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# JPRS Report

# Science & Technology

## China

JPRS-CST-88-014

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# SCIENCE & TECHNOLOGY

# CHINA

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# Success Claimed in Microgravity Experiments

40080146a Beijing GUANGMING RIBAO in Chinese 13 May 88 p 1

[Article by Liu Jingzhi [0491 2417 2535]]

[Text] This reporter recently learned that the microgravity experiments carried out on China's retrivable satellites has produced encouraging scientific results.

In an experiment conducted by the Institute of Semiconductors of the Chinese Academy of Sciences, it was found that when gallium arsenide crystals are grown under microgravity conditions, there are no impurities in the torch-shaped crystals, whereas the earth-grown crystals have obvious lines of impurities. Also, the doping uniformity of space-grown crystals is significantly improved over that of earth-grown crystals.

In another experiment conducted by the Lanzhou Institute of Physics which was part of the Ministry of Aerospace Industry, the behavior of moistened indium and cadmium were studied. The results show that on earth both indium and quartz glass have moisture content whereas under microgravity conditions they are free from moisture and they form a small ball in the test tube. Furthermore, on earth indium and cadmium are mutually solluble when heated to a temperature of 340$^{o}$C, but under microgravity they separate into two small balls.

The Institute of Botany of the Academy of Sciences conducted an experiment to study the effects of microgravity and cosmic radiation on the germination of plant seeds and the growth of seedlings. The results show that most of the seeds retrieved from space are more active and germinate earlier, and the seedlings exhibit accelerated growth, but their external appearances remain unchanged. The seeds which exhibit this behavior include the seeds of cucumber, Chinese pine, white pine, etc. The seeds of peas and sponge gourds exhibit reduced rate of germination and slower growth after returning from space; it was found that for these seeds, the growth of the main root is clearly retarded and their leaves turn red much earlier. The most interesting phenomenon is that the seeds of cockscomb flower retrieved from space not only show enhanced activities and accelerated germination, but also produce green flowers instead of the conventional velvet color; this is true whether the seeds are in space for 5 days or 8 days.

Officials told this reporter that these results show that developing microgravity factories and bio-engineering projects in space has obvious scientific value.

Breakthrough in Mathematics Has Space, Defense Implications

40080146b Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 8 Jun 88 p 4

[Article by Wang Yugong [3769 0645 1872]]

[Text] Chinese mathematicians achieved a recent breakthrough in mathematics by solving a difficult problem in partial differential equations which deals with the "Convergence Properties of the (La-ke-si-Fu-li-de-Li-xi) Differential Equations in Isentropic Flow".

Among the participants in this study are: Ding Xiaxi, director of the Wuhan Institute of Mathematics and Physics of the Chinese Academy of Sciences, Lo Peizu, research associate of the Institute of System Engineering, and Chen Guiqiang, PhD in mathematics. Mathematicians around the world consider their contribution to be of such significance that "any mathematician would be proud of."

Isentropic flow is a typical fluid flow in which discontinuities often occur. The study of isentropic flow has important applications in hydraulics, aviation, defense problems and meteorological observations. This problem has been considered by the international mathematics community as one of the major research topics in mathematics. Over the past three decades, many mathematicians around the world have devoted a great deal of energy to this problem, but with little success. In an attempt to study the unsteady flow problem in the "Shan Xia" section of Yantze River and to carry out calculations to describe the characteristics of shock waves in a nuclear explosion, China began studying this problem in the 1950's. Specifically, in 1958, with the help of Ding Xiaxi, Prof. Wu Xinmo of the Institute of Mathematics of the Chinese Academy of Sciences initiated and organized this study. During the following years, the study was interrupted several times due to a number of unforeseen reasons. Not until 1983 were Ding Xiaxi and others able to concentrate their efforts on this difficult problem. Their study used an innovative approach which combines the methods of classical theories with modern theoretical techniques.

The publication and presentation of a series of papers on "The General Solution of the Fluid Dynamic Equations of Isentropic Flow" prompted enthusiastic responses from the mathematics community. Many well-known mathematicians wrote to request copies of their papers and they generally

regarded the authors to be leaders in this field. In a letter addressed to the Wuhan Institute of Mathematics and Physics, Mr Gramm, who is a member of the U.S. Academy of Sciences and the director of Computer Science Department of the Courant Institute of Mathematics and Physics, pointed out that "Ding Xiaxi et al not only had solved a difficult problem of great mathematical interest, but their achievement also represented a major breakthrough from the point of view of overall mathematical development." A professor of mathematics of the University of Maryland, Liu Taiping, agreed: "The papers published by Ding Xiaxi et al represent one of the most important contributions in the areas of non-linear partial differential equations and numerical analysis."

/03012

# Forecast for Low-Alloy, Alloy Steels by Year 2000

40080085 Beijing GANGTIE [IRON AND STEEL] in Chinese Vol 23 No 1, Jan 88 pp 55-60

[Article by Zhao Xiancun [6392 0341 1317] of the Central Iron & Steel Research Institute: "Forecast for Low-Alloy and Alloy Steels by the Year 2000"]

[Excerpt] 2. Present Status and Existing Problems of Low-Alloy and Alloy Steels in China [7-9]

## 2.1 Present Status of Low-Alloy and Alloy Steels in China

When the government was founded, China could only smelt several dozens of alloy steels and roll over a hundred steel products. Now, we can smelt close to a thousand types of steels and make over 10,000 steel products. In 1985, alloy steels made up nearly 7 percent and low alloy steels 13 percent. Regarding key materials in building up the national economy and defense, China is essentially self-sufficient.

In the Sixth 5-Year Plan, because of the adoption of new technologies such as molten iron pre-treatment, out of furnance refining, controlled rolling, 76 steel materials for ship building, oil pipelines, automobiles and mining were made in compliance with or equivalent to international standards. Laminated tear resistant steel for oil drilling platforms, weld crack-free steel, X60 and X65 pipes, and weather resistant steel have been successfully developed and are comparable to similar products made in other countries.

## 2.2 Existing Problems With Low-Alloy and Alloy Steels in China

Despite the progress made in low-alloy and alloy steels, China still lags far behind compared to what is needed for economic build-up and national defense. It is particularly so compared to the steel industry in developed countries. The major problems are:

Insufficient Production Capacity: Even if China produces 8,000 x $10^4$ tons of steel by the year 2000, it is still not enough to meet domestic needs and it will be necessary to import a considerable amount of steel.

Incomplete Varieties: The key problem is the supply of high profit products, such as low cost cross-section steel, coated steel, multi-layered steel, composite surface steel, cold work steel, steel wire and its associated products, and products related to powder metallurgy, in quantity and the supply for extra large pipes, extra wide sheets, composite sheets and pipes, and large diameter thick wall steel pipes.

Quality Improvement Required: International standards should be followed in the technology reform. The quality of steel should continuously be improved. In particular, the quality of the steel surface must be improved and the dimensional tolerance reduced.

## 3. Outlook for the Development of Low-Alloy and Alloy Steels by the Year 2000

### 3.1 Prospect of New Structural Steel by the Year 2000 [1, 2, 5, 7]

Based on the trend that low-alloy and alloy steels are being upgraded, more varieties are being produced, energy conservation is being implemented, and functionality is being stressed, the following new structural steels will be developed to meet the demand by high technology industries:

1) Ultra-High Purity Steel

Ultra-high purity steel is several fold to several dozen fold purer than the current steel. When the purity of steel reaches a certain level, the properties also change. Ultra-high purity steel is limited in supply by cost which involves the technique, optimization of parameters and quality of raw materials.

By the year 2000, there will be super clean structural steel, ultra-low oxygen bearing steel, ultra-low phosphorus austenitic stainless steel, super clean high ductility high strength (not high strength or high ductility) steel for making low temperature vessels, ultra-high purity *martensitic aged steel, *martensitic aged stainless steel and ultra-high purity ferrite stainless steel.

The useful life of parts made of ultra-high purity steel will increase several to several dozen fold. Thus, the full potential of the steel can be realized to conserve materials.

2) Super High Quality Sheets

Quality has always been the key issue with low-alloy and alloy steels. The trend is moving toward super high quality sheets. With the adoption of new technology and process, the quality of most steels has been significantly improved. If we do not devote all the resources to develop super high quality low-alloy and alloy steels, they will be obsolete.

By the year 2000 the following super high quality low-alloy and alloy sheets will be available:

(1) super high speed steels: including segregation-free high speed steel and high hardness (HRC greater than 70) powder high speed steel.

(2) super tool steels: including super refractory alloy tool steel, ultra-hard carbide and nitride treated tool steels.

(3) super spring steels: including super elastic spring steel and ultra-high fatigue strength spring steel.

(4) super high strength steels: including ultra-high impact malleability high strength steel, high weldability high strength steel and high hardenability high strength steel.

(5) super high temperature steels: including super high strength heat resistant steel, ultra-high temperature corrosion resistant steel, fiber reinforced heat resistant steel, surface treated heat resistant steel, powder sintered heat resistant steel and composite heat resistant steel.

(6) super stainless steels: including stress corrosion free stainless steel, stress corrosion resistant austenitic stainless steel, surface treated stainless steel (particularly amorphous surface stainless steel, super pitting resistant stainless steel, super corrosion fatigue resistant stainless steel), high corrosion resistant (particularly againt chloride) high and ultra-high stainless steels, high erosion resistant stainless steel, high erosion and fatigue resistant aged martenistic stainless steel, gas erosion and wear resistant high strength stainless steel, etc.

(7) other super steels: including super easy cutting steels and stainless steels, structural steel without mass fluctuation in quenching, super heat and acid resistant bearing steel, long life linear motion bearing steel, etc.

3) Super High Precision Steels

These primarily include: ultra-high precision rolled structural steel, super high mirror surface tool steel, ultra-high precision bearing and small bearing steels, precision bearing rod steel and undistorted steels prepared by various surface treatments such as carburized hardened steel.

3.2 Application of High Technology in the Development and Applied Research of Steels

Electron beam, ion beam and laser can be used as the heat source in the smelting, refining, thermal processing, heat treatment and welding of low-alloy and alloy steels.

Fast quenching of liquid steel may become a practical technique to produce micro-crystal super plastic continuous cast low-alloy and alloy steel billets.

Super slow cooling technique may be used to produce large single crystal super magnetic and heat resistant materials by crystal pulling or zone refining method.

Through directional solidification of an eutectic alloy, an orientational composite material may be produced.

Ion implantation may be used to make wear resistant, corrosion resistant, erosion resistant, oxidation resistant, or high fatigue performance materials. It is particularly promising with rare earth elements which are only slightly soluble in steel and are ineffective using conventional chemical and physical means. Because ion implantation involves the injection of fast ions of the element of interest into the iron lattice, it is not limited by chemical thermodynamics.

The practical use of techniques to produce micro-grain or amorphous steel surface can result in new wear resistant, corrosion resistant, and high strength low-alloy and alloy steels. In addition, the research on fine grain and micro-grain steels is near the application stage.

The use of impact wave by laser irradiation to harden the surface of low-alloy and alloy steels is almost practical.

The most recent results in telemetry, computer and artificial intelligence will be used to establish a database of characteristics of low-alloy and alloy steels, a database of theoretical alloying data, an expert system to select steel, a new steel design expert system, and a steel component failure analysis expert system to elevate the development and application research of steels to a new level.

3.3 Important Aspects in the Development of Low-Alloy and Alloy Steels With High Technology

1) Pragmatic Utilization of Low Cost Functional Low-Alloy and Alloy Steels

(1) Noise and Shock Absorbing Steel:

By the year 2000, composite material made of noise absorbing and shock absorbing steels will be pragmatic. For instance, a layer polymer of finite thickness can be sandwiched between a sheet of sound absorbing steel and a sheet of shock absorbing steel. A glassy material can be placed between the inner and outer pipes made of sound absorbing steel and shock absorbing steel to form a composite noise resistant pipe. A plastic material (such as 0.6 mm PVC) can be sandwiched between a 0.2 mm shock absorbing sheet and a 0.2 mm sound absorbing sheet. It is resistant to heat and coldness, and is shock absorbing and has more or less the same rigidity as a steel plate for identical thickness. By 2000, sound and shock absorbing steel will be widely used in automobiles, electrical machinery, industrial machinery, bridges, stairs, sound barriers for presses, tractors, sound absorbing structures along high speed railroads, and steel structures in workshops with loud noise. The production of shock and sound absorbing steel in developed nations will grow from several thousand tons per year to tens and even hundreds of thousand tons per year. Sound and shock absorbing steel will become a key area in functional steel structure. It is receiving a great deal of attention in the world.

(2) Low Cost Steel for Effective Hydrogen Storage:

Hydrogen is an unlimited resource. It may be the most important, economic and clean energy source in the 21st century. This is because the combustion product

product of hydrogen is water and the amount of heat generated is 24 times that of gasoline. Because hydrogen can be obtained from seawater which is abundant on earth, the key issue is the development of cost effective hydrogen generating processes.

The driving force behind the development of hydrogen storage materials is the hazardous nature of transportation of pressurized liquid hydrogen.

Currently, the La-Ni series, Mg-Ni series, Zr-Ni series, Ti-Cu series and amorphous hydrogen storage materials have been developed. The Zr-Ni series alloys survived over 100 times of usage without turning into powder. The hydrogen storage efficiency of the Ni-Fe series alloys is 50 percent higher than that of other hydrogen storage materials. However, the cost is too high to be used widely when hydrogen becomes the primary energy source.

The hydrogen storage capability of the Ti series and Ti-Nb-S series being developed presently is even not as good as that of conventional hydrogen storage materials. There is a great deal of work to be done on the Fe-Ti-RE series, Fe-Ti-FE-S series and other types of steel for hydrogen storage. The research in this area should begin promptly.

(3) Shape Memory Steel:

More than 100 shape memory steels have been developed. The typical alloy contains Ni-Ti or Cu-Al-Be. The former has very good corrosion resistance and can be used up to $10^6$ times without any change in its properties. However, it is too expensive to be widely used in everyday life.

The key issues for future research are to expand the temperature range over which the shape can be restored and to improve the process to lower the cost.

In summary, not enough research has been done on shape memory steel. First, we must strengthen the development and application of thermoelastic martenistic steel. However, the scope of the investigation should be larger. It is believed that the development of memory steel will result in its practical use in the near future.

2) Range of Applications of Composite Materials Expanding

The ductility, corrosion resistance, wear resistance, radiation resistance, and noise and shock absorbing capability of low-alloy and alloy steels can be improved by composite technology. In addition to composite materials made of different dissimilar metals or metals and non-metals, these materials may be categorized from the structure point view into diffusion strengthened, grain reinforced and fiber reinforced composites.

Along with the progress made in high technology, the requirements of materials become more demanding. A single material can hardly meet these strict requirements. Therefore, composite materials will be used in a wider area. In general, surface treatment and surface alloying belong to the field of composite materials. Specifically, they are in the domain of laminated composite materials.

3) Low-Alloy and Alloy Steels for the Development of the Ocean

(1) The development of the ocean requires the use of a series of high strength steels (including high strength stainless steel), seawater corrosion resistant stainless steels, biphasic stainless steels, martenistic aged stainless steels, and steels resistant to the adhesion by organisms in the ocean.

(2) The strength of large steel structures for surface docking equipment, underwater digging equipment and deep sea survey vessel is generally over 500 MPa. In some cases, it exceeds 1000 MPa.

(3) The footings of ocean structures, the chains for docking, the pipeline to transport oil and magnesium nodules, and the hull for an underwater survey vessel have over 800-1000 MPa in strength. In some cases, it is over 1500 MPa.

(4) It is possible to develop a high strength, high ductility, seawater corrosion resistant steel which will not attract ocean organisms and is easy to weld for the construction of the hull of a ship.

4) Development and Use of a Series of Steel for Energy Exploration

(1) Develop and use a series of ocean atmosphere resistant steel, seawater resistant steel, seawater resistant high strength steel and seawater resistant super high strength steel for tidal power generation.

(2) Develop and use a series of low-alloy erosion resistant steel, corrosion resistant steel, cavitation resistant steel, high strength stainless steel and wear resistant steel for geothermal power generation.

(3) Develop and use a series of pressure vessel materials, reactor core materials (which must be high temperature, corrosion and radiation resistant) and shielding materials for high temperature air-cooled reactors, sodium cooled fast neutron reactors and nuclear fusion reactors.

(4) Develop and use a black stainless steel sheet with high absorption coefficient, low reflectivity and high overall thermal efficiency with respect to solar energy.

4. Conclusions

In order to shorten the gap between China and other countries in the world in low-alloy and alloy steels, to allow China to catch up to the late 1980 level by the year 2000, we must combine the conclusions reached about the present status and future development trend in the world with the situation in China to formulate a practical and feasible policy.

4.1 In the research, development and production of low-alloy and alloy steels, we must realize that the overall trend is "quality improvement, product varieties, energy conservation, and functionality." We must promote:

1) the development and applicationof high purity, high uniformity, super fine structure steel and precision steel.

2) the development and application of various product varieties:

(1) Composite Materials: the development and application of composite low-alloy and alloy steels in sheet, pipe, ribbon and wire form and composite materials with functionality.

(2) the development and application of surface alloyed or treated low-alloy and alloy steels.

(3) the development and application of precision cast parts, cast parts close to the shape of the product, precision forged parts, precision rolled parts (sheet, pipe, ribbon and wire), and powder made products.

(4) the development and application of deep machining of low-alloy and alloy steels, low cost cross-section steel, cold bent steel, plated and coated sheets, heterogeneous cold draw and extrusion materials, and steel wires and wire products.

(5) the development and application of special alloy casting pigs such as heat resistant alloy, wear resistant alloy and corrosion resistant alloy.

4.2 Focus on high technology in the research, development, production and application of low-alloy and alloy steels:

1) Develop and use high technology in raw material production, smelting, refining, processing, thermal treatment, welding and on-line inspection of low-alloy and alloy steels.

2) Develop and use high computers, artificial intelligence machines, telemetry and robots in the research, development production and management of low-alloy and alloy steels.

3) Develop and use different databases (steel characteristics, steel production equipment and techniques), theoretical alloying parameters and various expert systems (steel design system, steel selection system, life prediction and failure analysis system for steel parts).

4.3 Special attention must be given to the fundamental theory of low-alloy and alloy steels. The future material is not going to be a random product. New materials and the associated technologies can only be developed with a profound understanding of the basics.

4.4 Develop and use high technology to make low-alloy and alloy steel structures functional.

4.5 Formulate a long range plan and policy to scientifically develop low-alloy and alloy steels. This has a significant impact on the speedy development of low-alloy and alloy steels in China.

REFERENCES

1. Zhao Xiancun [6392 0341 1317] and Song Weishun [1345 3634 7311], Projection of the Development of Metals (Key Steels) in the 21st Century, (internal information), 1983.

2. Science and Technology in Iron and Steel, 1987. 2.

3. Hans-Friedrich Marten, H.-J. Engell and Hartwig, Stahl und Eisen, 1986, No 6, 245-253, 269-278.

4. Dieter Schauwinhold, et al, Stahl und Eisen, 1986, No 13, 715-744.

5. Yoshigi Kobayashi, Specialty Steel, 1986, No 2, 42-48.

6. Yan Feng [7051 1496], Current SUatus and Future Trend in Specialty Steel, Intelligence Office of the Ministry of Metallurgy Industry, 1984.

7. Quan Yujia [0356 6877 0857], Current Status and Future Outlook of Iron and Steel in China, First China Materials Discussion Meeting, 1986.

8. Zhou Chuandian [0719 0278 0368], Iron and Steel, 20 (1985), No 1, 1-4.

9. Na Baokui [6719 1405 7608], Iron and Steel, 21 (1986), No 6, 1-3.

12553/9274

Electromechanical Exports Heat Up in Shanghai

40080115a Shanghai JIEFANG RIBAO in Chinese 17 Mar 88 p 1

[Article by Wang Chengfeng [3769 2110 0023] and Zhang Zhiyuan [1728 1807 6678]: "The Electromechanical System in Shanghai Gets 'Hot' About Exports"]

[Text] To expand the export of machinery and electronics, the Municipal Bureau of Electromechanical Industries has implemented open competition as it determines bases for the export of electromechanical products and defines enterprises with expanded authority for foreign trade. Both large factories of 10,000 people and smaller factories with only 100 people may become bases for the export of electromechanical products and enterprises with expanded authority to trade abroad as long as they comply with the conditions. Consequently, more than 100 enterprises in the electromechanics industry are generating an "export fad." As of this time, 28 firms have attained status as bases for the export of electromechanics products and as enterprises with expanded authority for foreign trade, which is 2.4 times that of last year at this time. These 28 enterprises account for about 70 percent of the gross volume of foreign exchange generated by exports within the scope of this Bureau.

To encourage the export of electromechanical products, the Municipal Bureau of Electromechanical Industries has clearly determined that within the scope of this Bureau all enterprises annually generating foreign exchange through exports at volumes of 3 million U.S. dollars and more, or whose annual export volumes are at 50 percent or more of the gross industrial output values of that enterprise, may apply to become a base for the export of electromechanical products; enterprises whose annual exports generate foreign exchange in the amounts of 1 million U.S. dollars and more, or whose annual export volumes are at 10 percent or more of the gross industrial output values of that enterprise, may apply to become enterprises with expanded authority for foreign trade. This changes the former method whereby these categories were determined administratively, and introduces the mechanism of competition.

