently applied to most of Toyota's real-time control systems. Toyota is currently developing a 16-bit single chip microcomputer for larger systems.

Over the past 15 years, engine management systems have changed from entirely analogue-based to digital systems. The digital approach has very much followed the history of the microprocessor in all facets of our lives.

The present

Today, most systems designed are based around microprocessors with special features designed specifically for automotive use. Even digital signal processing functions are appearing on some microprocessors, enormously enhancing the signal computation capabilities of systems.

With greatly improved processing devices, car designers and manufacturers are now able to