With the implementation of open competition, the electromechanics industry has experienced an unprecedented "export fad." The costs of exchanging currency for electomechanical products is rather high and many enterprises originally felt that "selling abroad is not as good as selling domestically"

and were unwilling to export. But now these enterprises are trying every way they can to seek out channels for export. Two years ago, a Shanghai magnetic coil plant was generating no foreign exchange from exports, but last year it found a total of five import companies to which to export magnetic coils, and in one year has generated nearly 2 million U.S. dollars in foreign exchange. As of now, there are already 161 enterprises in the Municipal Bureau of Electromechanical Industries system that have products to export, which is more than two-thirds of the non-governmental enterprises in the Municipal Bureau of Electromechanical Industries. For the last 2 years, the volume of foreign exchange generated from exports has grown at an annual rate of 50 percent, and the foreign exchange generated from exports last year for the entire bureau exceeded 100 million U.S. dollars, which was foremost among machine industries throughout China.

To most expediently meet the demands posed by bases for the export of electromechanical products and enterprises with expanded authority for foreign trade, many small to medium enterprises in the Municipal Bureau of Electromechanical Industries system have moved to join together to arrange for exporting under the leadership of a collective of enterprises and to engage in competition. Enterprise collectives for electrical machinery, electric wire and cable, appliances, and printed packaging machinery have joined closely with relevant enterprises to rationally sell their production capacities both domestically and abroad, giving preference to ensuring the export of commodities. There are currently 28 export bases and enterprises with expanded authority in the system of the Municipal Bureau of Electromechanical Industries, and they are generating an annual volume of foreign exchange of 67 million U.S. dollars, which has become the core strength of export production in the bureau.

After implementation of open competition, eight older export factories have been approved as bases for the export of electromechanical products and enterprises with expanded authority for foreign trade, and they are actively using their existing favorable conditions to directly compete in international markets. The majority of these enterprises have implemented export agency systems, which can directly negotiate, quote prices, and sign contracts. To adapt to competition in international marketplaces, these enterprises have proceeded to establish production systems that concentrate on foreign marketing. For example, the Shanghai Microbearings Plant can already quote prices within 2 days, within 2 weeks can design new products as proposed by foreign businesses, and within 2 months can provide sample export products. The strengthened export competitiveness has allowed this factory to achieve a higher reputation within the international markets, and their volume of exports is about 90 percent of the exports of similar products throughout China. Recently, the Municipal Bureau of Electromechanical Industries has also actively created the conditions under which some export base enterprises can further develop to become legal export entities managing their own exports. With the approval of the Ministry of Foreign Economic Relations and Trade, the Shanghai Machine Tool Plant has become one of the first independent units for engaging in foreign imports/exports. There are at present some other units in the process of seeking such approval.

12586/9604

## Second of Six Key Laboratories Opened in Shanghai

40081062a Beijing RENMIN RIBAO in Chinese 20 Mar 88 p 3

[Article by Xinhuashe Reporter Wu Yingxi [0702 5391 3556] and Correspondent Lu Guoyuan [7120 0948 0337]: "Six Key National Level Open Laboratories Built in Shanghai"]

[Text] A key national molecular biology laboratory specializing largely in the study of biomacromolecules, molecular genetics, and biomembranes has been built recently in Shanghai, and has been formally opened to both Chinese and foreign scientists. This is the second of six key national level public laboratories to be built in Shanghai for the purpose of further promoting both basic and applied research, and to advance scientific exchanges with all the nations of the world.

Previously, a genetic engineering laboratory capable of gene cloning, protein analysis, and cell line and strain conservation research had been built in 1986 on the campus of Fudan University in Shanghai, with China's renowned geneticist and director of the Fudan University Genetic Research Institute, Tan Jiazhen [6151 1367 2823], as director of the laboratory's academic committee. The remaining four laboratories still under construction are: the marine engineering laboratory, the oncogene research laboratory, the plant molecular genetics laboratory, and the sensory technology laboratory.

9432/9738

Key National Molecular Biology Laboratory Established

40081062b Beijing KEXUE BAO [SCIENCE] in Chinese 25 Mar 88 p 2

[Article by Hua Qinxin [5478 1987 2450]: "Key National Biomacromolecular Laboratory"]

[Text] A key national biomacromolecular laboratory has been built at the Chinese Academy of Sciences Biophysics Institute. This laboratory is concerned with research on the functioning of biomacromolecules, which is at the core of molecular biology today, and which has received great attention in scientifically advanced countries. The discovery in 1953 of the DNA double helix marked the birth of molecular biology, which subsequently developed with lightning speed and scored world noteworthy accomplishments one after another, giving mankind a new perception of the nature of vital phenomena. Concerted research on biomacromolecular proteins and nucleic acid has revealed the role of protein systems (including enzymes), and of protein-lipoprotein systems (biomembranes), which carry on vital activities, as well as of carrier nucleic acid inherited from the biozone era [shengwudai] in the metabolism of matter, the transformation of energy, and the transmission of information. Study of the interrelationship among their structures, functions, and activities relates to the nature of vital phenomena. Understanding of vital activity at the molecular level has become increasingly profound and complete, and when taken together with the study of vital activity at many levels including cells, tissue, organs, and whole organisms, man has a deeper understanding of the nature of vital phenomena. The rapid development of molecular biology, particularly the study of biomacromolecules, has boosted the development of biology in an overall way. Even in the study through the ages of biological classification and evolution, molecular classification and molecular evolution have emerged as separate studies. In application, the rapid development of molecular biology centering around the study of biomacromolecules, and the emergence on a global scale of biological high technology centering around gene engineering, will have an unprecedented tremendous influence on man's life and material production. An outgrowth of the greater understanding of the functioning of biomacromolecules was the emergence during the 1980's of a brand new field of protein engineering. Gene modification was used to make directed changes in proteins, making it possible to produce new kinds of protein molecules that do not exist in nature, but that have superior properties. Even completely new animal and plant varieties were cultured,

which played an immeasurable role in the fields of medicine, pharmacology, farming, forestry, fishing, and animal husbandry, and which opened happy vistas for changing the way in which mankind makes use of living things.

The main thrust and substance of research in the newly built biomacromolecular laboratory is: (1) Study of the principles underlying enzyme catalysis and regulation; study of enzyme dynamics and irreversible inhibition dynamics; enzyme research at the forward edge of molecular biology, as well as research on the stretching and folding of peptide chains in protein biosynthesis. (2) Study of the measurement of spatial structure in biomacromolecules (including enzymes, functional proteins, nucleic acid, and polypeptide hormones) and their functional relationships, as well as the molecular design and molecular transformation of proteins. (3) Study of the effects of biomembrane structures, centering around the interaction of membrane lipids and membrane proteins on membrane protein conformation and functioning, as well as the effect of the interchange between lipid bilaminar membranes and non-lipid bilaminar membranes on energy transformation, on information transmission, and on protein transmembrane conveyance. In carrying out research in these three regards, the laboratory will give attention to the new methods and new techniques of organic linkage, interpermeation, and applied mathematics, maintaining and carrying forwarded their work strengths and characteristics, emphasizing their relationship to medical and agricultural realities, and closely linking them to the study of protein engineering. The laboratory will build step by step on the basic methods and techniques of protein engineering to bring about the improvement of proteins of practical value.

The laboratory will adhere to a management policy of openness, flow, and common use, and will follow the principle of building and openness going hand in hand, making full use of existing facilities during the construction period, accepting both domestic and foreign research topics for research. The currently approved staff totals 80, 39 of them permanent research technicians, another 39 researchers, and two administrators. Toward the end of the Seventh 5-Year Plan period, the total number will be increased to 100 including professors Zou Chenglu [6760 2110 7627], Liang Dongcai [2733 2767 2624], and Yang Fuyu [2799 4395 1938] as doctorate instructors, together with some middle age permanent cadres who have rich experience and are in the prime of life. Suitable numbers of intermediate and primary level research technicians will also be provided. In addition, there will be nine researchers, 19 assistance researchers, plus a number of young and promising doctors and masters. This is a research corps with a rational make up and abundant strength. Currently three doctoral students are being trained (and another 10 are studying for their doctorate), and there are 29 students holding masters degrees (and another 32 studying for their masters degrees).

Establishment of the key national biomacromolecular laboratory creates good conditions for the assimilation of outstanding young scientific researchers from both China and abroad, and for the return to China for work of students currently studying abroad. It will make a major contribution in strengthening the development of China's highly technical biology study including molecular biology and protein engineering.

9432/9738

'Golden Bridge Plan' Adopted by Electronics Ministry

40080115b Beijing GUANGMING RIBAO in Chinese 2 Apr 88 p 1

[Article by Liu Jingzhi [0491 2417 2535] and Zhou Wenbin [0719 2429 2430]: "Electronics Industrial System Implements 'Golden Bridge Plan'"]

[Text] A new strategic "Golden Bridge Plan" that will hasten the transformation of technology achievements into commodities and that will use science and technology to support the development of coastal regions is currently being implemented within the electronics industrial system.

It is a new development process to create a product from a scientific research achievement, and the investment required for this process is invariably much greater than the investment to obtain the scientific achievement. A person of authority explained to this reporter that the investment for a major new technological achievement to be transformed into a formal commodity is generally 100 times that of the investment needed to develop that achievement. But many institutes in this country do not have the capacity to undertake the technological development from achievement to commodity, nor are enterprises willing to assume this risk. It was to deal with just this contradiction that the "Golden Bridge Plan" of the Ministry of Electronics Industry (MEI) was proposed and implemented. On a foundation of preliminary research, key problem solving, and new technology development, it is a plan that will develop existing achievements into commodities, and at the same time is a scientific and technical plan that will promote the integration of scientific research with the economy by relying on scientific and technical progress.

Revenue sources for the "Golden Bridge Plan" will come for the most part through fund raising within the sector and local areas, and through funds accumulated by the enterprises and research institutes. This four-way cooperation, joint sharing of risk, and unity will achieve the goal of greater economic results.

At present, MEI has included 30 of the 600 achievements within this Ministry as part of the "Golden Bridge Plan," and these new achievements will bring in 3 billion yuan in economic results with a 100 million yuan investment. In addition, the majority of new technology commodities will compete within the coastal regions in the new strategy of supporting the development of

the coastal regions. Since the last half of 1987 and with the "Golden Bridge Plan" as backup, S&T companies within this Ministry have signed the "Long-Term Agreement for Cooperation Regarding the Establishment of Electronic Information Technologies" with the city of Xiamen. Some research institutes have signed 14 major agreements for technological cooperation and for technological development with the city of Xiamen. For example, units of Institute No 52 have signed an agreement with the city of Xiamen and foreign commercial interests to establish an enterprise intended for foreign trade of "San Yuan" brand hard disks. Institute No 3, Institute No 33, Institute No 38, and Institute No 11 are currently developing foreign trade enterprises for the "San Yuan" brand or branch institutes in the special economic zones of Shenzhen and Zhuhai, the majority of which products are for sale abroad.

Since its inception in 1987, the "Golden Bridge Plan" has progressed smoothly. Some new technological achievements have completed the development process of being turned into products, which has created a capability for intermediate test production. For example, Institute No 18 has developed multipurpose products from a research achievement concerning lead-acid hermetically sealed batteries for use in television cameras, for which it has set up an automated production line. This accomplishment not only breaks the technology blockade from abroad, but fills domestic voids, saves a great deal of foreign exchange, and opens up excellent prospects for export.

The spokesperson pointed out that the "Golden Bridge Plan" is simply an element of planning within MEI, and that they hope to be able to see a national-level "Golden Bridge Plan" as soon as possible, which will allow valuable scientific and technological achievements to quickly become products.

12586/9604

Strategies for Developing Integrated Electromechanics Reviewed

40080115c Beijing BEIJING KEJI RIBAO [BEIJING SCIENCE & TECHNOLOGY NEWS] in Chinese 6 Apr 88 p 1

[Article by Shi Wenti [0670 2429 2251]: "Inquiring into Prospects and Measures for the Development of Integrated Electromechanics"]

[Text] The development of integrated electromechanics has become a necessary path for the revitalization of the mechanical industries of China and for getting onto track economically, and is the primary direction of the new technological revolution. What, then, are the prospects and measures for the development of integrated electromechanics? Recently, pertinent specialists, scholars, and engineering technology personnel from all over China gathered in Beijing to inquire into these.

In this wave of the new technological revolution, the rapid development of microelectronics technologies and their infusion into the mechanical industries have constituted a compound technology of mechanics and microelectronics--an integrated electromechanics, from which have erupted new products: integrated electromechanical products. These have brought great changes to the technological structures, commodity structures, functions and compositions, production modes, and management systems. They have also forced industrial production to jump from "electrified mechanics" into a stage of development where the integration of mechanics and electronics is the index.

What are the prospects and measures for the development of integrated electromechanics in China? Specialists feel that for China to develop integrated electromechanics we must undergo a rather long process before we can achieve the current international levels. But we both can and should directly use in some of our products integrated electromechanics technologies that have matured abroad, and over a shorter time this will allow some of our products to attain standards common in industrially developed countries; we will apply while we develop, will continue to accumulate experience, will train personnel, will enrich our base, and will actively and stably push integrated electromechanics to an advanced level. The primary goal for which China is developing integrated electromechanics is, under the premise of first ensuring economic and social results, to improve product quality and labor productivity.

Specialists believe that the level of development of integrated electromechanics is a comprehensive phenomenon involving the levels of development of the microelectronics and mechanical industries. For mechanical industries to implement integrated electromechanics depends upon the development and stimulus of the microelectronics industry, while the development of the microelectronics industry depends in turn upon the support of the mechanical industries. Therefore, we must correctly handle relations between these two areas, and at present especially should adopt effective measures to improve the capacity of the mechanical industries to absorb contemporary mature technologies.

Based upon the fact of uneven development of technology in the various regions, industries, and enterprises of China, specialists believe that integrated electromechanics should comply with the principle of "overall planning, hierarchical coordinated development," and that under the overall guidance of the government this should proceed at three levels. The first level: begin with technology transformation. While we rectify and improve conventional technologies and equipment, we should at the same time actively disseminate and apply the technological achievements of integrated electromechanics, should transform backward technologies andold equipment, and should gradually improve enterprise quality and production capacity. The second level: by means of the integration ofimported technologies with those that we develop ourselves, we should concentrate our primary strength on the products, basic components, and relevant key technologies in the areas of priority development, and we should organize and combine key problem solving to obtain a new generation of products by stages and in groups that are of excellent quality, have good economic results, and are of an advanced level. The third level: to not lose momentum in the process of the development of new high technologies in the world. While we practically and realistically organize and accomplish the tasks of the first and second levels of development, we must at the same time make a certain effort to keep up with the leading technologies under development at any time abroad (e.g., intelligent robots, comprehensive (integrated) automated systems, etc.). We should strive for breakthroughs in particular areas so that we might improve and provide the necessary technology and equipment for the sustained development of China's mechanical industries during the 21st century.

12586/9604

## BRIEFS

NEW SCIENCE, TECHNOLOGY ASSOCIATION--China established the International Association for the Promotion of Science and Technology (CIAPST) recently in Beijing. The object of the association is to promote the country's scientific and technological development, facilitate the integration of science with economic development, and expand international scientific and economic cooperation. It will help coordinate China's research findings with foreign investment and management experience to promote their commercialization. [Text] [CHINA DAILY (BUSINESS WEEKLY Supplement) in English 18 Apr 88 p 1 HK] /9274

DALIAN HIGH-TECH LABORATORY--Dalian, 5 Apr (XINHUA)--A laboratory equipped for research into modifying properties of materials by the use of ion, electron and photon beams will be jointly built by the Dalian Engineering University, Liaoning Province and Shanghai's Fudan University, XINHUA learned today. The laboratory will develop high-strength coatings and alloy surfaces on different materials for industrial use. It is an example of the results of combining basic research with practical application and will be at the service of industries striving to produce advanced items. The laboratory will also serve as a training center for young scientists. [Text] [40100019 Beijing XINHUA in English 0140 GMT 5 Apr 88] /9604

INFORMATION TECHNOLOGY PLAN APPROVED--Beijing (XINHUA), 15 May--The State Council has recently approved key policies for the development of China's information technology. These policies encourage production of goods oriented to both the foreign and domestic markets and to economic benefits. Imported advanced-technology components and even subsystems will greatly improve the power of the information industry's exports to earn foreign exchange. At the same time, also necessary is selective implementation of protectionary measures beneficial to the development both of applications for information technology and of indigenous information technologies and industry. China will give priority to microcomputer and compact mini-computer systems with Chinese character-processing functions, digital program-controlled switchboards, fiber-optic and satellite communications technology and equipment, silicon analog ICs, design and manufacturing technology for silicon digital large-scale integrated circuits, technology for software engineering, etc. Unified planning for coordinated development is to be extended to microelectronics, communications, computer, and software technologies; economies of scale and production rationalization

will be realized. For a specified period, the state will grant preferential treatment of taxes, credit, and depreciation to enterprises and enterprise groups in the information industry; research, development, and innovation will be promoted. A two-level approach will be taken in R&D--toward the current situation and toward the future. The former is the main battlefield in the development of information technology, inseparably linked with industry. Future-oriented R&D will be geared toward the critical areas of very-large-scale and very-high-speed integrated circuits, ISDN technology, and artificial intelligence. [Summary] [40080161 Beijing GUANGMING RIBAO in Chinese 16 May 88 p 1]

/09986

Quantitative Analysis of Stealth Performance in Air-to-Air Combat

40080118 Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 4, 1988 pp 24, 14

[Article by Chen Yilin [7115 4135 6775]]

[Text] In recent years, stealth and counter-stealth technologies have increasingly attracted the attention of fighter aircraft designers. A large number of published articles have reported on these technologies and discussed their effect on future warfare. However, most of these articles are qualitative in nature; they do not contain any quantitative analysis. In this article, the author has taken a global point of view and made an attempt to provide a quantitative analysis of the effect of radar stealth performance of fighter aircraft on future air-to-air combat. This analysis is based on calculations carried out for a number of typical combat scenarios.

Many military analysts believe that with the development of airborne radars and advanced medium-range air-to-air missiles, combat advantage in the 90's will largely depend on the over-the-horizon capability of the aircraft, i.e., the ability to hit the enemy and run without making visual contact. For example, the U.S. AIM-120 medium-range missile has a maximum attack range of 50-100 km (determined by the performance of the airborne radar). It does not rely on the reflected energy from the target to guide it toward the target; during the early stages of flight, it uses inertial guidance aided by the airborne radar to provide corrected position data. Based on this information, it can determine the intercept flight path; once it reaches within the action range of the homing device, the missile is then guided by the homing sensor of the active radar to the target. Thus, in this type of combat, the ability of an aircraft to initiate a first attack primarily depends on the performance of the airborne radar and the air-to-air missile. However, the following analysis will show that the radar stealth characteristics of the fighter aircraft play an important role in this combat scenario.

Quantitative Measure of Radar Stealth Performance. During over-the-horizon air-to-air combat, a commonly used measure is the maximum detection range of the airborne radar, $R_{max}$. This measure depends on a number of parameters such as transmitter power, antenna gain, operating wavelength, and the radar cross-section [RCS] of the target. Most of these parameters, except for the radar cross-section of the target, are performance characteristics of the radar.

Therefore, the primary indicator of stealth performance is the radar cross-section of the target. The larger the RCS, the greater the detection range; on the other hand, if the RCS of the target approaches zero, it cannot be detected by any radar, no matter how advanced it may be, i.e., it becomes invisible to the radar. Therefore, in the following calculations, this parameter will be used as the measure of radar stealth performance.

Effect of Stealth on the Detection Capability of Airborne Radars. We use the airborne radars APG-63 (which has been installed on the F-15) and APG-66 (which has been installed on the F-16 A/B) as examples in our calculations because they are representative of two classes of radars which differ in performance by approximately an order of magnitude. For given values of detection probability and false-alarm probability, the detection ranges of these two radars for a 5 $m^2$ RCS target are respectively 185 km and 74 km.

Let us first look at the effect of target RCS on radar detection range for given detection probability and false-alarm probability. Specifically, the detection range is proportional to the 1/4 power of RCS. Table 1 shows the calculated results of maximum detection range $R_m$(km) as a function of RCS $\sigma$ ($m^2$). It can be seen that when the garget RCS is reduced by one order of magnitude (e.g., from 5 $m^2$ to 0.5 $m^2$), the effective detection range will be reduced by 44 percent; when the RCS is reduced by two orders of magnitude (e.g., from 5 $m^2$ to 0.05 $m^2$), the detection range will be reduced by 68 percent.

Table 1.

| $\sigma$ | | 5 | 2.5 | 1.0 | 0.5 | 0.25 | 0.10 | 0.05 | 0.02 | 0.01 | 0.005 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APG-63 | $R_m$ | 185 | 155.6 | 123.7 | 104 | 87.5 | 69.6 | 58.5 | 46.5 | 39.1 | 32.9 |
| APG-66 | $R_m$ | 74 | 62.2 | 49.5 | 41.6 | 35 | 27.8 | 23.4 | 18.6 | 15.6 | 13.1 |

For a given detection range, one can calculate the relationship between detection probability and target RCS $\sigma$ for different values of target distance (see Table 2). The results show that when the target RCS is reduced to 0.5 $m^2$, the two radars can no longer detect the target at maximum range; the effective combat radius of the APG-63 loses its over-the-horizon combat capability. On the other hand, when the combat ranges of the two radars are within 20 km and 10 km respectively, the stealth design is no longer effective even if the target RCS is reduced to 0.005 $m^2$.

Table 2.

| $\sigma$ | 5 | 1.0 | 0.05 | 0.01 | 0.005 | $\sigma$ | 5 | 1.0 | 0.05 | 0.01 | 0.005 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1)目标间隔距离 | (2)APG-63 发现概率, % | | | | | (1)目标间隔距离 | (3)APG-66 发现概率, % | | | | |
| 185 | 80 | 0.8 | ~0 | ~0 | ~0 | 74 | 80 | 0.8 | ~0 | ~0 | ~0 |
| 100 | 99.99 | 99.99 | 0.2 | ~0 | ~0 | 50 | 99.99 | 70 | ~0 | ~0 | ~0 |
| 60 | 99.99 | 99.99 | 70 | 0.6 | ~0 | 30 | 99.99 | 99.99 | 7 | ~0 | ~0 |
| 20 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 | 10 | 99.99 | 99.99 | 99.99 | 99.99 | 99.99 |

Key:

1. distance between targets
2. detection probability of APG-63
3. detection probability of APG-66

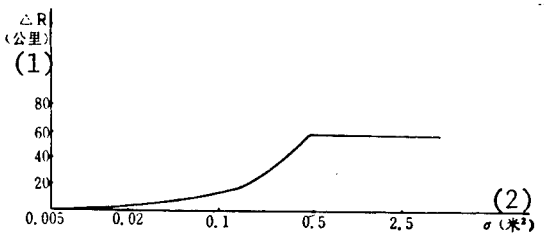
Effects of Stealth on Over-the-Horizon Air-to-Air Combat. Consider two aircraft A and B engaged in air-to-air combat. Assume that aircraft A is equipped with an APG-63 radar and AIM-120 air-to-air missile whose maximum attack range is 100 km; aircraft B is equipped with an APG-66 radar and AIM-TM missile whose maximum attack range is 60 km.

Clearly, the advantage is on the side of aircraft A.

If the two aircraft have the same radar cross-section of 0.5 $m^2$, then aircraft A can easily detect aircraft B to initiate a first attack with its intercept missiles; on the other hand, with a maximum detection range of only 41 km, aircraft B cannot detect aircraft A and therefore will be in a passive position of being attacked. However, if aircraft B has good stealth characteristics, the detection and attack range of aircraft A will decrease dramatically with decreasing RCS of aircraft B (see Fig. 1). When the RCS of aircraft B decreases to 0.01 $m^2$, the combat advantage of aircraft A no longer exists because at this point, $\Delta R$ (i.e., the difference in the maximum detection ranges between the two aircraft) is almost zero.

This illustrates how the stealth characteristics of aircraft B can compensate for its disadvantage in radar and missile capability.

Fig. 1. Combat Advantage of Aircraft A Over Aircraft B as a Function of the Radar Cross-Section of Aircraft B



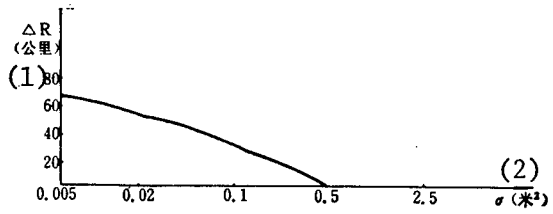

Key:

1. kilometers
2. meter$^2$

Stealth's influence on air-to-air combat can also be expressed in terms of aircraft survivability. Calculations show that when the distance separating the two aircraft is greater than 100 km, aircraft B is beyond the attack range of aircraft A, hence the stealth characteristics of aircraft B have no effect on its survivability. Similarly, when the separation is less than 20 km, both sides have entered the close-range combat zone, and again stealth characteristics have no effect on survivability. But at an intermediate range, say 60 km, stealth characteristics become a critical factor. If the RCS of aircraft B is greater than 0.1 $m^2$, the probability of being hit will be very high, whereas if the RCS is less than 0.1 $m^2$, its survivability will increase significantly.

If aircraft A and B are both equipped with the same radar APG-63 and the same missile AIM-120, then the aircraft with better stealth characteristics will clearly have the advantage in terms of discovering the opponent first to initiate a first attack. If the RCS of aircraft A is 1.$m^2$, then one can calculate the combat advantage of aircraft B as a function of its RCS, as shown in Fig. 2 and Table 3. $\Delta R$ is still the difference between the maximum detection range of aircraft B (in this case 100 km) and the maximum detection range of aircraft A (which varies with the RCS of aircraft B). It is seen that when the stealth performance of aircraft B is one order of magnitude higher than that of aircraft A, i.e., when its RCS is 0.1 $m^2$, it can achieve a 30 percent attack advantage.

Fig. 2. Combat Advantage of Aircraft B as a Function of Its Radar Cross-Section




Key:
1. kilometers
2. meter$^2$

Table 3.

| $\delta_B$ | 1 | 0.5 | 0.25 | 0.1 | 0.05 | 0.02 | 0.01 | 0.005 |
|---|---|---|---|---|---|---|---|---|
| $\Delta R$ | 0 | 0 | 16 | 30 | 41 | 52 | 61 | 67 |

The above calculations clearly indicate that radar stealth performance plays a significant role in the over-the-horizon combat capability of fighter aircraft. When the radar and weapon capabilities of an aircraft are comparable to those of the enemy aircraft, its stealth characteristics can provide a combat advantage in terms of discovering the enemy and initiating a first attack. When its radar and weapon capabilities are inferior to those of the enemy aircraft, the stealth characteristics can compensate for its deficiency.

3012/9274

SPACE MEDICINE FACILITY LAYS GROUNDWORK FOR MANNED SPACE FLIGHT

40081066 Beijing BEIJING KEJI BAO [BEIJING SCIENCE AND TECHNOLOGY NEWS] in Chinese 13 Apr 88 p 1

[Summary] Having made definite strides in the theory and technology of space medical engineering, the Chinese Institute of Space Medico-Engineering is launching a preliminary study of space application systems, while marking its 20th anniversary this year, according to institute personnel. The Institute, under the direction of renowned scientist Qian Xuesen, has established a space medical engineering system with Chinese characteristics. Over the past two decades, 455 projects have been carried out by creatively applying man-machine environmental systems engineering, combined Chinese traditional and Western medicine, and multi-disciplinary comprehensive research to space medical engineering studies. Among these, medical engineering research and applications related to space life support systems garnered a national award. The Institute started by having a group of professional staff with medical and engineering backgrounds carry out interactive studies of ways to overcome technical problems of space suits and life support systems. The application of traditional Chinese medicine to relieve effects of motion sickness, noise, and radiation in space has drawn attention from experts around the world. The Institute is equipped with a complete ground simulation facility constructed for space medical engineering research, including a low-pressure airtight cabin, a temperature-modified chamber, a hydraulically powered rotating seat, and a Chinese-made centrifuge (the largest in Asia). Currently, products such as a satellite pressure-control system for scientific exploitation and technological tests, oxygen supply system, medical sensors, protective ear plugs, headsets, protective helmets, liquid-cooled suits, microwave protection suits, and individual protective equipment to handle rocket propellants are extensively applied in economical, military, and scientific studies.

/12858

FIRST DOMESTIC METEOROLOGICAL SATELLITE DEVELOPED

40080142 Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 10 Jun 88 p 4

[Text] According to a report in JIEFANG RIBAO, the Shanghai Satellite Engineering Research Institute of the Chinese Space Technology Institute has developed China's first solar-synchronous-orbit weather satellite. A few days ago at the test site, the writer observed that this satellite was already in pre-launch preparation, and very soon would be sent to the launching field.

The satellite is square shaped, 1.2 m high, 1.4 m wide, and 1.4 m long, and weighs 750 kg. With the solar panels on both sides deployed, the satellite is 8.6 m long. This weather satellite has been developed and will be launched for the purpose of capturing cloud images above China and major foreign areas for weather forecasting, and for the purpose of obtaining maritime data for the service of maritime agencies.

The writer noticed the keyed-up white-clad technical personnel at the test site as they performed various signal tests. The silver-white insulating materials on the satellite shone brilliantly. The round heat-dissipating blinds on both sides of the satellite can be automatically opened or closed regulating the satellite's internal temperature. The six solar panels on the sides of the satellite have a total of 14,000 solar cells that can produce 800 Watts of power and that have an efficiency of from 11.5 to 12 percent, demonstrating that China has mastered fairly advanced solar cell technology. Institute Director Meng Zhizhong [1322 1013 0022] revealed that a notable feature of China's first weather satellite is that a long-life three-axle attitude stabilization system is employed. On board the satellite is a scanning radiometer for space remote sensing; this device meets the U.S. standard of the early eighties. An on-board tape unit can record 60 minutes of cloud pictures in one run. The heart of the satellite is computer controlled. An additional function is that of detecting the components of space particles, to provide data for research in space physics.

/9604

NEW SHANGHAI LAUNCH VEHICLE COMPLETES GROUND TESTS

40080143 Shanghai City Service in Mandarin 0900 GMT 12 Jun 88

[Excerpt] China's space products have entered a stage of manufacturing, research, and designing. A new type of launch vehicle developed by Shanghai completed ground testing recently. A flight test will take place soon. This was disclosed at today's gathering marking the 30th founding anniversary of Shanghai's Xinzhonghua Machinery Plant.

The Xinzhonghua Machinery Plant of Shanghai is a large backbone enterprise of the aviation and astronautics industries. Its major tasks include the research, designing, manufacturing, and experimenting of large carrier rockets. The plant presently has a research center with outstanding technical personnel, a well-equipped laboratory, and excellent production facilities. It has formed an overall management system that coordinates its research, designing, trial-manufacturing, production, and experimenting of (?military supplies).

The plant's Long March-3 launch vehicles have been launched successfully four times. The Xinzhonghua Machinery Plant has become a window to the outside displaying China's space technology level. The plant has also achieved good results in the production of civilian goods.

/9604

## BRIEFS

FRG-PRC SATELLITE LAUNCH--Bonn, 6 May (XINHUA)--According to an announcement today by the FRG's Ministry for Research and Technology, the FRG in July of this year will utilize a Chinese recoverable satellite to conduct two experiments under conditions of outer space zero gravity. China will use a "Long March 2" rocket to launch this satellite. The satellite compartment will carry two West German experimental packages: one for measuring and recording external conditions during flight, and the other for carrying out experiments in protein crystal growth. The FRG's Minister for Research and Technology [Heinz] Riesenhuber emphasized that, up to now, scientific cooperation between both sides has been quite successful, especially with the cooperation of the West German business community in manufacturing the DFH-3 China Television Broadcast Satellite, as well as in the cooperation between the DFVLR (FRG Research and Test Facility for Air and Space Flight) and the Chinese Astronautical Technology Research Institute. In December of this year, on the occasion of the tenth anniversary of bilateral scientific and technological cooperation, a joint scientific conference on microgravity will be held in Bonn. [Text] [40080154 Beijing RENMIN RIBAO in Chinese 9 May 88 p 7]

## Some Problems Facing China in Developing Composite Materials

40080122 Beijing LIXUE YU SHIJIAN [MECHANICS AND PRACTICE] in Chinese Vol 10 No 2, Apr 88 pp 1-13

[Article by Gu Zhenlong [7357 7201 7127] of the Harbin Polytechnical University: "Status of the Development of Composite Materials and Problems Facing China in Composite Materials]

[Excerpt] 2. Major Problems Facing the Composite Materials Industry in China

China had a reasonable start in fiberglass. However, due to many reasons, there is a large gap between China and developed nations in advanced composite materials.

In order to track high technology in the world, China is also facing the problem of developing high-temperature composite materials. In addition, China has imported and is in the process of negotiating to import several production lines for SMC and short cut fiber composite materials. Of course, it is also facing the problem of how to digest these materials for civilian use to scale up production to lower the cost. We must also develop a variety of conventional (150°C) resin-based composite materials, improve quality and gain further understanding to narrow the gap.

There is not much demand for the fibers and matrices (thermosetting or thermoplastic resin, metallic or ceramic matrix) required for high temperature composite materials. It is in a leisure pre-research stage. Some are further along, such as silicon carbide fiber, and some are more behind. As for the use of composite materials in civilian applications, with the exception of fiber glass products, the use of short fiber composite materials (such as train window frames) is just beginning. Because of high cost, the trend is not very obvious.

The materials community needs an overall plan. The users have to present specifications for advanced products. Higher learning institutions, research organizations, and design and manufacturing departments must work together to prevent us from concentrating our effort on certain hot items and from duplicating our effort at the lower level. Each development area must have a person in charge to provide the necessary support.

The development of ceramic-based composite materials abroad appears to be faster than the development of metal-based composite materials. In the past, China has been more involved in functional materials in industrial ceramics. Very little work has been done in heart resistant structures for leading edge industries. However, it is not difficult to turn the situation around. Based on the foundation built in China, we have to strengthen the cooperation among all trades. It appears that rules and regulations are hampering lateral alliance.

In addition to materials, there is an urgency to develop new techniques. We have acquired considerable experience in some techniques, such as the winding technique at Harbin Glass Institute. However, it is also necessary to organize people to study some recent new techniques such as knitting and weaving. It is also necessary to develop soft small diameter fibers for these new techniques. Surface treatment is also very important. The development of materials must match with the development of techniques. There is also a great deal of information to be learned in the technology to manufacture metal and ceramic based composite materials.

China has invested a great deal of manpower in the study of characteristics of composite materials. The problem of standardization must be resolved. Let us begin with the standardization work done in other countries and accumulate all the useful results and data step by step to stop waste in the research and development process.

To develop composite materials, the key issue is still talent. In order to have qualified people to work in all areas, we must strengthen training. We not only need high level research talent but also a large number of middle level people. This is very important for the mass production of products made of composite materials. Existing civilian composite material products must be further supported and guided in order to form a technology intensive industry.

Considerable effort has been devoted to the development of composite materials in higher learning institutions. The problem is how to face the real demand. To this end, the materials community, mechanics community and applications community must join forces. Because composite materials are novel interdisciplinary materials, everyone must step out of his own field to become familiarized with the entire picture in order to contribute fully to composite materials. However, we also need the financial support from the authorities to be successful. Composite materials are relatively expensive. Experimentation is needed in the development work. The resources in most higher learning institutions are very primitive. If this condition cannot be improved everywhere due to financial constraints, it may be appropriate to support a few selected key organizations to allow them to make a larger contribution to the development of composite materials in China.

Let us take advantage of the edge of the socialist system in China, get organized and pick up the pace to catch up with the rest of the world.

12553/06662

## EFFECT OF PRESSURE ON DIELECTRIC CONSTANT OF $KTaO_3$ CERAMICS AT LOW TEMPERATURE

40090102a Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 1, Feb 88 pp 13-18

[English abstract of article by Chen Zhixiong [7115 1807 7160] of the Solid State Electronics Department, Huazhong Institute of Technology; Z.P. Chang and L.E. Cross of the Materials Research Laboratory, Pennsylvania State University]

[Text] $KTaO_3$ ceramics with excellent dielectric properties have been fabricated by isostatic hot pressure sintering. The dielectric constant K is equal to 2000 at low temperatures and the dielectric loss tangent, tan , is less than 0.01 at frequencies less than 100 kHz.

The effect of hydrostatic pressure on the dielectric constant of the $KTaO_3$ ceramics has been investigated in the pressure range of 0 to 2000 MPa below temperatures of 100 K. The linear decreasing of the dielectric constant with increasing pressure has been observed, and the values for dK/kp evaluated. The results show that it is possible to make a transducer to measure pressure at low temperatures.

The authors show that the Barrett expression describing the properties of the dielectric constant at low temperatures is inadequate for analyzing the effect of pressure on the dielectric constant, and possible reasons are presented.

9717

EFFECTS OF SINTERING TEMPERATURES ON MICROSTRUCTURE, PROPERTIES OF FULLY STABILIZED ZIRCONIA

40090102b Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 1, Feb 88 pp 27-33

[English abstract of article by Zhou Yu [0719 3768], et al., of Harbin Institute of Technology]

[Text] In the present work, 14 mol percent $MgO-ZrO_2$ powder is prepared by a chemical method and specimens are sintered in air at temperatures varying from 1550 to 1700°C. The microstructure, mechanical properties and homogeneity of the chemical composition of the sintered specimens are studied. The results indicate that the chemically-prepared powder and sintered specimens are all fully stabilized zirconia (FSZ), and they remain FSZ, without experiencing any transformation, after rigorous grinding. As the sintering temperatures increase from 1550 to 1700°C, the density, hardness and fracture toughness of the specimens decrease, while the lattice parameters and intergranular areas on the fracture surfaces increase. In addition, the cleavage facets become smoother due to the segregation of MgO at the grain boundaries.

9717

SOLID-POROUS-SOLID SANDWICH PZT (3-3) COMPOSITE

40090102c Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 1, Feb 88 pp 41-49

[English abstract of article by He Yuanguang [0149 6678 0342], et al., of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] A new composite model for the structure of three-layer sandwich PZT (3-3) is proposed in this paper. The solid-porous-solid sandwich (PZT/pore) composite materials are fabricated by a simplified fabrication technique. They have outstanding properties compared with other PZT materials. When the porosity of the sandwich composite is from 0.53 to 0.68, the $\overline{\varepsilon}^{T}_{33}/\varepsilon_0$ ratio is 200-400, $\overline{d}_{33}$ is 350-400 x $10^{-12}$C/N, and ($\overline{d}_h$ x $\overline{g}_h$) is 25000-67000 x $10^{-15}$ $m^2$/N. The effects of structural factors, such as the solid layer, porosity and polymer, on the properties of the sandwich composite are discussed. The application to the transducer using the sandwich composite as transducer material is described briefly. It is shown that the sandwich composite is better than PZT material in manufacturing high sensitivity hydrophones and short pulse ultrasonic transducers.

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PREPARATION OF $Bi_2O_3$-$Y_2O_3$-Gd O OXIDE IONIC CONDUCTOR, ITS ELECTRICAL CONDUCTIVITY

40090102d Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 2, Apr 88 pp 149-153

[English abstract of article by Yang Pinghua [2799 5493 5478], et al., of the Department of Applied Chemistry, University of Science and Technology of China]

[Text] Oxide solid solutions $(Bi_2O_3)_{0.76}(Y_2O_3)_{0.24-x}(Gd_2O_3)_x$ were prepared by the chemical coprecipitation method. XRD study indicates that the x value for the face centered cubic (fcc) solid solution phase is less than 0.10. An AC impedance spectroscopic technique was applied to study the conductivity and its temperature dependence. It is found that samples doped with a small amount of $Gd_2O_3$ have higher conductivity than those doped with $Y_2O_3$ only. When $x > 0.10$, the conductivity curve jumps at about 700°C due to the transition of a small rhombohedral phase into the fcc phase.

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INVESTIGATION OF GROWTH OF LARGE AMMONIUM PERCHLORATE (AP) SINGLE CRYSTAL

40090102e Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 2, Apr 88 pp 172-177

[English abstract of article by Yuan Duorong [5913 1122 2837], et al., of the Institute of Crystal Materials, Shandong University]

[Text] This paper reports the growth of the $NH_4ClO_4$ large single crystal used as the sandwich in rocket propeller technology. The solubility, supersolubility and $T_s$-pH curve of this crystal have been measured. It is found that the metastable region of the AP solution possesses the relative minimum supercooling characteristic. The main defect observed in this crystal is the "veil." The internal and external causes of the formation defect are analyzed, and key measures to exclude "veils" are suggested. The direct influence of pH on the recovering of seed and transparent crystal growth is also analyzed and discussed. An optimum pH range for the AP growth solution has been found. If pH = 5.1 and the initial saturation temperature is 50°C, when the lowering gradient of temperature is 0.05°C/d, a 40 x 40 x 20 mm large transparent single crystal can be grown successfully in a small vessel (1000 ml).

9717

# ANOMALOUS PHENOMENA OF PURE $LiNbO_3$ CRYSTALS IN RANGE FROM ROOM TEMPERATURE TO 130°C

40090102f Beijing GUISUANYAN XUEBAO [JOURNAL OF THE CHINESE SILICATE SOCIETY] in Chinese Vol 16 No 2, Apr 88 pp 178-182

[English abstract of article by Chen Nandou [7115 0589 2435], et al., of Nanjing University]

[Text] In the range of from 30°C to 130°C, the mechanism for the anomalous phenomena of $LiNbO_3$ crystals has been proven similar to that for the optically induced change of refractive indices. The anomalous phenomena result from thermally excited electrons in the point defect of crystals. According to the experiment results, a thermal excitation model is proposed by the authors. The anomalous phenomena of $LiNbO_3$ can be deduced from the model. Several problems which have occurred in previous experiments and were difficult to explain are discussed in this paper.

9717

# INTERNAL FRICTION STUDY OF INTERFACE DYNAMICS DURING PHASE TRANSFORMATIONS OF NiTi ALLOY

40090096a Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 353-362

[English abstract of article by Zhang Jinxiu [1728 6651 0208], et al., of the Department of Physics, Zhongshan University, Guangzhou]

[Text] The martensitic (MP) and incommensurate/commensurate (I/C) phase transformations during the athermal process of the NiTi alloy were studied by measuring the internal friction, elastic modulus and electric resistance simultaneously. The IF behavior during the MP and I/C phase transformations is nearly the same and is associated with the motion of the phase interface under the action of the phase transformation driving force. Starting with the interface dynamics model, the interface dynamic behavior of the MP and I/C transformations was studied. An explicit functional relationship of the interface dynamics during the martensitic transformation process was obtained as $V = V^* \exp(-\Delta G^*/\Delta G-\Delta G_R)$ and the expression for IF during the phase transformation process as $Q^{-1} = (n^2/2) \times (\mu\Delta G^*/(\Delta G-\Delta G_R)^2)dF/dT\cdot\dot{T}/\omega$. The transformation resistance force $\Delta G_R$ is on the order of 10 cal/mol. The "soft mode effect" during the transformation process is discussed, and it is shown that the softening of the phonon mode and the modulus defect associated with interface motion coexist during the martensitic and I/G phase transformation processes.

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STUDIES OF STRESS-INDUCED I/C TRANSITION, INTERFACE DYNAMICS IN NiTi ALLOY

40090096b Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 363-372

[English abstract of article by Zhang Jinxiu [1728 6651 0208], et al., of the Department of Physics, Institute of Materials Science Research, Zhongshan University, Guangzhou]

[Text] The internal friction (IF) $Q^{-1}$, modulus $f^2$, electrical resistance R and stress $\sigma$ of the superelastic $Ni_{51}Ti_{49}$ alloy during stress-induced incommensurate/commensurate (I/C) transition has been measured as a function of strain $\epsilon$ by a middle torsion pendulum on a tensile testing machine modified with a four-terminal potential piece of equipment. The effects of the number of stress cycles and the strain rate $\dot{\epsilon}$ (in the range of $7 \times 10^{-7}$/s to $1 \times 10^{-4}$/s) were studied. An IF peak and a minimum modulus were observed respectively in the $Q^{-1}$-$\epsilon$ and $f^2$-$\epsilon$ curves. The IF peak height $Q_p^{-1}$ and modulus defect $\Delta M/M$ increase with an increase in $\dot{\epsilon}/\omega$, where $\omega$ is the angular frequency of measuring.

By utilizing an expression obtained from phase interface dynamics and experimental data of $Q_p^{-1}$ (as a function of $\dot{\epsilon}/\omega$ and the amount of phase transition F), an explicit functional relationship of the average I/C phase interface velocity V and effective phase transition driving force $\Delta G' = \Delta G - \Delta G_R$ (where $\Delta G_R$ is resistance) was derived as $V = V^*(\Delta G - \Delta G_R)^m$, where $V^*$ and m are dynamic parameters and $\Delta G_R$ is a resistance force exerted on the moving interface, which is of the order of 1 cal/mol for the stress-induced I/C transition of the superelastic NiTi alloy.

The relationships between $Q^{-1}$ and the modulus defect $\Delta M/M$ and soft modulus effect are discussed.

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# EXTRAORDINARY BRAGG DIFFRACTION OF SURFACE ACOUSTIC WAVE ON ACOUSTIC GRATING

40090096c Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 379-387

[English abstract of article by Wang Zuoqing [3769 0146 0615], et al., of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] In this paper, the Bragg diffraction of the surface acoustic wave (SAW) on an acoustic grating is investigated by incorporating the anisotropy of the substrates. In the analysis, the differences among the incident wave, the fundamental wave and spatial harmonic wave in the grating region and the diffraction waves in the transmission region are phenomenologically described through their varying corresponding velocities. The experimental results of the SAW diffraction on acoustic grating fabricated on Y-cut $LiNbO_3$ are presented. A comparison of the experimental results with the analyzed results obtained on isotropy approximation shows that the discrepancy is significant. The "extraordinary Bragg diffraction" equations are obtained by using the coupled-waves method which takes the anisotropy of the substrates into consideration. It is shown that the calculated results based on "extraordinary Bragg diffraction" equations coincide with the experimental results fairly well.

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# FOCUSING BEHAVIORS OF DIFFRACTED BEAM OF SURFACE ACOUSTIC WAVE ON CHIRPED GRATING IN BRAGG REGIME

40090096d Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 388-395

[English abstract of article by Wang Zuoqing [3769 0146 0615] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] The acoustic field distribution of the deflected wave beam in the transmission region from a chirped acoustic grating is described by using the Fresnel-Kirchhoff diffraction integral expression. The transmission function of the surface acoustic wave (SAW) beam, diffracted by a linearly chirped grating in the Bragg regime, is obtained through a quasi-periodicity approximation, and this function is taken as the field distribution function in the aperture of the exit plane. It is shown from the analysis that in the Fresnel region there is a Fraunhofer plane where the field distribution is the Fourier transformation of the field along the aperture. It is demonstrated that the role played by the grating is two-fold, i.e., a deflector and a lens. The most important point found by the author is that the focusing axis of the focused wave beam will translate in parallel when the frequency of the input signal is changed. This scanning configuration is quite different from the traditional deflection scanning. The theoretical predictions are verified by experimental observations and measurements.

9717

RESEARCH ON PERFORMANCE OF LONG-PULSEWIDTH PULSED Nd:YAG LASER

40090096e Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 416-423

[English abstract of article by Ye Biqing [0673 4310 7230], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The authors have developed a several-millisecond pulsewidth pulsed Nd:YAG laser with an output power of 200 watts on the average and 5000 watts at its peak. The performance of the long-pulsewidth pulsed Nd:YAG laser has been investigated. The theoretical analysis agrees with the experimental results quite well.

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## HIGH POWER CONTINUOUSLY TUNABLE FAR-INFRARED RAMAN $NH_3$ LASER PUMPED USING HIGH PRESSURE TE $CO_2$ LASER

40090096f Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 424-429

[English abstract of article by Zhu Wensen [2612 2429 2773] of the Institute of Physics, Chinese Academy of Sciences; B.K. Deka and J.R. Izatt of the Department of Physics and Astronomy, University of Alabama]

[Text] A tunable far-infrared Raman transition $NH_3$ laser with output energies of up to 4 mJ (~80 kW) is reported. The tuning range covers more than 70 percent of the emission spectrum from 90 to 93 μm, and the continuous tuning range associated with individual K-level transitions is about 30 GHz. Typical experimental results are described and discussed.

9717

METHOD FOR CALCULATING DC CONDUCTIVITIES OF POROUS MEDIUM, COMPOSITE. I. APPROACH TO POROUS MEDIUM WITH PERIODIC STRUCTURE

40090096g Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 3, Mar 88 pp 439-446

[English abstract of article by Gu Guoqing [7357 0948 1987], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] A first-principle approach to the calculation of dc conductivities of a porous medium and composite is developed. In this paper, the case of the porous medium with a periodic structure is discussed in detail. The effective conductivities for many two-dimensional porous systems are calculated by polynomial approximation, Fourier expansion using an elimination procedure and an iterative approach of Fourier expansion. Critical exponents for the dc conductivity of Sierpinski carpets are also calculated by an improved iterative approach. All the theoretical results agree fairly well with recent experimental measurements.

9717

# $^{7}Li$ NMR INVESTIGATIONS DURING PRE-CRYSTALLIZATION PROCESS IN AMORPHOUS IONIC CONDUCTOR $B_2O_3$-0.7$Li_2O$-0.7LiCl-x$Al_2O_3$

40090095a Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 4, Apr 88 pp 529-537

[English abstract of article by Su Fang [5685 2499] of the Center of Fundamental Physics, University of Science and Technology of China, Hefei]

[Text] To avoid absorbing moisture from the air, the author sealed all samples in a high vacuum, then performed $^{7}Li$ NMR investigations during the pre-crystallization process of the amorphous ionic conductor $B_2O_3$-0.7$Li_2O$-0.7LiCl-x$Al_2O_3$ (x = 0.15, 0.10 and 0.05) at 293 K and 77 K.

The author finds that there is only a spin-spin relaxation time of lithium ions in the solid phase, $T_2$ = 87 μs, which obeys the Gaussian decay law at 77 K. At room temperature, all lithium ions divide into two phases. $T_{2S}$ of lithium ions in the solid phase still obeys the Gaussian law of decay, $T_{2S}$ = 127 μs, but $T_{2l}$ of lithium ions obeys the Lorentzian law.

For three amorphous lithium-ionic conductors $B_2O_3$-0.7$Li_2O$-0.7LiCl-x$Al_2O_3$ (x = 0.15, 0.10 and 0.05), $T_{2l}$ of lithium ions in the liquid phase increases rapidly, i.e., the width of their $^{7}Li$ NMR absorption line becomes much narrower at about 401, 388 and 381°C, respectively. Therefore, the physical picture of the interfacial effect between the amorphous matrix and the crystallites is again confirmed.

9717

ENERGETIC TRAPPED PARTICLE STABILIZING EFFECT OF INTERNAL KINK MODE

40090095b Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 4, Apr 88 pp 546-556

[English abstract of article by Chen Yanping [7115 7159 5493], et al., of the Institute of Physics, Chinese Academy of Sciences; R.J. Hastie of the Euratom-Ukaea Association, Culham Laboratory, Abingdon, Oxon, United Kingdom; Ke Fujiu [2688 1318 0036] of the Department of Applied Mathematics and Physics, Beijing University of Aeronautics and Astronautics; L. Chen of the Plasma Physics Laboratory, Princeton University]

[Text] The Grad-Shafranov equilibrium equation for an anisotropic Tokamak plasma is rederived using Greene, Johnson and Weimer's method. The stabilizing effect of the anisotropic energetic particle component on the internal kink mode in the Tokamak plasma has been analyzed using the generalized energy principle. A detailed calculation of this effect has been performed for two kinds of energetic particle distribution functions, including an energy deceleration and a square top poloidal pressure profile. The stability window of the internal kink mode due to the energetic trapped particles with a magnetic turning point at the high field side is obtained. Its relationship with various physical parameters is discussed in some depth.

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METHOD FOR CALCULATING DC CONDUCTIVITIES OF POROUS MEDIUM, COMPOSITE. II. APPROACH TO ISOTROPIC, ANISOTROPIC COMPOSITE

40090095c Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 37 No 4, Apr 88 pp 582-588

[English abstract of article by Gu Guoqing [7357 0948 1987], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] The first-principle approach for calculating the dc conductivities of the composites is discussed systematically. The integral equation for determining the effective conductivities of the composites with local anisotropic components is derived, and a convenient method for calculating an effective conductivity tensor is proposed. The authors have dealt with an effective conductivity tensor of composites with local anisotropic components. A theoretical method which can treat the more common composites with no periodicity is developed. A new approximate method for solving integral equations by means of expansion with two bases is also proposed by which composites with high porosity and complicated structures can be calculated with high precision, This would offer the advantage of saving significant computing time.

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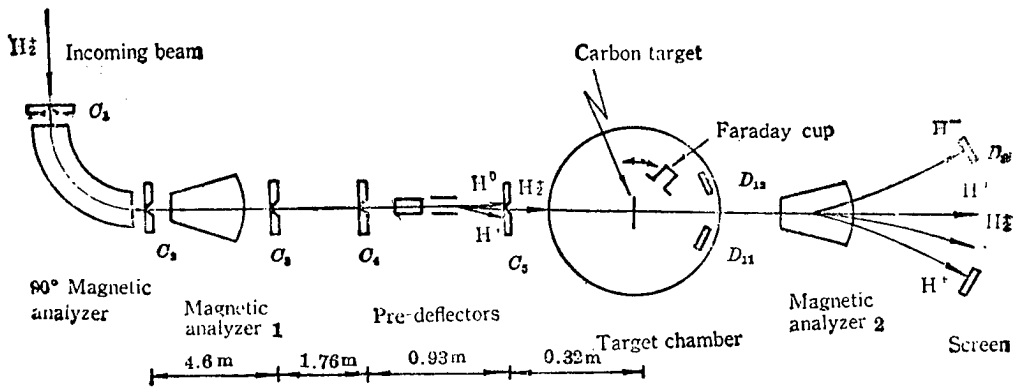
STUDIES OF NEGATIVE IONS PRODUCED BY FAST MOLECULAR IONS THROUGH CARBON FOILS

40090092a Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese Vol 11 No 5, May 88 pp 6-10

[English abstract of article by Shi Miangong [1597 0517 1872], et al., of the Institute of Nuclear Science and Technology, Sichuan University]

[Text] In this paper, the collision mechanism and production of negative ions by fast molecular ions traversing solid foils are described. The experimental results of the production of negative ions by molecular ions $H_2^+$, $D_2^+$ of various energy levels traversing thin carbon foils are presented, and the production of negative ions by molecular ions is compared with that by atomic ions. The results are discussed and analyzed qualitatively.




Schematic Diagram of Measurement Negative Ion

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ANGULAR DISTRIBUTIONS OF ATOMS SPUTTERED WITH $Ar^+$ IONS FROM Ag TARGET

40090092b Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese Vol 11 No 5, May 88 pp 21-23

[English abstract of article by Pan Haochang [3382 3185 2490], et al., of Shanghai Institute of Nuclear Research, Chinese Academy of Sciences; Zhang Hengshan [1728 5899 1472], et al., of Shanghai Institute of Semiconductor Devices; Zhou Zuyao [0719 4371 1031], et al., of Shanghai Institute of Metallurgy, Chinese Academy of Sciences]

[Text] The experimental method is described for measuring angular distributions of sputtered particles using a sputtered particle collector and Rutherford backscattering analysis. The angular distributions are given for 100 keV $Ar^+$ ions sputtering of Ag at incident angles of 0, 30, 50 and 80 degrees. The angular distributions have large deviations from the cosine distribution and show an anisotropy with a preferred emission in the forward direction with respect to the beam. The differential sputtering yield increases rapidly with the increasing angle of incidence. The total sputtering yield calculated from the angular distribution for 50 keV $Ar^+$ sputtering of Ag is $16.8 \pm 2.4$ atoms/ion, and is compared with theoretical values. Finally, the results are discussed qualitatively.

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MEASUREMENT OF NEUTRON CAPTURE CROSS SECTION OF $^{169}$Tm IN ENERGY RANGE FROM 10 TO 100 KEV

40090101a Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 10 No 2, May 88 pp 102-107

[English abstract of article by Xia Yijun [1115 1355 0689], et al., of the Institute of Nuclear Science and Technology, Sichuan University, Chengdu; Zhao Wenrong [6392 2429 2837], et al., of the Institute of Atomic Energy, Beijing]

[Text] The neutron capture cross section of $^{169}$Tm is measured in the neutron energy range of 10-100 keV, using $^{197}$Au as a standard. Neutrons are produced via the reaction $^{7}$Li(p,n)$^{7}$Be with the 2.5 MeV pulsed Van de Graff accelerator at Sichuan University. Capture events are detected by two Moxon-Rae detectors. The results are compared with recent data measured by other authors.

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ACTIVATION REACTION CROSS SECTION MEASUREMENT OF SOME BARIUM NUCLIDES INDUCED BY 14.7 MEV NEUTRON

40090101b Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 10 No 2, May 88 pp 108-113

[English abstract of article by Fan Yangmei [5400 2254 4168], et al., of the University of Science and Technology of China, Hefei; Xiao Zhenxi [5135 2182 0823] of the Institute of Management, Chinese Academy of Sciences, Beijing]

[Text] Cross sections of nuclear reactions $^{134}Ba(n,2n)^{133m}Ba$, $^{136}Ba(n,2n)^{135m}Ba$, $^{138}Ba(n,\alpha)^{135g}Xe$, $^{138}Ba(n,\alpha)^{135m}Xe$ and $^{138}Ba(n,p)^{138}Cs$, induced by a 14.7 MeV neutron, are measured by the activation method. The neutron fluence is determined by the $^{65}Cu(n,2n)^{64}Cu$ and $^{27}Al(n,p)^{27}Mg$ reaction cross sections, respectively. The measured values of these five cross sections are 837 ± 30, 1073 ± 36, 1.50 ± 0.10, 1.10 ± 0.04, and 3.16 ± 0.15 ($10^{-31}$ $m^2$), respectively. The accuracy obtained in this work is higher than that achieved in other experiments.

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INVESTIGATION OF DIFFUSION PROCESS OF FISSIONING SYSTEM. II. ANALYSIS OF BEHAVIORS OF QUASI-STATIONARY STATE

40090101c Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 10 No 2, May 88 pp 120-126

[English abstract of article by Feng Renfa [7458 0088 4099], et al., of the Institute of Atomic Energy, Beijing]

[Text] Based on the diffusion model of nuclear fission, some observable quantities in the fission process are calculated, e.g., the fission rate at saddle point, averaged collective energy at scission point, etc., by solving the time-dependent Fokker-Planck equation. The results are compared to those of Kramer's stationary approximation.

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FACILITY FOR MEASURING $\gamma$-RAY PRODUCTION CROSS SECTIONS FROM (n, x$\gamma$) REACTIONS USING PULSED NEUTRON SOURCE

40090101d Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 10 No 2, May 88 pp 166-173

[English abstract of article by Yan Yiming [7346 0001 7686], et al., of the Institute of Low Energy Nuclear Physics, Beijing Normal University; He Peilun [0149 0160 0243], et al., of the Department of Technical Physics, Beijing University]

[Text] A facility using the pulsed neutron source for measuring $\gamma$-ray production cross sections from (n, x$\gamma$) reactions is presented. The 300 keV deuteron pulses with full width at half-maximum 1-1.5 ns and full width at 2 percent maximum 3ns are obtained by chopping and bunching the deuteron beam on the 400 keV Cockcroft-Walton accelerator. The mean current intensity is 3-6 $\mu$A, which gives a neutron yield of about $10^8$-$10^9$ n/s. The $\gamma$-rays from (n, x$\gamma$) reactions are detected by a Ge(Li) spectrometer, the efficiency of which is carefully calibrated. The time-coincident $\gamma$-spectra are measured using the difference between the times of flight of the $\gamma$-rays and neutrons. A program for data processing is rewritten and improved. To test this facility, the 846.8 keV $\gamma$-ray production cross section of the $^{56}$Fe (n, n'$\gamma$) reaction produced by 14.9 MeV neutrons is measured. Two different sizes of Fe samples are measured and the results are consistent in their error range. The measurement reproducibility of six turns is fairly good. The measured production cross section of 846.8 keV photons from the $^{56}$Fe (n, n'$\gamma$) reaction at 90 degrees is (67.14 $\pm$ 3.42) $10^{-31}$ m$^2$/sr.

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Strategy for Basic Biological Research, Development Set

Biotechnology Policy

40081065 Beijing BEIJING KEJI BAO [BEIJING SCIENCE AND TECHNOLOGY NEWS] in Chinese 9 Mar 88 p 3

[Article: "China Sets Main Points of Policy for Development of Biotechnology; Focus on Industrial Development To Promote and Raise Level of Scientific Research; Concentration of Forces To Highlight Development of a Number of New Products"]

[Text] The State Council recently approved the key points of a policy for the development of China's biotechnology.

The key points of this policy, which was set following study by departments concerned including the State Science and Technology Commission, are as follows: During the present century, China is to focus closely on building new industries and transforming old industries to build the country's biotechnology. It should use the garnering of multiple economic and social benefits as the point of departure for organizing and planning work at various levels and on various links such as basic research, applied research, developmental research, production, and the development of associated technologies, as well as the manufacturing of equipment.

Industrial development should serve to promote and raise the level of scientific research on biotechnology in China, biotechnology thereby making the contribution it should make to the burgeoning of the country's economy and to laying the groundwork for ushering in a new situation in the development of biotechnology during the early part of the next century.

The key points of this policy provide that the country will concentrate forces and highlight key points, giving priority to the development of a number of new biotechnology products that the country urgently needs, and for which the technology is well developed, that provide marked economic social benefits, and for which a definite foundation exists within China. In the field of medicine and health, priority is to be given to the development of enzyme preparations and biochemical reagents used for medical diagnosis, monoclonal antibodies, genetically engineered vaccines, activated polypeptides, and amino acid products, as well as the use of animal and plant cell culturing

techniques on a large scale to produce secondary products of metabolism. In the fields of light industry and food products, priority is to be given to the development of new foods and enzyme preparations used in industry, food additives and livestock feed additives, biological preparations used in the processing of foods, single cell proteins and serial products from them. In the field of farming, forestry, animal husbandry and fishing, priority is to be given to the development of a combination of modern applied biotechnology and conventional breeding techniques for the breeding of fine varieties of plants and animals of superior quality that produce high yields, are disease resistant, and are physically resistant. In the fields of applied tissue culturing and detoxification technology, the rapid propagation of certain forest trees, fruit trees, cash crops, vegetables, and scarce or valuable Chinese medicinal herbs and decorative plants is to be realized, and impetus is to be given to the formation of production systems for them. Techniques such as applied embryo transplants and nucleus transplants are to be used in breeding varieties of livestock and for development of superior varieties of fish. In addition, new biological preparations such as monoclonal antibodies, genetically engineered vaccines, and plant and animal growth hormones used to help monitor and diagnose animal and plant diseases, and in immunoprophylaxsis are also to be developed actively. In the chemical industry and energy fields, a rational assignment of research and development work is needed that includes chiefly microbiological pesticides, macrobiological polysaccharides, bioenergy, multiple uses of reproducible resources, biotechnical synthetic fine chemical industry products, and basic chemical industry products.

The key points of the policy set development goals and drew up a series of corresponding policies for the use of modern biotechniques in the transformation of traditional industries, for hastening the pace of biotechnology development, for intensifying basic research in biotechnology, and for developing and perfecting the infrastructure associated with biotechnology.

In order to promote development of biotechnology, the key points of the policy call for major efforts to strengthen international academic exchanges, technical cooperation and technical imports of biotechnology, active promotion of biotechnology legislation, and a strengthening of leadership and coordination having to do with the development of biotechnical research.

## Strategy for Basic Research

40081065 Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 14 May 88 p 4

[Article by Wang Yahui [3769 0068 6540], Researcher and Director of the Shanghai Cell Biology Research Institute, Chinese Academy of Sciences: "Present State and Strategy for Development of Basic Research on Biology in China"]

[Excerpts] Present Status of and Existing Problems in Biology in China

After more than 30 years of effort since the founding of the People's Republic, China has produced a capability of a certain size that is fairly complete in terms of fields of study. Macroscopically speaking, it has a fairly strong corps of professionals in the field of survey and development of biological resources, their use, environmental protection, and the collection and cataloguing, recording, editing, and collating of basic scientific data as well as ecological research. Research network points cover the entire country, and have done a large amount of beneficial work in building the economy. Microscopically speaking, new branches of learning such as molecular biology, cellular biology, neurobiology, and developmental biology have developed fairly rapidly, and basic research has scored some major achievements at a world advanced level such as synthesis of bovine insulin and analysis of crystalline structure, and the synthesis of yeast alanine tRNA genes. Basic research has also given very great encouragement and impetus to development of biotechnology within the country from the 1970's to the present. Nevertheless, for historical reasons, basic research on biology in China has been disrupted and damaged on several occasions. A very great gap exists between available research forces and levels and both needs for national construction and reaching international advanced standards.

In the field of molecular biology, China has fairly strong capabilities in protein synthesis and the structure of crystals. However, in the analysis of the primary structure of protein, it was not until after 1980 that results were published one after another on the complete sequential analysis of yihuan [00001 6703] protein (such as protein from the root of Chinese trichosanthes [Trichosanthes kirilowii], and lactic dehydrogenase from pandas.) A fairly good foundation exists with regard to the structure and function of enzymes, and some high level pioneering results have been obtained. China also has fairly strong capabilities in nucleic acid synthesis and sequential measurement. In higher biomolecular genetics, molecular immunology, and protein research, however, it is extremely weak or completely lacking. In short, China has begun work in all important fields of molecular biology, and in some it has approached or reached world advanced levels. Nevertheless, in an overall sense, it is estimated that in both terms of the numbers of people engaged in research and the quantity and quality of papers published each year, China's work lags behind that of an intermediate level in the United States, and is between 5 and 10 years behind advanced countries. It also lags behind India and South American Third World countries.

In the field of cellular biology, some basic work had formerly been done with animals, mostly in connection with questions about the development of embryos (such as oosphere maturation, fertilization and unisexual reproduction, embryo induction and differentiation, and analysis of ova development). Fairly good work was done with plant cells in the areas of tissue culturing, and karyon penetration of cell walls. In addition, a good foundation was laid in the fields of submicroscopic morphology, cell chemistry, cell genetics, and experimental cytology with protozoans. Despite the extremely daunting conditions of the mid-1970's, a certain amount of progress was made in the

fields of cell nucleus transplants, the culturing of malignant cell strains and study of their biological characteristics, and anther culturing and the breeding of haploids. Nevertheless, overall, the level and scope of research, the available equipment, and the numbers of personnel were very much lower than international advanced standards. In particular, study at the molecular level was virtually non-existent. Neurobiology has become one of the most active fields in biology internationally. China has a pretty good foundation in ganglion dissection, and electrophysiology, as well as in the sense of pain and the sense of vision; however, in the two new fields that are developing fastest internationally, namely molecular neurobiology and developmental neurobiology, China has a virtual void.

China has superior natural conditions for ecological studies. As a result of the needs of national construction, the field of applied ecology has developed fairly rapidly. Progress has been slow in basic research, particularly on quantitative ecology and experimental ecology, as a result of a shortage of manpower and materials, and difficulties of one kind or another.

The situation has been particularly serious with regard to work in the fields of animal and plant classification and in the cataloguing, recording, editing, and compiling of accumulated basic data. China has vastly more numerous kinds of insects than either the United States of the Soviet Union. The United States has identified more than 85,000 species, and the USSR has identified more than 50,000. China, however, has identified only 15,000 species. Since publication began in 1959, more than 30 volumes of ZHONGGUO ZHIWUZHI [CHINESE PLANTS] have been published and more are yet to come. This comes nearly half a century after "British India Plants," [1875-1897]. In the development and use of biological resources, of the more than 30,000 kinds of higher order plants in China, it has been estimated that no more than 4,000 kinds (13 percent) are used. Of the country's more than 3,000 different kinds of plants used for medicinal purposes, only 25 percent have been chemically analyzed in China. Looked at in terms of the numbers of personnel engaged in the classification of flora and fauna, and the work that has been done, the gap is even greater. For example, China's ornithology society has more than 360 members, only 83 of which are ornithologists, while in Japan the ornithology society has more than 1,000 members. As another example, it has been estimated that China and the United States each have 450,000 species of insects, but in China only 400 people are engaged in the classification of insects while more than 2,000 are engaged in the United States.

China got off to an early start in biotechnology (gene engineering and cell engineering), and it has scored some preliminary accomplishments. Nevertheless, progress in this work has been very much impaired by the lack of necessary theoretical and technical backstopping. This has shown up in project appraisals in the field of "863" biotechnology in which the content of most projects has tracked that of foreign projects with very little innovation. In the realm of plant cell engineering, experimental research on and promotion of anther culturing and the breeding of haploids during the early 1970's attracted international attention; however, failure of basic research to keep pace has made it difficult to continue further. Since the

1984 reform of the science and technology system, the development of various fields of learning has been uneven. As a result of the fairly substantial investment in the Seventh 5-Year Plan and the "863" biotechnology plan, substantial changes have been made in technical facilities available for research on topics of biotechnology nature in the fields of molecular biology and cell biology, and basic research has been unable to obtain sufficient financial support. As a result, they have tended to be left out in the cold. In the course of appraising projects in the realm of "863" biotechnology during 1987, it was found that three of the main projects (in agriculture, pharmaceuticals, and protein engineering) lacked the necessary theoretical backstopping, and that their content mostly followed work done abroad with very little innovation. Neurobiology is one of the fields in which most rapid progress is currently being made internationally. The United States Neurology Association has more than 10,000 members, while China's neurology association has only approximately 1,800, only approximately 100 of whom are engaged in work on the leading edge. The United States spends as much as $5 billion annually on neuroscience. In China, according to State Natural Sciences Foundation financial assistance project statistics for 1986, there were 64 neurobiology projects for which financial assistance funds amounted to 1.9 million yuan for 3 years, an average expenditure of only 10,000 yuan per project. The two leading edge fields of neurobiology that have developed fastest in the world, namely molecular neurobiology and developmental neurobiology, have failed to develop in China for lack of funds. Likewise, as a result of a lack of funds, basic ecological research has encountered numerous difficulties in China and progress has been slow, particularly the development of quantitative ecology and experimental ecology. The gap between basic research on biology in China and foreign countries continues to widen.

Following changes in the system for appropriating funds, the too low investment made by the State Natural Sciences Foundation, cuts in operating funds for research institutes, and lack of policy support have created various difficulties and problems.

Prominent and urgent problems currently being faced are as follows:

1. Increasing dispersal of basic research projects making it impossible to score major accomplishments, research institutes also finding it difficult to shape a distinctive academic course.

2. Institutes lack discretionary authority to use research funds. This makes it impossible to support new projects containing innovative ideas and requiring exploration, or to help outstanding young talent that has just returned to China for whom requests for funds have been turned down for the time being. There is no way to update large pieces of equipment, and procurement of spare parts is also extremely difficult, making smooth operation of the entire institute difficult.

3. Not much improvement has been made in the aging of personnel, particularly with regard to setting up a system for classifying personnel needs. There is a shortage of successors. A predicament already exists of "a valuable resource facing a critical threat" and urgently awaiting deliverance.

Unless the above problems are solved promptly, development of the country's biology is bound to be seriously impeded, and this will hurt development of the national economy. Serious attention should be given in particular to neurobiology and the classification of flora and fauna.

Thoughts About a Development Strategy

In view of the present status and need for development of China's biology, a development strategy should include the drawing up of limited projects in the four priority fields of molecular biology, cytobiology, neurobiology and ecology, and support given them in order to spur a rise in the level of biology as a whole and to provide guiding personnel and the theoretical backstopping necessary for development of China's technology (including biotechnology and information technology). At the same time, basic research on biological resources linked to strengthening the taxonomy of flora and fauna should be done to promote the modernization of traditional biology. In view of the importance of neurobiology to the future development of computers and to information science and technology, as well as the crisis being faced in fauna and flora taxonomy, emergency action should be taken to bolster and improve research in these two regards.

In the field of molecular biology, there should be a continued strengthening of research on protein and nucleic acid structure and function at all levels, the spatial structure and catalytic mechanism of enzymes, and the structure and function of biomembrances. Research should also be launched at the leading edge of macromolecular solution conformation and changes in its dynamic state, molecular recognition and interaction, the structure and function of complex macromolecular systems and how they assemble themselves; the weak area of molecular genetics should be strengthened, particularly higher animal and plant molecular genetics to meet the long-term needs of genetic engineering and the development of agriculture.

Photosynthesis and the fixing of nitrogen by organisms holds important practical prospects for agriculture and energy, and China has a fine foundation in both that requires strengthening with close cooperation between physics and chemistry in the carrying out of long-term basic research.

In the field of cytobiology, there should be a strengthening of regulation and control over eukaryocyte gene expression, particularly time and space sequence research on gene expression in the development of individual higher plants and animals to provide a theoretical foundation for the application of genetic engineering to higher organism; exploratory research should be launched on chromosome structure, function and synthesis, and on the structural laws governing genetic information on chromosomes to unravel the mystery of "genetic language;" launching of research on intercellular recognition,

communication and transmission of matter, maturation of ova, fertilization and nidation of ova, cell division, regulation of the cell cycle, the cancerization mechanism, cytoskeletons and nucleus matrices, cell membranes and membrane systems and receptors; and research related to cell engineering to solve some crucial theoretical and technical problems.

In the realm of neurobiology, not only should there be continued development of fields of research in which a foundation already exists, but emphasis should be placed on strengthening study at the cell and molecular levels in neurobiology, including the molecular biology of synapses, brain function and activity, and the application in all regards of recombinant DNA techniques; filling of some major gap areas such as motor control systems, nerve endocrinology, and developmental neurobiology.

In the field of ecology, rare and endangered organisms of considerable scientific and economic importance should be objects of study, priority going to development of genecology, emphasis being placed on quantitative and qualitative research in system ecology and synecology for rapid development of these two new fields. There should also be a strengthening of basic research in the weak field of autoecology for the gradual formation of an ecology research system to solve major scientific problems in fields of learning and in day-to-day tasks, the aim being to make research breakthroughs on the ecological traits of some important organism populations, and the mechanisms for ecological adaptation and for coordinated evolution of groups of organisms. Also to be studied is the structure and functioning of certain types of ecosystems, the revival and rebuilding of retrogressed ecosystems, and the building of optimum artificial ecosystems in order to propose theories, actions, and forecasts for ecological balance of a protected area nature that are consistent with China's ecogeography for improvement of bioproductivity.

China has abundant varieties of biological resources, approximately 200,000 or more different species. This is a natural treasure-house that is a source of supply for food, medicines, and industrial raw materials. At the same time, it is a strategic reserve that serves as an inexhaustible source of germ plasm for the development of future biotechnology. Rational development of the country's biological resources requires employment of new techniques and new methods in the conduct of a systematic classification, and basic research on rational use of the succession flora and fauna and biological resources (including the laws governing natural growth and decline of species in the natural world and the correlation between the introduction of species and native species). It also requires development of new fields of study such as evolutionary biology. In addition, it is necessary to study plant resources, principally the country's wild plants, including those useful for food (those containing edible protein and oil), those useful for medicine (anti-cancer drugs, contraceptive drugs, and cardiovascular drugs), those useful for industry (fiber and scents), classifying, naming, giving the function, nature, chemical properties, ecological environment, geographic distribution, and techniques for introduction into cultivation of all useful plants, as well as preparing rational plans for their development and use. This should be used

as a basic for establishing a plant resources data bank to serve as a reference in building the economy. In addition, it is necessary to do more in the way of conservation of animal, plant and microorganism plasm resources (including nature preserves, botanical gardens, seed banks, fungus banks, cell banks, and gene banks).

Suggestions About Policies Toward Fields of Learning

1. Increased Investment in Biology Commensurate With Its Position in Modern Natural Science and Socio-economic Development. It is suggested that when the state formulates long-range development plans for all major fields of study (including proportional expenditures, key laboratories, and capital construction), it should increase investment in biology. The most pressing need today is to increase financial assistance from the State Natural Sciences Foundation for basic research in biology, as well as to increase discretionary expenditures for scientific research by biological research organs.

2. Management of Science According to Scientific Characteristics, Maintaining Long-term Stability in Basic Research on Biology.

The fundamental thrust of reform of scientific management is to manage science in accordance with the characteristics and laws of science. First, it is necessary to tailor management on the basis of the characteristics of three categories of research. All policy actions, setting up of organizations, management of plans, scientific evaluations, methods of issuing awards, and training personnel should be consistent with specific individual characteristics. Basic research is characterized by being exploratory, creative, and on-going. In biology, many important topics take decades or even as much as a 100 years. Basic biological research from the time it begins until it produces results, and on to practical application frequently requires a fairly long cycle. The most important thing today is to maintain long term stability in basic research. The basic research corps might be a little smaller so long as policies provide that personnel engaged in this kind of work be able to work in peace. Different fields of learning differ in nature and the level of their development, and they also differ in the actual way in which they relate to production. Goals for serving the national economy have to be consistent with different circumstances. Some may be short term or intermediate term, and some may be long term. Some may be direct; others indirect. When a basic research project seems for the moment to hold no clear practical benefit, so long as it is important scientifically, one cannot say that it is useless and not make proper provisions for it. In short, long-term stability has to be maintained in basic research on biology to enable an accumulation of knowledge and the maturation of the latent involved. It is necessary to conform to nature, and adroitly guide action according to circumstances in accordance with the nature of biology and the laws of development; one cannot try to help growing shoots along by pulling them upward. We have had numerous lessons of experience in this regard in the past.

3. Proper Handling of the Correlation Between Fields of Study for Priority Development and Routine Fields of Study, Strengthening of Weak Links That Relate to the Situation as a Whole, and Taking Urgent Action To Rescue Critically Endangered Classification of Flora and Fauna.

On the basis of the trend of development of biology and strategic needs for development of the national economy, it is recommended that the four new fields of molecular biology, cytobiology, neurobiology, and ecology be selected for priority support in order to spur development of the entire field of biology toward a modern advanced level. Therefore, it is necessary to handle correctly the correlation between front running fields of learning and ordinary fields of learning, and between new fields of learning and old fields of learning. Provision must also be made for "cold" fields of learning and "small fields of learning" having only a small number of researchers (such as theoretical biophysics), as well as work that accumulates basic scientific data (such as animal and plant characteristics, and morphological dissection). They cannot be dropped, thereby creating new "voids." In short, overall planning that takes all factors into account, and proper provisions must be made while maintaining emphasis on key areas to enable China's biology to develop in a healthy and undeformed way. Achieving this will require proper apportioning of funds. Key projects should not receive excessive amounts. Even projects in priority fields will have to be given selective support as circumstances warrant in order to promote the healthy development of biology. A scholarly spirit of unflagging perseverance should be the style of study, and doing whatever happens to be in vogue, changing ones mind every time something new comes along, being flashy but without substance, jumping on bandwagons, and breaking away with much ado should be opposed.

Genetics, particularly higher organism molecular genetics is of crucial importance in the whole field of the development of biology. China is extremely weak in this regard, and it must take emergency action to strengthen this important weak link.

The country's characteristics of flora and fauna is in a "predicament of valuable and rate things being critically endangered and awaiting deliverance." Emergency action has to be taken to stabilize and to expand appropriately the scientific and technical corps engaged in characteristics and basic research on flora and fauna and biological resources. Scientific research funds, field work conditions and subsidies, and personnel training (including dedicated facilities, and public funds for a quota of people to travel abroad) should be given the required attention. In the field of international cooperation, an active policy should be adopted that both protects resources and expands cooperation to promote the development and modernization of fields of study.

4. Proper Handling of the Correlation Between the Orientation Toward Building the Economy and the Development of Fields of Study To Produce a Mutually Advancing Benign Cycle.

First of all, serious attention should be given to basic research in the field of biotechnology that has major practical applications; weak links (such as key theories and techniques for higher animal and plant molecular genetics, target genes and vectors, and post processing of products) should be strengthened and work done in depth to provide the personnel to guide, and the theoretical backstopping for, the development of the country's biotechnology, and for completion of the "863" plan. In addition, it is also necessary to do more work on basic biological problems (such as the ecosystem, biological resources, and reproductive biology) having to do with major national economic tasks (agriculture, biological resources, the environment, population, and medical health care) in order to obtain financial support and to energize the development of certain fields of study. Research on neurolemma pattern recognition will provide new concepts and new principles for information science. Special actions will have to be taken to advance the linking of neuroscience and information science and their joint development.

Bolstering the Interaction of Fields of Study To Enhance the Development of Biology.

To a very large extent, the swift development of modern biology is attributable to its widespread permeation by mathematics, physics, and chemistry. Solution to many major theoretical problems in modern biology such as how photosynthesis works, nitrogen fixation by organisms, research on the brain, and ecological balance will require cooperation among the fields of physics, chemistry, and mathematics. Consequently, mathematicians, physicists, and chemists should be encouraged and attracted to take part in biological research. In addition, interaction among various fields of study within biology should be bolstered. Of particular importance is the permeation of other areas by molecular biology. This will require strengthening cooperation among institutions of higher learning and among institutes; in particular, support will have to be given to cooperative research plans that cut across unit lines and involve many fields of study to open new fields of study on the frontiers of science.

6. Training Personnel

The key to realization of basic research plans for biology lies in the availability of skilled scientists. In every research organization today, there is the problem of personnel who have grown old and knowledge that has grown old. The existing personnel system must be reformed so that scientific and technical personnel can move in and move out. Henceforth, research personnel should be obtained primarily through the training of graduate students linked to the training of doctoral students outside the country. A "post-doctorate research personnel" system should be established to improve the quality of the scientific research corps. Recruitment of researchers with qualifications that cut across scientific fields should be encouraged to train up "masters and doctors in two fields of study." People who have already obtained a masters degree in chemistry or physics should be brought in to work on obtaining a doctorate in biology so as to train personnel able to open up new fields on the frontiers of science. In order to create the necessary scientific research and living conditions for students studying abroad, plans should be made to attract outstanding talent to return to China to work.

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# Depressed Production of Interleukin 2, Immune Interferon by Peripheral Blood Lymphocytes of Patients With Viral Hepatitis B

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[Article by Chen Wei-feng [7115 1983 1496] et al., Department of Immunology, Beijing Medical University, Beijing]

[Excerpts] The capacity for interleukin 2 (IL2) and immune interferon ($IFN_\gamma$) production by phytohemagglutinin-stimulated peripheral blood lymphocytes (PBL) is investigated in a group of 76 patients with hepatitis B virus (HBV) infection. A significant decrease in IL2 and $IFN_\gamma$ production is observed in patients with acute and chronic type B viral hepatitis when compared with normal level IL2 and $IFN_\gamma$ activity in age-matched healthy donors. The degree of depression in IL2 and $IFN_\gamma$ production was correlated to the clinical types of HBV infection, as manifested by the following order depression: acute and subacute fulminant hepatitis>chronic persistent hepatitis (CPH)>chronic active hepatitis (CAH)>acute hepatitis (CH).

In the CAH and CPH patients with detectable hepatitis B virus surface antigen (HBsAg), the impairment of IL2 and/or $IFN_\gamma$ Production was still marked in the majority, although the live enzyme value (SGPT) was returning to normal. There was positive correlation between the depression in IL2 and $IFN_\gamma$ production calculated on individual samples. These data suggest that the defect in the ability to produce IL2 and $IFN_\gamma$ probably constitutes the basis of the anomalous immunoregulation during HBV infection.

It is well documented that both cellular and humoral immune responses are mediated by cytokines secreted by regulatory cells. Among numerous cytokines, interleukin 2 (IL2) and immune interferon ($IFN_\gamma$) are known to be critical factors in the induction and modulation of cytotoxic T lymphocyte (CTL) functions, in the response to various antigens.[5,6] So estimating the capability of IL2 and $IFN_\gamma$ by lymphocytes derived from HBV-infected patients may offer an objective parameter for assessing non-specific lymphocyte function in these patients.

More recently, there have been several reports indicating that a defect in either IL2 or $IFN_\gamma$ by peripheral blood lymphocytes (PHL) has been shown in patients with type B viral hepatitis.[7-9] However, these observations were

mainly based on a few cases of chronic viral hepatitis. The implications of this finding is far from clear. In an attempt to determine whether the depression in cytokine production is a common feature in patients with HBV-infection, we have investigated the capability of IL2 and IFN$\gamma$ production by PBL upon phytohemagglutinin (PHA) stimulation in patients in the acute and chronic phases of viral hepatitis. This study has revealed the fact that the severity of the depression in IL2 and IFN$\gamma$ production is correlated with the clinical phase of the hepatitis.

This study has provided evidence that HBV infection leads to marked depression in IL2 and IFN$\gamma$ production by PBL of patients. The degree of depression is related to the clinical phase of the disease: The most severe depression is observed in fulminant hepatitis, mild but significant depression acute hepatitis and moderate depression in chronic hepatitis. The mechanism of the depression is not clear. It is certainly not due to immunosuppressive agents (such as corticosteriods) administration, for the blood samples were taken prior to treatment; neither can it be attributed to the activation of suppressor cells, as attributed to the activation of suppressor cells, as the function of suppressor cells is decreased during HBV-infection; nor is it solely attributable to autoanti-T cell antibodies for these autoantibodies re not readily detectable in the acute phase of the disease. As depression of CK production occurs in all phases of viral hepatitis, we suggest that the HBV itself damages at least helper T cell functions in factor production. This suggestion is consistent with the finding by Martino et al that HBV can damage hepatocytes when immune response is depressed.

Our study is not in complete agreement with the hypothesis that liver cell damage is induced solely by the cytolytic effect of effector CTL response. The extreme depression of IL2 and IFN production by PBL from fulminant hepatitis patients makes it unlikely that a normal CTL response can occur, because these two factors are required for the induction of effector CTL and NK cell.

Based on our finding that both CAH and CPH patients have marked depression of IL2 and/or IFN production, in combination with the finding by Mondelli et al., that the PBL of both CAH and CPH patients express a similar degree of cytotoxicity to autologous liver cells, we doubt that the degree of CTL response is the decisive factor in determining the phase of CAH or CPH. The correlation of HBsAg persistence in the suppression may be a clue to the possible role of HBsAg in the suppression of helper T cell functional expression. Further efforts should be made to explore the consequences of the interaction between the HBV antigen (HBsAg and other antigens) and lymphocytes.

/06662

# Idiopathic Thrombocytopenic Purpura Antiplatelet Autoantibodies, Their Related Antigens Studied by Using Monoclonal Antibodies Against Platelet Glycoproteins

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[Article by Hu Chang-jun [5170 2490 6511], et al., Shanghai Second Medical University, Shanghai and Shen Bei-fen [3088 0223 1164], et al., Institute of Basic Medical Sciences, Chinese Academy of Military Medical Sciences, Beijing]

[Text] We studied the antiplatelet autoantibodies and their related antigens of idiopathic thrombocytopenic purpura (ITP) patients using three McABs against platelet glycoproteins, ELISA, immunoprecipitation and autoradiography. The results of the study indicate that the related antigens of antibodies are nonhomogeneous including GPIb, GpIIb, and/or GPIIIa and other components of platelet membranes. We suggest that ITP may be a complex and nonuniform autoimmune disease with different autobodies and different related antigens.

Idiopathic thrombocytopenic purpura (ITP) is one of the commonest clinical hemorrhagic diseases. In 1951, Harrington et al[1] reported that an antiplatelet factor could be found in ITP patient blood. Now it is well known that the factor is an autoantibody against platelets predominantly of the 7S IgG type. In 1975, Dixon et al[2] established a method of determining platelet associated IgG (PAIgG) in ITP patients. They found that the PAIgG level was increased in the majority of these patients and that there is an inverse correlation between PAIgG and platelet count. These findings have been confirmed by many authors using different methods.

But what are the antigens related to the antiplatelet antibody? This study began only at the beginning of the 1980's. In 1982, Van Leeuwen et al[3] reported that serum antibody (14/42) or platelet eluate (35/42) from ITP patients could bind to normal platelets but not to the platelets of patients with Glanzmann's thrombasthenia. These authors concluded that some ITP antiplatelet antibodies may be directed to platelet GPIIb and/or GPIIIa.

Recent studies of the related antigens indicate that, by using several techniques including McAb, they may be GPIIb/IIIa GPIb and GPIIb/IIIa or single GPIIIa.[4-7]

In this study, we used three McAbs against platelet glycoproteins in order to further elucidate the antiplatelet autoantibodies and their related antigens in ITP patients.

Materials and Methods

McAb. McAb against GPIIb (P256) was provided by Professor Bai Yan, and McAb against GPIb (SZ-2) and GPIIIa (SZ-21), by Professor Ran Chang-geng (thrombosis and Hemostasis Laboratory, Suzhou Medical College, Suzhou).

Patients. All patients were diagnosed as chronic ITP according to the following criteria: mucosal bleeding or skin purpura, thrombocytopenia with normal or increased numbers of megakaryocytes in myelograms, and absence of other causes of thrombocytopenia, such as drugs, SLE, aplastic anemia and splenomegaly. All the normal control subjects had no thrombocytopenia or abnormal bleeding. There was no menorrhagia in the women. The blood samples were taken 2 weeks after cessation of steroid drug therapy if the ITP patients were treated with these drugs.

ELISA indirect method. Plasma samples were obtained from 51 patients with chronic ITP (16 males, 35 females, M:F=1:2.2, age ranged 14-67, average 35.6), and 29 normal controls (9 males, 20 females, M:F=1:2.2, age ranged 23-60 average 40.4).

Each well of the microtiter plate (Third Plastic Products Factory, Shanghai) was coated with 1 of normal platelet suspension at a concentration of $2X10^7$ platelets/ml for 10 min at room temperature, then centrifuged at 2,500 rpm for 10 min. After centrifuging, the platelet-coated wells were incubated with 100 $\mu$l of patient or normal plasma for 2 hours at 37 C. The microtiter wells were washed 3 times with PBS and then incubated for 1 hour with 200 $\mu$l of HRP-antihuman IgG antibody (Institute of Biological Products, Shanghai) at 37 C. The wells were then incubated with 100 $\mu$l substrate buffer (OPD 4 mg, citrate buffer 10 ml 30% $H^2O^2$ 15 $\mu$l, pH 5.6) for 15 min at 37 C. The reaction was stopped by 50 $\mu$l of 2M $H_2SO_4$.

The results were expressed as a ratio of the optical density of the patient's well divided by the average optical density of normal subjects' wells.

Preparation of platelet extract. Normal platelets were obtained from blood with EDTA for anticoagulation. after centrifuging and collection, the platelets were washed 3 times with buffer solution (Tris 10 mM, EDTA 2.5 mM, NaCl 250 mM Glucose 5 mM). The washed platelets were solubilized by incubation in lysis buffer (1% NP40, 150 mM NaCl, 1 mM EDTA, 50 mM Tris, 0.1% BSA, 0.02% $NaN_3$ for 20 min at 4 C at a final concentration of $10^9$ platelets/ml. Insoluble material was removed by centrifuging at 12,000 rpm for 15 minutes, and the extracts stored at -30C.

ELISA sandwich method. The ITP patient and normal subject plasma were the same as with the ELISA indirect method.

Each well was coated with McAbs specific for GPIb, GPIIb and GPIIIa respectively, and incubated overnight with 100 $\mu$l of purified McAb at 1 $\mu$g/ml in 0.05 M $NaHCO_3$ buffer. The microtiter wells were washed 3 times with 0.05% Tween 20-PBC to remove free McAb and incubated with 10% rabbit serum for 30 min to block remaining protein-binding sites. To the McAb-coated wells, we added 100 $\mu$l of a 1:10 dilution of platelet extract in PBS. After 2 hours incubation at 37C, the wells were washed 3 times with Tween 20-PBS and incubated for 2 hours with 100 $\mu$l of human plasma samples. After washing, the wells were incubated with HRP-antihuman IgG antibody substrate buffer as in the ELISA indirect method.

The results were expressed as in the ELISA indirect method.

ELISA competitive method. Platelet samples were obtained from 17 patients with chronic ITP (6 males, 11 females, M:F = 1:1.8, age ranged 19-57, average 35), 14 patients with thrombocytopenia due to other causes than ITP (in 9 of them caused by drugs), 1 myelodysplastic syndrome (MDS), 1 PAIgG, 2 aplastic anemia, 1 refractory anemia (5 males, 9 females, M:F = 1:1.8, age ranged 14-57, average 33).

Platelets were incubated with $GPII_b$-specific McAb P256 for 1 hour at 4 C and washed 4 times with buffer. Then the platelets were suspended in 0.01 M, pH 7.4 PBS at a final concentration of $10^8$ platelets/ml.

Each well was coated with P256 by overnight incubation with 100 $\mu$l of the purified McAb at 1 $\mu$g/ml in 0.05 M $NaHCO_3$ buffer. The microtiter wells were washed 3 times with Tween 20-PBS and incubated with 10% rabbit serum for 30 minutes, then removed. 50 $\mu$l suspension of P256-coated platelets and 50 $\mu$l of HRP-antimouse IgG antibody (DAKO) were put in the wells. After 1 hour incubation at 37 C, the wells were washed 3 times with Tween 20-PBS and substrate added as in the ELISA indirect method. The amounts of P256 binding to the platelets are shown by the standard curve.

Preparation of the standard curve. P256 was diluted with PBS, the final concentration being 2 $\mu$l/ml-125 ng/ml (five concentrations. Then the wells were coated with P256 and incubated with 50 l of P256 diluted at different concentrations and 50 $\mu$l of HRP-rabbit antimouse IgG antibody for 1 hour at 37 C. After washing 3 times, the well substrate was added as above. The curve was plotted by the P256 concentration and optical density.

According to the optical density, the amount of P256 binding to the platelets could be calculated from the curve.

Platelet labelling and immunoprecipitation. 44 chronic ITP patients were tested. Plasma was used from 32 cases, platelet eluate from 7 cases and both plasma and platelet eluate from 5 cases.

The lactoperoxidase and oxidase method[8] was used to label platelet surfaces. 6 X $10^8$ platelets from normal subjects was labelled with 1 mCi $^{125}I$ by incubating with 30 $\mu$l of a mixture of lactoperoxidase (1 mg/ml, Sigma, St.

Louis, Mo) and glucose oxidase (5 U/ml, Sigma) in 0.5 ml PBS/5 mmol/L glucose at room temperature for 15 minutes. After washing 3 times, the radiolabelled platelets were lysed with 1 ml lysis buffer for 30 minutes at 4 C. Insoluble material was removed by centrifuging at 12,000 rpm for 15 minutes at 4 C. The supernatant was $^{125}$I-labelled platelet extract.

Immunoprecipitation was performed by adding 400 $\mu$l of plasma or 50 $\mu$l of platelet eluate and 100 $\mu$l of 3.5 M NaCl to 100 $\mu$l of platelet extract, and then adding lysis buffer to bring the final volume to 1 ml. After incubation for 2 hours at 4 C, 100 $\mu$l of a 10% suspension of rabbit anti-human IgG antibody coated Staphylococcus Aureus was added. After additional incubation for 30 minutes at 4 C, the S Aureus was pelleted at 12,000 rpm for 30 s, and the supernatant discarded. The pellet was washed first by NET buffer (0.15 M NaCl, 50 mM Tris, 5 mM EDTA, 0.02% $NaN_3$, pH 7.4 containing 0.5% NP40 with the NaCl concentration raised to 0.5 M; second by NET buffer with 0.5% NP40 and 0.1% SDS; and finally with 0.1% NP40 in 10 mM Tris pH 8.0. The bound $^{125}$I-labelled surface antigens were eluted by boiling for 5 minutes with sample buffer containing 2% SDS and 5% mercaptoethanol, the solution was electrophoresed in SDS-polyacrylamide slab gels, by the Laemmli system[9] and autoradiographed.

Preparation of platelet eluate. Platelets were obtained from ITP patients by centrifuging, and the platelets washed 3 times with buffer. After adding 50 $\mu$l of glycine-HCl buffer pH 2.8 for 5 minutes at room temperature, the immunological material was eluted from the platelet surfaces. Finally, the suspension was centrifuged at 12,000 rpm for 2 min, and the pH of the supernatant platelet eluate was adjusted to neutral with 1 N NaOH.

*Table 1. Plasma antiplatelet antibody in ITP patients by ELISA sandwich method*

| | | No. | M | SD | Positive | | P |
|---|---|---|---|---|---|---|---|
| | | | | | No. | % | |
| Anti-GPIb | N | 29 | 1.00 | 0.12 | | | |
| | P | 51 | 1.15 | 0.32 | 24 | 47.1 | < 0.01 |
| Anti-GPIIb | N | 29 | 0.98 | 0.17 | | | |
| | P | 51 | 1.01 | 0.30 | 6 | 11.8 | > 0.05 |
| Anti-GPIIIa | N | 29 | 0.99 | 0.19 | | | |
| | P | 51 | 1.18 | 0.34 | 17 | 33.3 | < 0.01 |

N: normal P: patient

## Results

ELISA indirect method for measuring antiplatelet antibodies in human plasma. Plasma from 29 normal subjects and 51 ITP patients was tested. Mean ($\pm$SD) ratios of normal subjects were 1.03$\pm$0.08 while that of ITP patients, were 1.33$\pm$0.27. 41 (80.4%) of 51 patients had ratios greater than 2 standard deviations above the mean of normal subjects.

ELISA sandwich method for measuring antigens related to antiplatelet antibodies in human plasma. The positive rate was 54.8% (28 of 51). We classified the platelet antibodies into the following 3 groups:

(1) According to their action against GPIb, GPIIb or GPIIIa, there were respectively 24 (47.1%) cases, 6 (11.8%) cases and 17 (33.3%) cases in positive patients as shown in Table 1. The levels of anti-GPIb and anti-GPIIIa antibodies were much higher in patients than in normal subjects ($p>0.01$), and anti-GPIIb was slightly higher ($p>0.05$).

(2) According to the antiplatelet antibodies bound in every patients' plasma, 10 (19.6%) cases had anti-GPIb antibody, 4 (7.8%) anti-GPIIIa antibody, 8 (15.7%) both anti-GPIb and anti-GPIIIa antibodies, 2 (3.9%) both anti-GPIb and GPIIb antibodies, 4 (7.8%) anti-GPIb, GPIIb and GPIIIa antibodies, and one anti-GPIIb antibody alone (Fig 1).

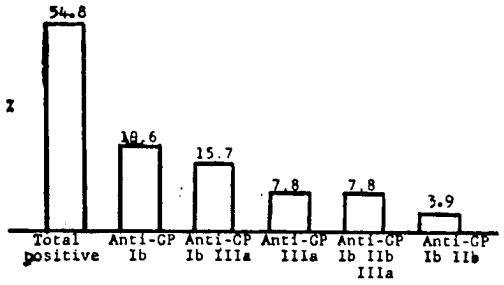


Fig 1. Classification of plasma antiplatelet Ab in 51 ITP patients.

(3) The positive rate of anti-GPIIb and/or anti-GPIIIa in patient plasma was 35.2% accounting for 64.2% in 54.8% of positive cases (28/51).

13 (31.7%) of 41 positive cases detected by ELISA indirect method were negative by the ELISA sandwich method. It can be concluded that, besides GPIb, GPIIb and/or GPIIIa, there are other platelet antigens responsible for the formation of antiplatelet autoantibodies.

ELISA competitive method for determining the amount of P256 bound to platelet surfaces. 27 normal subjects, 17 ITP patients and 14 patients with thrombocytopenia caused by diseases other than ITP were tested. The amount of P256 bound to platelets was much scantier in ITP patients than normal subjects and non-ITP diseases ($p>0.01$), but there was no difference between normal subjects and non-ITP patients ($p>0.05$), as shown in Table 2.

Plasma antiplatelet GPIIb and/or GPIIIa antibodies were positive in 6 of 17 ITP patients, and negative in 14 non-ITP patients by the ELISA sandwich method. The amount of P256 bound to platelet surfaces is less than 2 standard deviations below the mean of normal subjects in 4 of 6 positive cases. There is no correlation between plasma antiplatelet antibody bound to platelet surfaces in ITP patients ($r = -0.12$).

*Table 2. Amount of McAb against GPIIb bound to platelet surfaces*

| | Normal | ITP | Non-ITP |
|---|---|---|---|
| N | 27 | 17 | 14 |
| M(ng/$10^6$PL) | 18.39 | 11.79 | 18.71 |
| SD | 3.8 | 6.62 | 6.2 |
| < 1SD | — | 14(82.35%) | 1(7%) |
| < 2SD | — | 9(52.94%) | — |

Precipitation of radiolabelled platelet antigens with ITP plasma and platelet eluate. The positive rates of 37 ITP patient plasma and platelet eluate from 12 ITP patients were 73% (27/37) and 66.7% (8/12) respectively, and GPIIb and/or GPIIIa accounted for 70.3% and 50%. One patient's plasma precipitated both GPIb and GPIIIa (Table 3 and Fig 2 [omitted]).

*Table 3. Immunoprecipitation results*

| Sample | GPIb | GPIIIa | GPIIb/IIIa | Total positive |
|---|---|---|---|---|
| Plasma | 2* | 8* | 18 | 27 |
| (n = 37) | 5.4% | 21.6% | 48.7% | 73% |
| Platelet eluate | 2 | 4 | 2 | 8 |
| (n = 12) | 16.7% | 33.3% | 16.7% | 66.7% |

* One patient's plasma precipitated both GPIb and GPIIIa.

In 5 patients both plasma and platelet eluate were precipitated. In 3 of these patients, plasma and eluate results were identical. In 2 cases, the related antigens were GPIIb/IIIa, in 1 it was GPIIIa only, while in the other 2 cases, the results were not unanimous. In 1 of the 2 plasma precipitated GPIIb/IIIa but the platelet eluate yielded only GPIb. In the other one plasma did not precipitate glycoprotein but platelet eluate yielded GPIIIa.

## Discussion

According to the literature, the positive rates of ITP plasma antiplatelet antibody found by different laboratory methods ranged generally 50-70%. In our study, the positive rates of plasma antiplatelet antibody detected by ELISA indirect method and immunoprecipitation were 80.39% (41/51) and 73% (27/31) respectively, higher than Fabris' 64%[10] and Shen's 62.5% (PAIgG).[11] The negative results in some patients could be explained by many factors, namely, the methods used and their sensitivity may differ, different mechanism

of thrombocytopenia such as cellular immunity. Besides, some authors[12] suggested that there are two kinds of antiplatelet antibodies in ITP and that according to their affinity to platelets, one is higher and the other lower. The former mainly binds to platelet surfaces and the latter is free in the plasma.

The studies on related antigens conducted with different techniques indicate that they were not uniform. They include GPIb, GPIIb and/or GPIIIa, the latter 2 being the main related antigens.

Tables 4 and 5 show the results of studies on antigens related to platelet autoantibodies found in our study and the medical literature.

From the tables, it is evident that GPIIb and/or GPIIIa are the main ITP related antigens, and the results are no identical in the different patient groups or by different methods. There are some differences in our results and those reported in the literature, perhaps they are due to differences in the methods used and different patient groups.

The positive rate of immunoprecipitation may be affected by factors as the antibody titer, the character of the antibody and components of the platelet membrane other than the membrane protein. Only membrane protein can be labelled with $^{125}I$, especially that rich in lysine, while lipids cannot. So if there is any antilipid antibody in plasma or platelet eluate, immunoprecipitation would remain negative. Recently, Harris[13] found that there were anticardiolipid antibodies in 30 (31.3%) of 96 chronic ITP patients, suggestion that the mechanism of thrombocytopenia may be associated with antilipid antibody in some patients. In our study, the differences in results also indicate that, by the ELISA indirect method and ELISA sandwich method, besides GPIb, GPIIb and/or GPIIIa, there are other antibodies against other platelet components.

*Table 4. Platelet related Ags isolated in our study by several methods*

| Methods | Case | GPIIb and/or GPIIIa (%) | GPIb (%) |
|---|---|---|---|
| ELISA sandwich method (plasma) | 51 | 35.2 | 19.6 |
| ELISA sandwich method (plasma) | 17 | 35.2 | ND |
| Immunoprecipitation (plasma) | 37 | 70.3 | 5.4 |
| Immunoprecipitation (platelet eluate) | 12 | 50.0 | 16.7 |
| ELISA competitive method (platelet) | 17 | 52.94 | ND |

* ND: Not detected

In one of the patients in this series, GPIIb/IIIa was precipitated from plasma, and GPIb from the platelet eluate. Van Leeuwen et al[3] found similar phenomena in 2 patients, by immunofluorescence assay. Further study is needed

to ascertain whether this is due to different affinity of antibodies against platelets or to another mechanism.

*Table 5. Idiopathic thrombocytopenic purpura related Ags reported in the literature*

| Methods | Cases | GPIIb and/ or GPIIIa (%) | GPIb (%) | Author |
|---|---|---|---|---|
| Immunofluorescence assay (plasma) | 42 | 33.5 | ND | Van Leeuwen in 1982[3] |
| Immunoprecipitation (plasma) | 7 | 14.0 | — | Dana in 1984[6] |
| Immunoprecipitation (plasma) | 8 | 37.0 | 25.0 | Woods in 1984[4,5] |
| Immunofluorescence assay (platelet eluate) | 42 | 83.3 | ND | Van Leeuwen in 1982[3] |
| Immunoblot (platelet eluate) | 13 | 69.0 | — | Beardsley in 1984[7] |

According to the results of our study and the literature, it can be assumed that the related antigens are not homogeneous in ITP. ITP may be a complex and not uniform autoimmune disease with different autoantibodies and their related antigens.

## REFERENCES


1. Harringon, W.J., et al. Demonstration of a thrombocytopenia factor in the blood of patients with thrombocytopenic purpura. J Lab Clin 1951; 38:1.

2. Dixon R., et al. Quantitative determination of antibody in idiopathic thrombocytopenic purpura: correlation of serum and platelet-bound antibody with clinical response. N Engl J Med 1975; 292: 230.

3. Van Leeuwen E.F., et al. Specificity of antibody in autoimmune thrombocytopenic purpura. Blood 1982; 59:23.

4. Woods V.L., et al. Autoantibodies against the platelet GPIIb/IIIa complex in patients with idiopathic thrombocytopenic purpura. Blood 1984; 63:368.

5. Woods, V.L. et al. Autoantibodies against platelet GPIb in idiopathic thrombocytopenic purpura. Blood 1984; 64:156.

6. Dana V., et al. Identification of platelet proteins that bind alloantibodies and autoantibodies. Blood 1984; 64:1240.

7. Beardsley D.S., et al. Platelet membrane glycoprotein IIIa contains target antigens that bind antiplatelet antibodies in immune thrombocytopenias. J Clin Invest 1984; 74:1701.

8. Richard J.J., et al. Immunological method. Academic Press, Inc 1979; 2:169.

9. Laemmli V.K. Cleavage of structural proteins during the assembly of the head of bacteriophage $T_4$, Nature 1970; 337:685.

10. Fabris F., et al. A new ELISA method for the detection of SPBIgG. Clinica Chimica Acta 1985; 146:223.

11. Shen Z. X., et al. Direct and indirect assay of PAIgG. Chin J Hematology 1985; 6:625.

12. Hymes K., et al. Heavy-chain subclass of bound antiplatelet IgG in idiopathic thrombocytopenic purpura. Blood 1980; 56:84.

13. Harris E.N., et al. Anticardiolipid antibodies in autoimmune thrombocytopenic purpura. Br J Haematol 1985; 59:231.

/06662

Value of Ionic Astatine-211 in Tumor Treatment Evaluated

40081060a Chengdu SICHUAN DAXUE XUEBAO [JOURNAL OF SICHUAN UNIVERSITY, NATURAL SCIENCE EDITION] in Chinese Vol 25 No 1, Feb 88 pp 105-108

[Article by Shao Yuesheng [6730 1471 3932], Chen Wenyuan [7115 2429 0337], Zhang Shuyuan [1728 0647 3220], Jin Jiannan [6855 1696 0589], Xu Daoquan [6079 6670 2938], Jin Shushan [6855 2885 3790], and Zhou Maolun [0719 2021 0243]: "The Effect of Astatine-211 (Ionic) on Chromosome Aberrations, and Sister Chromatid Exchange of Human Lymphocytes in Vitro"]

[Text] Abstract: This article reports the processing of umbilical cord blood with different doses of ionic astatine-211. Results of the experiment show that when the dosage of astatine-211 was incrementally increased from 0.25 μCi to 4 μCi per milliliter of blood culture, the number of cells in which chromatid aberrations occurred rose correspondingly from 11.7 percent to 100 percent. On average, the number of cell chromosome breaks rose from 0.16 at 0.25 μCi to 17.14 at 5 μCi. Of all the various chromosome aberration types, fragments and chromatid breaks were most sensitive to the astatine-211, but ring chromosomes and dicentric chromosomes showed no marked changes. There was no marked difference in the SCE values of controls compared with exposed leucocytes, demonstrating that the effect of astatine-211 on sister chromosome exchange was negligible.

Radioactive isotope astatine-211 is a virtually pure alpha radioactive source whose alpha particles have an average energy of 6.8 MeV. They are able to penetrate soft tissue only to a depth of 60 μm,[1] and their half life is 7.2 hours. As a result, they can be developed into powerful anti-tumor medicines having few side effects.[2][3] In order to make a complete evaluation of the safety of astatine-211 anti-tumor research, the biology department and the Institute of Nuclear Science and Technology of Sichuan University undertook a systematic study of the biological effects of astatine-211, the present article being one result. No reports have yet appeared in foreign references about the effect of astatine-211 on human chromosomes, and references inside China have been limited to only a single brief report from our study group.[4]

## Materials and Methods

Preparation of Ionic Astatine-211. The university's 1.2 meter cyclotron used 27 MeVa with a particle beam diameter of $^{209}Bi(a,2n)$ to produce an astatine-211 reaction. Following chemical isolation, it was preserved in a solution of 0.5 MNaOH + 0.4 $MNaHSO_3$, and it was neutralized with 3MHCl before use. The sodium astinide solution obtained was diluted in normal saline to the required radioactive strength.

Human umbilical cord blood was used in the experiment following the semimicro whole blood culturing method. The dosage of astatine-211 selected was about 5 times the medical treatment dosage (1 μCi/ml),[5] and divided into two groups as follows:

1. After culturing for 26 hours, to the blood medium was added different dosages of ionic astatine-211, and culturing was continued for another 22 hours (colchicine being added 2 hours before slides were made).

2. After culturing for 24 hours, BrdU (at a final concentration of 12 μg/ml) was added to the blood culture after which different dosages of ionic astatine-211 were added. After further culturing for 32 hours away from light, slides were made. Differential SCE staining and examination under the microscope was done during the second cell cycle. Chromosomes numbered 46 with good separation. During the mid-break up phase when color differences were distinct, the number of SCE exchanges were recorded.

## Results and Discussion

Chromosome Aberrations. Results of the experiment are shown in Table 1 and Table 2.

Table 1. Effects of Different Dosages of Astatine-211 on the Chromosome Fragmentation Rate and the Aberrant Cell Rate

| At-211 Dosage (μCi/ml)medium | 0.05 | 0.25 | 0.5 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|
| Chromosome Fragmentation Rate Average Value (%) | 0 | 15.86 | 22.45 | 77.16 | 346.88 | 647.51 | 878.56 | 1713.76 |
| Aberrant Cell Rate (%) | 0 | 11.72 | 18.37 | 47.24 | 85.94 | 96.36 | 100 | 100 |

Note:

$$\text{Chromosome Fragmentation Rate}(\%) = \frac{\text{Total Number of Fragmented Chromosomes}}{\text{Observed Number of Cells}} \times 100$$

Table 1 data show the following: As the ionic astatine-211 dosage increases, both the chromosome fragmentation rate and the frequency of chromosome aberrations increase rapidly. A dosage of 1 $\mu$Ci/ml gives rise to strong aberrations in chromosome structure, and a 1 $\mu$Ci/ml dosage is the dosage used in medical treatment.[5] Therefore, if astatine-211 is used in the preparation of a tellurium colloid, the medicine can be restricted to the area of the tumor, or astatine-211 may be used in combination with monoclonal antibodies for specific effect against tumors. This would effectively treat tumors without damaging normal cells.

Table 2. Types of Chromosome Aberrations Caused by Astatine-211 and Their Frequency

| At-211 Dosage ($\mu$Ci/ml medium) | | 0.25 | 0.5 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| Number of Cells Observed During Fragmentation Phase | | 145 | 19 | 127 | 64 | 55 | 28 |
| Number of Cells Showing Chromosome Aberrations | | 17 | 36 | 60 | 55 | 53 | 28 |
| Chromosome Aberrations | | | | | | | |
| Acentric Fragmentation | Total | 3 | 10 | 28 | 95 | 119 | 81 |
| | Frequency % | 2.07 | 5.12 | 22.04 | 148.44 | 216.35 | 298.28 |
| Chromatid Break | Total | 1 | 1 | 16 | 11 | 20 | 5 |
| | Frequency % | 0.69 | 0.51 | 12.60 | 17.19 | 36.36 | 17.86 |
| Ring Chromosomes | Total | 3 | 4 | 5 | 9 | 7 | 2 |
| | Frequency % | 2.07 | 2.04 | 3.94 | 14.06 | 13.72 | 7.14 |
| Dicentric Chromosomes | Total | 0 | 5 | 5 | 5 | 1 | 3 |
| | Frequency % | 0 | 2.55 | 3.97 | 7.81 | 1.81 | 10.71 |
| Chromatid Aberrations | | | | | | | |
| Chromatid Fragmentation | Total | 6 | 7 | 10 | 40 | 60 | 46 |
| | Frequency | 4.83 | 3.57 | 7.87 | 62.8 | 109.09 | 164.28 |
| Chromatid Fracture | Total | 3 | 5 | 6 | 19 | 35 | 11 |
| | Frequency | 2.07 | 2.55 | 4.72 | 29.69 | 63.63 | 39.29 |
| Microchromatids | Total | 1 | 3 | 6 | 2 | 10 | 9 |
| | Frequency | 0.69 | 1.53 | 4.72 | 3.13 | 18.18 | 32.14 |
| Number of Fractures of Other Aberrant Types | Total | 2 | 2 | 10 | 27 | 11 | 84 |
| | Frequency | 1.39 | 1.02 | 7.87 | 42.19 | 201.81 | 300 |

Note: Other aberrant types include sansheti [0005 1410 7555], sisheti [0934 1410 7555], and fuheti [1788 0678 7555].

The data in Table 2 show that as the astatine-211 dosage increased, of the various kinds of aberrations to the chromosome structure, fragments and chromatid breaks showed greatest sensitivity followed by chromatid fractures, microchromatids and shuang weiti [7175 1792 7555]. Ring chromosomes and dicentric chromosomes were least sensitive. These facts show that the use of fragmentation as an indicator of astatine-211 radiation damage is far more sensitive than use of dicentric chromosome ring accretion.

Results of the experiment with regard to sister chromatid exchanges rates are shown in Table 3.

Table 3. SCE Frequency Following Processing With Different Dosages of Ionic Astatine-211

| At-211 Dosage ($\mu$Ci/ml medium) | 0 | 0.05 | 0.25 | 0.5 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| Observed Number of Cells | 24 | 24 | 18 | 26 | 25 | 13 | 6 |
| SCE Frequency (Average Value) | 8.79 | 9.25 | 9.72 | 8.27 | 9.20 | 9.31 | 11.0 |
| Comparison (P) of Blanks and All Dosage Groups | -- | >0.5 | >0.1 | >0.4 | >0.5 | >0.5 | >0.1 |

It is evident from Table 3 that the SCE frequency does not change as the astatine-211 dosage changes; testing of the data derived shows no marked statistical variations. Instead, it shows that astatine-211 has no marked effect on the frequency of change in sister chromatic exchange.

REFERENCES


1. Baown, I., Int. J. Appl, Radiat, Isot., 33 (1982), 75-77.

2. Bateman, W.J., et al., Int. J. Nucl. Med. Biol., 10 (1983) 241-244.

3. Harrison, A., et al., Intl. J. Appl. Radiat. Isot., 35 (1984), 1005-1008.

4. Zhou Maolun and Wang Zishu [3769 1311 3219], Institute of Nuclear Science and Technology, Sichuan University, 1984 Annual Report, 80.

5. Bloomer, W.D., et al., Int. J. Radiat. Oncol. Biol. Phys., 10 (1984) 341-348.


9432/9604

## Ultrastructural Changes in the Heart, Brain, Kidney of Rabbit in Endotoxic Shock

40091054a Shanghai SHANGHAI YIKE DAXUE XUEBAO [ACTA ACADEMIAE MEDICINAE SHANGHAI] in Chinese Vol 15 No 2, Mar 88 pp 81-83

[Article by Wang Huiren, Gu Huayun, Jin Huiming*, Chen Juliang, Zhu Huiju, Departments of Histology and Embryology, *Pathophysiology, Faculty of Basic Medical Sciences, Shanghai Medical University, Shanghai]

[Abstract] Electron microscopic observations on the ultrastructures of the heart, brain and kidney were made in endotoxic shock model rabbits employing E.coli toxin injected intravenously. The sarcolemma of the cardiac muscle extended outwards forming numerous slender villous projections. Disarrangement and fragmentation of the myofilaments, and even disruption and dissolution of the myofibers were found. Many marginal folds formed from the surfaces of endothelial cells extending into the lumen. Degranulation and distention of the cisternae of rough endoplasmic reticulum are common in neurons. Swelling mitochondria, with disordered and disrupted cristae, or mitochondria of irregular sizes and forms could always be seen in both cardiac muscles and neurons. A lot of lysosomes were seen in the cytoplasm of the rental proximal convoluted tubule cells.

/12232

# Differential Diagnosis Between Malignant Lymphoma, Nonlymphosystem Tumors with Moncolonal Antibody $L_3B_{12}$

40091054b Shanghai SHANGHAI YIKE DAXUE XUEBAO [ACTA ACADEMIAE MEDICINAE SHANGHAI] in Chinese Vol 15 No 2, Mar 88 pp 129-132

[Article by Xu Liangzhong, Zhang Youwang*, Qiu Bingseng**, Zhang Taiming, Luo Jainmin, Gu Lianghong, Departments of Pathology and *Radiotherapy, Cancer Hospital, Section of Pathology, **Institute of Dermatology, Shanghai Medical University, Shanghai]

[Abstract] This study reports the use of monoclonal antihuman leucocyte antibody $L_3B_{12}$ to differentiate malignant lymphoma from nonlymphosystem tumors. Pathologic samples from 67 cases of malignant lymphoma, 277 cases of nonlymphoid tumors including various kinds of carcinoma and sarcoma were tested for reactivity with monoclonal antibody $L_3B_{12}$. Tests with tumor cells from 67 cases of malignant lymphoma were all positive, while 277 cases of nonlymphoid tumors were $L_3B_{12}$ negative. Our study demonstrates the monoclonal antibody $L_3B_{12}$ can be used effectively in clinical pathology for the differential diagnosis between malignant lymphoma and nonlymphoid tumors. The main points of clinical practice and techniques in increasing accuracy of differential diagnosis are discussed.

/12232

## Use of Male Sterile Wheat Strains in Distant Crossings Reported

40081063c Taiyuan SHANXI NONGYE KEXUE in Chinese No 2, Feb 88 pp 5-6

[Article by Fan Lu [2868 6424], Han Jinglong [7281 2417 7893], Deng Jingyang [6772 2529 2254], and Shen Jimeng [3088 1323 1322], Institute of Crop Breeding and Cultivation, Chinese Academy of Agricultural Sciences: "Breeding and Assay of Tal, kr, phlb Gene Composites"]

[Text] Abstract: Hybridization, backcrossing, and sidecrossing were used to breed Tal, kr, and phlb gene composites, which were used for the hybridization of distantly related wheat strains without the need for artificial emasculation, thereby obtaining large numbers of true hybrid seeds through the introduction of beneficial exogenous genes into common wheat. Some homologous chromosomes from subsequent hybrid generations could then be paired and exchanged.

Key words: genes and composites

The work of introducing beneficial exogenous genes from closely related wheat strains into common wheat has received serious attention and increased support in recent years, and a certain amount of success has been achieved. However, the lack of ready manes of hybridization has, in varying degrees, adversely affected the efficiency of this work. The introduction of beneficial exogenous genes (in translocated form) poses two main difficulties. One is a low fruiting rate from distant crosses requiring a large amount of manpower to do the emasculation required in hybridization in order to obtain hybrid seeds, and the possibility of false hybridization. The second is that some of the homologous chromosomes of the succeeding generation of the hybrid will not pair. Use of male sterile genes (particularly dominant male sterile genes), Kr genes (mateable genes), and phlb genes provide the possibility of overcoming the above difficulties. In this regard, we crossed, backcrossed, and sidecrossed, producing the first combination in a single plant strain of Taigu dominant male sterile genes Tal and kr (kr1, kr2, and kr3) with phlb genes to produce a composite containing three kinds of genes. This also demonstrated that these genes could be independently expressed without mutual interference, thereby widening the useful range of Taigu dominant male sterile wheat.

## Materials and Methods

The Tal TCERROS$^3$ and the Lanzhou rye used in this experiment were provided by our own institute. Zhongguo Chun and Zhongguo Chun phlb mutants were obtained from R. Mossis (at Nebraska State University in the United States). Breeding of the composite and steps taken in its assay were as follows: the Tal TCERROS$^3$ served as the female parent, and the phlb mutant (including krl, kr2 and kr3) served as the male parent in the hybridization. A sterile strain was selected from the $F_1$ generation for backcrossing with the phlb mutant, and another sterile strain from the $BC_1$ was used in a backcrossing with the phlb mutant.

Six strains (possible composite plant strains) from the $Bc_2$ and $F_1$ generations, namely 300-1, 300-2, 302-1, 302-2, 304-2, and 304-3 were pollinated in a sidecrossing with the Lanzhou rye, the crosses between the Lanzhou rye and the Zhongguo Chun and its phlb mutant serving as controls, their individual fruiting rates being calculated. Carnoy's fixative was used to fix the young spikes in the hybrid $F_1$ generation, and the acetic acid carmine tabletting method was used to observe the chromosome pairing of the pollen mother cell (PMC) during the meiosis I (MI) period.

## Results and Analysis

Fruiting rates for the "six possible composite plant strains" and for the crosses in the Zhongguo Chun and phlb mutant crossing with Lanzhou rye, as well as the situation with regard to pairing of $F_1$ generation (not total) PMC during the MI period are shown in the table. Figures 1, 2, and 3 show the status of PMC pairing during the MI period for the cross between 302-2 and Lanzhou rye, Zhongguo Chun phlb mutant and Lanzhou rye, and Zhongguo Chun and Lanzhou rye. Table 1 shows that the fruiting rates for all side-crossed plant strains, except 302-1, were equal to or greater than the fruiting rate (88.0 percent) for crossing between the control, i.e., Zhongguo Chun and Lanzhou rye. For the cross between 300-2 and Lahzhou rye, and between 302-2 and Lanzhou rye, the fruiting rates were 91.9 percent and 90.0 percent respectively. This shows that this plant strain contains all the Zhongguo Chun kr genes (krl, kr2, and kr3), demonstrates that when Tal and phlb are present, these changes are expressed normally without interference.

A look at the pairing of the chromosomes of the "three possible composite plant strains" and the Lanzhou rye hybrid $F_1$ generation PMC during the MI period shows the number of bivalent numbers per cell in the cross between 300-2 and Lanzhou rye, and between 302-2 and Lanzhou rye to have averaged 4.63 and 4.81 (Table 1). These two values are very much higher than the value for the cross between Zhongguo Chun and Lanzhou rye (0.68), and similar to the value for the cross between the phlb mutant and the Lanzhou rye (4.62). This shows no inhibition when the phlb gene is present (or is not present) and the kr gene is present in the Tal, allowing for full

Table 1. Status of Partial Homologous Chromosome Pairing of "Six Possible Composite Plant Strains," Fruiting Rates For Controls, and Paring of $F_1$ Generation PMC During the MI Period

| Combinations | Hybrid Fruiting Rate | | | $F_1$ Generation Chromosome Pairing in MI Period | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of Pollinated Blossoms | Number of | Fruiting Rate (%) | Number of Strains Observed | Number of Cells Observed | Number of Chromosomes Per Cell | Number of Monovalent Bodies | Number of Bivalent Bodies | Number of Trivalent Bodies | Number of Tetravalent Bodies | Number of Crosses |
| 300-1 x Lanxhou Rye | 48 | 44 | 91.7 | | | | | | | | |
| 300-2 x Lanxhou Rye | 62 | 57 | 91.9 | 6 | 107 | 28 | 18.5 | 4.63<br>2-6 | 0.08<br>0-1 | | 5.1<br>2-8 |
| 302-1 x Lanzhou Rye | 56 | 35 | 62.5 | | | | | | | | |
| 302-2 x Lanzhou Rye | 60 | 54 | 90.0 | 6 | 115 | 28 | 18 | 4.81<br>2-7 | 0.10<br>0-1 | 0.009<br>0-1 | 5.4<br>2-8 |
| 304-2 x Lanzhou Rye | 44 | 41 | 93.2 | | | | | | | | |
| 304-3 x Lanzhou Rye | 50 | 44 | 88.0 | 3 | 78 | 28 | 21.3 | 3.26<br>1-6 | 0.05<br>0-1 | | 3.51<br>1-7 |
| Zhongguo Chun x Lanzhou Rye (ck) | 200 | 176 | 88.0 | 6 | 145 | 28 | 26.6 | 0.68<br>0-3 | 0.01<br>0-1 | | 0.70<br>0-4 |
| Zhongguo Chun Phlb x Lanzhou Rye (ck) | | | | 2 | 52 | 28 | 18.5 | 4.62<br>2-7 | 0.10<br>0-1 | | 5.05<br>2-8 |

expression. Thus, observation of chromosome pairing during sidecrossing of the $F_1$ generation at pollination time shows plant strains 300-2 and 302-2 to be true Tal, kr, phlb gene composites. In this plant strain, the Tal, kr, and phlb genes can be normally expressed, and Zhaongguo Chun phlb backcrossing can preserve them. If they are used with distant hybrids, large numbers of true hybrid seeds may be obtained without the need for artificial emasculation, and some of the homologous chromosomes in succeeding generations can be paired and exchanged. This holds very great potential for the study of genetic relationships in wheat and is helpful in the introduction of beneficial exogenous genes (into common wheat).

9432/9738

## Application to Agriculture of Nuclear Irradiation Techniques Surveyed

40081063b Beijing BEIJING KEJI BAO [BEIJING SCIENCE AND TECHNOLOGY NEWS] in Chinese 6 Feb 88 p 1

[Article by Xinhuashe Correspondent Liu Zhijie [0491 1807 2638]: "Research on the Application to Agriculture of the Country's Nuclear Techniques Scores a Series of Achievements"]

[Text] China has developed a nationwide research system and an academic exchange network for the application to agriculture of nuclear techniques, and has scored a series of achievements in research on the application of nuclear technology to agriculture.

China presently has 26 institutes (or offices) and nearly 2,000 full time technical personnel engaged in the application to agriculture of nuclear energy. Statistics show 77 prizes of various classes as having been earned as of 1986 for research in the application of nuclear technology to agriculture in China, six of them national prizes. Use of nuclear irradiation and of nuclear irradiation in combination with other methods has produced 243 new superior varieties of 23 different plants. This is 30 percent of the mutant varieties bred by all the countries of the world, placing China first among the nations of the world. An additional large number of superior new mutants that are early ripening, have short stems, are resistant to damage from the elements, and are disease resistant serve as genetic stock for breeding.

Substantial advances have also been made in basic research on irradiation breeding. Isotopic tracer techniques have also played important roles in soil improvement, rational fertilization and irrigation, protection of the agricultural environment, animal metabolism of plant nutrients, and radio-immunity.

Examples include fertilizer experiments using 15 N and 32 P that found the proper amounts of fertilizer to be used under different fertility conditions to obtain high yields of paddy and wheat; applied research applying 15 N nitrate fertilizer to the entire soil layer in the growing of paddy for a between 10 and 20 percent increase in the fertilizer utilization rate, and

an average 5 to 12 percent increase in yields; and use of more than 10 different isotopes in research on the dynamics of residual agricultural pesticides in paddy and tea crops and in the soil to provide scientific data for drawing up "safety standards for agricultural pesticide use."

Application of radio-immunity analysis methods 18 days after the breeding of cows to diagnose pregnancy showed an accuracy rate of between 80 and 86 percent. The same method was used in the quick diagnosis of "hog disease number 6," and "Newcastle disease" in chickens. Use of isotope tracer techniques permitted determination and evaluation within a relatively short time of kidney function and thyroid gland function to provide a basis for prompt prevention or treatment of functional disorders. Use of radiation-prepared hypotoxic vaccine for the prevention of hog asthma produced a 50 to 80 percent immunity rate.

China now has accumulated experience and scored remarkable achievements in the application of nuclear techniques to agriculture. It is in a position to provide technical support or transfer technology to the Third World.

9432/9738

## Important Advances Claimed for Irradiation Breeding of Farm Crops

40081063a Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 12 Apr 88 p 4

[Article by Xinhuashe, Changsha 9 April: "Widespread Application of Hundreds of New Varieties Reaps Benefits; Major Advances in Irradiation Breeding of Farm Crops"]

[Text] Major advances have been made in the irradiation breeding of China's farm crops, hundreds of new varieties having been used widely in production following irradiation with nuclear energy for remarkable yield increases.

Statistics from the authorities concerned show irradiation bred varieties in China as accounting for slightly more than one third of all irradiation bred varieties in the whole world, and most of the bred varieties have been staple farm crops such as grain, cotton, and oil-bearing crops that are closely bound up with the life of the people.

Following 30 years of effort, China's research in the agricultural use of nuclear energy has become an independent branch of learning. Scientific research institutions are found throughout the country in 26 provinces, and a fairly complete scientific research and academic exchange network has been formed internationally. China's research work, particularly its irradiation breeding, has vaulted to the front rank internationally.

Irradiation breeding using nuclear energy consists of the irradiation of seeds of plants with cobalt-60 causing their genes to mutate, thereby increasing possibilities for the selection of forms that meet breeding objectives. Numerous tests have shown that irradiation bred farm crops cannot carry nuclear radiation pollution or poison into the human body.

9432/9738

Studies on Mutangenesis of Bacillus Subtilis by Protoplast

40081060b Chengdu SICHUAN DAXUE XUE BAO [JOURNAL OF SICHUAN UNIVERSITY, NATURAL SCIENCE EDITION] in Chinese Vol 25 No 1, Feb 88 pp 109-111

[Article by Hu Yongsong [5170 3057 2646], Wang Zhongyan [3769 1813 1750], Sun Qiling [1327 0796 3781], and Shao Chunbo [6730 2504 3134]: "Study on the Mutagenesis of Bacillus Subtilis Protoplasts"]

[Abstract] This article reports research using ultraviolet light to induce the mutation of protoplasts of Bacillus subtilis (BF-7658) that yielded two mutant strains capable of producing 1.4 times again as much alpha amylase as their parent strains.

Alpha amylase is an enzyme produced by Bacillus subtilis that is widely used in food and textile industries around the world, and it is the enzyme most widely produced and used in China.

The two page article provides particulars about materials and methods used to produce and isolate the mutant strains of the bacillus.

9432/9604

# LOCALIZATION OF C-RAS$^{H}$ ONCOGENE ON HUMAN CHROMOSOME BY IN SITU HYBRIDIZATION

40091055a Beijing BEIJING YIKE DAXUE XUEBAO [JOURNAL OF BEIJING MEDICAL UNIVERSITY] in Chinese Vol 20 No 1, Feb 88 pp 11-13

[English abstract of article by Hou Yan [0186 1484], et al., of the Beijing Institute for Cancer Research]

[Text] Gene localization on chromosomes has great significance in the examination of gene expression, and oncogene activity in particular. The method of in situ hybridization for gene localization is most efficient and satisfactory. Using this technique, hybridization of the C-Ras$^{H}$ oncogene with human chromosomes was conducted. Analysis of 100 karotypes revealed that 29 percent of the silver grains were on chromosome 11 and 89 percent of the grains on this chromosome were localized in the 11p15 region.

This project was supported by the State Science Commission and the Ministry of Health.

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LOCALIZATION STUDIES OF MONOCLONAL ANTIBODY AGAINST HUMAN COMPLEMENT C3 WITH RECOMBINANT DNA, IMMUNOLOGICAL TECHNIQUES

40091055b Beijing BEIJING YIKE DAXUE XUEBAO [JOURNAL OF BEIJING MEDICAL UNIVERSITY] in Chinese Vol 20 No 1, Feb 88 pp 15-18

[English abstract of article by Ma Dalong [7456 1129 7893], et al., of the Department of Immunology]

[Text] Three overlapping cDNA clones, namely ReC3-10, ReC3-B1 and ReC3-L1, coding the α chain of human complement C3, were isolated by a recombinant DNA technique. They expressed different α chain segments of C3 in E. coli. Polyclonal antibodies and one monoclonal antibody, H215, against human C3 reacted with all of the three clones as revealed by Western blots. In order to subclone the α chain cDNA of human C3, a new family of expressed plasmid vectors, pECL1-3, was constructed. The HpaII fragment (0.3 kb) from the clone ReC3-10 was subcloned into the Cla I sites of the pECL1-3. A cDNA clone ReC3-H2 was obtained, and expressed a small peptide segment of human C3 in E. coli. The polyclonal antibody to C3 reacted with ReC3-H2, but the monoclonal antibody H215 did not. The results combining restriction mapping and immune analysis of the four clones showed that the recognition site of the H215 could be localized within the region of about 120 amino acids at the C terminal end of the C3 α chain.

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# EFFECT OF E. COLI ENDOTOXIN, ANISODAMINE ON $Ca^{2+}$-INDUCED AGGREGATION OF LIPOSOMES

40091055c Beijing BEIJING YIKE DAXUE XUEBAO [JOURNAL OF BEIJING MEDICAL UNIVERSITY] in Chinese Vol 20 No 1, Feb 88 pp 19-22

[English abstract of article by Tang Chaoshu [0781 2600 2873], et al., of the Department of Pathophysiology]

[Text] In order to investigate the pathogenetic mechanism of endotoxin shock at the cellular membrane level and the antishock mechanism of anisodamine, the effect of the E. coli endotoxin and anisodamine on a $Ca^{2+}$-induced aggregation of artificial biological membranes, liposomes, was observed. The results show that neither the endotoxin alone nor anisodamine alone induced the aggregation of PC/PA/cholesterol liposomes. Endotoxin, however, preincubated with liposomes, significantly prompted $Ca^{2+}$-induced aggregation of liposomes. This endotoxin effect is time and dose dependent. Anisodamine, when preincubated with liposomes, did not alter the $Ca^{2+}$-induced aggregation of liposomes, although it significantly inhibited the endotoxin-prompted effect on the $Ca^{2+}$-induced aggregation of liposomes. The effect of anisodamine on the biological membrane could explain, at least in part, the antishock mechanism of anisodamine against septic shock.

This project was supported by the National Natural Science Foundation.

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# FACILITATING ALLOGENEIC BONE MARROW TRANSPLANTATION BY T CELL-SPECIFIC IMMUNOTOXIN WITHOUT GVHD

40091056a Beijing ZHONGHUA WEISHENGWUXUE HE MIANXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 1, Feb 88 pp 1-6

[English abstract of article by Xie Shusheng [6200 5771 3932] of the Department of Immunology, Beijing Medical University; Erwin Diener of the Department of Immunology, Alberta University, Canada]

[Text] Daunomycin coupled via a pH-sensitive spacer, cis-aconytyl, to monoclonal Thy-1,2-specific antibody is a highly T-cell specific immunotoxin. In this report, the immunotoxin was used to purge T lymphocytes from $C_{57}$BL/6 bone marrow prior to engraftment in full allogeneic, irradiated BALB/c recipients. Treatment of bone marrow with the immunotoxin had no effect on the viability of the committed hematopoietic progenitor or multipotent stem cells. All of the recipients of purged bone marrow were chimeric for donor peripheral blood cells and none developed GVHD. Of the 50 chimeras, 49 were still alive more than 200 days following transplantation. The immunocompetence of the chimeras was tested by MLR, CTL, skin grafting and in vivo IgM and IgG PFC to SRBC. The results indicate that the irradiated BALB/c mice were reconstituted immunologically with the immunotoxin-treated $C_{57}$BL/6 bone marrow.

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# DETECTION OF ADHERENCE, RELATED PLASMIDS OF 132 HUMAN ENTEROPATHOGENIC ESCHERICHIA COLI

40091056b Beijing ZHONGHUA WEISHENGWUXUE HE MIANXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 1, Feb 88 pp 12-16

[English abstract of article by Jin Shaoxiong [6855 1421 7160], et al., of Fujian Medical College]

[Text] In this paper, 132 human EPEC and 199 non-EPEC strains were studied to detect their patterns of adherence of HeLa cells and the related plasmids. Of the 132 EPEC strains tested, 85 (64.39 percent) showed localized adherence (LA), 8 (6.06 percent) showed diffuse adherence (DA), and 16 (12.12 percent) showed LA/DA. The percentage of LA and LA/DA strains in EPEC was significantly higher than that in non-EPEC. The adherence ability and resistance of 45 (42.28 percent) of 109 adherent EPEC were simultaneously transferred to E. coli K-12. All the adherent EPEC and transconjugant strains harbored at least a plasmid of 50-70 Md, in which 15 transconjugants harbored only a plasmid band. CFA/I was found in 9 of the 132 EPEC strains, of which 2 of serogroup O126 produced ST and 3 of serogroup O126 not only produced ST, but also showed adherence to HeLa cells. These results suggest that the pathogenicities of EPEC involve several mechanisms, but mainly LA or LA/DA, and that LA genes are encoded on a 50-70 Md plasmid and may be simultaneously transconjugated with resistance genes.

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# EXPERIMENTAL INFECTION OF DUCK HEPATITIS B VIRUS (DHBV), EFFECT OF BURSECTOMY ON COURSE OF INFECTION

40091056c Beijing ZHONGHUA WEISHENGWUXUE HE MIANXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 1, Feb 88 pp 17-20

[English abstract of article by Qu Di [4234 3321], et al., of the Department of Microbiology, Shanghai Medical University]

[Text] DHBV positive serum was injected intravenously into Cherry Valley ducks and Beijing ducks hatched within 24 hours. The percentage of infection was 68.4 percent and 71.4 percent, respectively. To study the role of Bursa of Fabricius in the infection of the ducks, the ducklings were bursectomized after being hatched. They were subsequently infected either immediately or after 2 weeks. It was found that in the 1-day-old group, the rate of infection showed no significant difference between the bursectomized and non-bursectomized groups. However, in the 2-week-old troup, DHBV DNA was found in 40 percent of the bursectomized group, while no infection was found in the control group. Histopathological studies showed significant changes in the livers of the bursectomized and infected group as compared to slight changes in the nonbursectomized group. However, the significant pathological changes did not correlate with active viral replication. Therefore, it seems that the Bursa of Fabricius is of importance to anti-DHBV infection in adult ducks.

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PRELIMINARY STUDY OF DELAYED HYPERSENSITIVITY TO HEPATITIS B SURFACE ANTIGEN

40091056d Beijing ZHONGHUA WEISHENGWUXUE HE MIANXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 1, Feb 88 pp 47-49

[English abstract of article by Luo Kangxian [7482 2123 0341], et al., of the Hepatitis Immunology Laboratory, Nanfang Hospital, Guangzhou]

[Text] In a population with natural immunity to the hepatitis B virus (HBV), the skin reaction of delayed type hypersensitivity (DTH) to the hepatitis B surface antigen (HBsAg) was tested. With a 2 μg dosage, all the individuals revealed negative results. With a 20 μg dosage, positive DTH appeared in 42.5 percent of those with high levels of antibodies against HBsAg (anti-HBs) and 37.5 percent with low levels of anti-HBs, and even in 15 percent without any HBV markers. The results suggest that the delayed hypersensitivity to HBsAg is not a sensitive immune response. As to why the skin reactivity appeared in the individuals without anti-HBs is not clear, however, the authors infer that the HBV-immunized individuals might have different humoral and cell-mediated immune responses to HBsAg.

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DETECTION OF CAMPYLOBACTER JEJUNI HEAT-LABILE ENTEROTOXIN

40091056e Beijing ZHONGHUA WEISHENGWUXUE HE MIANXUE ZAZHI [CHINESE JOURNAL OF MICROBIOLOGY AND IMMUNOLOGY] in Chinese Vol 8 No 1, Feb 88 pp 50-51

[English abstract of article by Xue Dehou [5641 1795 0624], et al., of the Department of Pediatrics, West China University of Medical Sciences, Chengdu; Zhu Qingyi [2612 1987 5030] of Taiyuan Children's Hospital, Shanxi Province]

[Text] The production of Campylobacter jejuni heat-labile enterotoxin (CJT) by 77 strains isolated from children with acute diarrhea was determined. All the strains were detected by the rabbit ileal loop assay and 67 strains were detected by the passive immune hemolysis assay simultaneously. The results show that the rabbit ileal loop assay of all strains tested was negative, while 24 strains (36 percent) were positive in the passive immune hemolysis assay. It also was demonstrated that the CJT produced was immunologically related to both the Cholera enterotoxin and the E. coli heat-labile enterotoxin. Of the 14 CJT-producing strains serotyped by the Penner method, only 7 strains were typable, i.e., types 5, 44, 34, 45, 21, 3 and 45-21.

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# RELATIONSHIP BETWEEN HYDROGEN METABOLISM, NITROGEN FIXATION IN AZOSPIRILLUM SPP. III. HUP$^-$ MUTANT OF AZOSPIRILLUM BRASILENSE BY TRANSPOSON Tn5 MUTAGENESIS

40091057a Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 28 No 1, Mar 88 pp 24-28

[English abstract of article by Wang Zifang [3769 1311 5364], et al., of Wuhan Institute of Virology, Chinese Academy of Sciences, Wuhan]

[Text] Cell conjugation was carried out between the donor E. coli RL29 (pR64::Tn5) and recipient Azospirillum brasilense W251-10. The frequency of transposon Tn5 transfer was $5.0 \times 10^{-7}$, while the spontaneous Kanamycin resistance mutation of the recipient cell W251-10 was less than $1.14 \times 10^{-9}$. One of the transconjugants, WG15, was obtained from the medium containing Kanamycin (50 μg/ml). Hydrogen uptake hydrogenase and nitrogenase activities of WG15 were compared with those of the parent strain, W251-10, through gas chromatography. WG15 was defective in hydrogen uptake and nitrogen fixation (Hup$^-$ Nif$^-$), while the parent strain W251-10 had both functions (Hup$^+$ Nif$^+$). Positive results were obtained when Dot hybridization was conducted between a radiant Tn5 probe and DNA of WG15, whereas the total DNA of W251-10 showed negative results. Therefore, Hup$^-$ mutation from Hup$^+$ was caused by Tn5 insertion, and a very close relationship exists between hup and nif genes during the DNA sequence.

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# CLONING OF REGULATORY GENE MUTANTS OF ARABINOSE IN E. COLI, THEIR DNA SEQUENCING

40091057b Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 28 No 1, Mar 88 pp 34-39

[English abstract of article by Zeng Weiqiang [2582 0251 1730] of the Institute of Genetics, Chinese Academy of Sciences, Beijing; Ron, G.W. of the University of California at Santa Barbara]

[Text] The pieces of para$C^c$ mutant chromosomal DNA were cloned into E. coli Δ766RecA$^-$. The regulatory function of the para$C^c$ mutant genes to the L-arabinose isomerase activity was studied. Through DNA sequencing analysis, the mutant genetic codons were found. The results were as follows: $C^c_1$ at -364 position $\frac{A}{T}$ mutant into $\frac{C}{G}$; $C^c_2$ at -367 position $\frac{T}{A}$ mutant into $\frac{A}{T}$; $C^c_5$ at -595 position $\frac{G}{C}$ mutant into $\frac{A}{T}$; $C^c_6$ at -337 position $\frac{T}{A}$ mutant into $\frac{G}{C}$; $C^c_8$ at -777, -778 $\frac{CT}{GA}$ mutant into $\frac{AG}{TC}$; $C^c_7$ and $C^c_{67}$ at -331 to -339 position deletion. $C^c_{68}$ at -351 position $\frac{A}{T}$ mutant into $\frac{C}{G}$; $C^c_{100}$ at -331 $\frac{A}{T}$ mutant into $\frac{G}{C}$; $C^c_{101}$ at -300 to -376 position deletion; $C^c_{103}$ at -366 $\frac{C}{G}$ mutant into $\frac{G}{C}$; $C^c_{108}$ at -375 position $\frac{G}{C}$ mutant into $\frac{T}{A}$; $C^c_{112}$ at -370 position $\frac{T}{A}$ mutant into $\frac{G}{C}$; $C^c_{100}$ at -366 position has another mutation $\frac{C}{G}$ into $\frac{A}{T}$.

Due to the mutation of the codons, the amino acids in the protein changed correspondingly. Therefore, the L-arabinose isomerase activity was influenced. Signs suggest that the mutation at both sides of the regulatory gene affects isomerase activity somewhat differently.

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CLONING, LOCATION OF PENICILLIN G ACYLASE GENE FROM E. COLI AS1.76

40091057c Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese
Vol 28 No 1, Mar 88 pp 40-44

[English abstract of article by Zhang Qijiu [1728 0366 3773], et al., of the Institute of Biophysics, Chinese Academy of Sciences, Beijing; Chen Lanxiang [7115 5695 7449], et al., of the Center for Development of Biotechnology, Yichang]

[Text] A clone carrying the gene encoding penicillin G acylase has been obtained from E. coli AS1.76 chromosomal DNA by means of in vitro DNA recombination. A restriction endonuclease map of plasmid pPGA20 containing 3.5 kb cloned DNA fragments has been determined. Several mutant derivatives were constructed from plasmid pPGA20 through subcloning. The authors' results of assay of their enzymatic activities and analysis of restriction endonuclease sites show that the gene encoding penicillin G acylase is located in no more than 2.8 kb DNA fragments between HindIII and SmsI sites.

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NEW SEROTYPE OF SALMONELLA

40091057d Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 28 No 1, Mar 88 pp 68-73

[English abstract of article by Liu Xiangping [0491 3276 1627] of Wuhan University; Zhu Chao [2612 6389], et al., of Chengdu Institute of Biological Products; Li Futian [2621 4395 3944] of Kaifeng Medical Institute; Gao Jieqian [7559 2638 6197] of the Hygienic and Anti-epidemic Station of Henan Province, Zhengzhou; Wu Peilin [0702 0160 3829] of the Hygienic and Anti-epidemic Station of Xinyang Prefecture; Zhang Li [1728 5461] of Xinyang People's Hospital]

[Text] A new serotype of Salmonella, No 757, was isolated from a finless eel at Xinyang in April 1980. It could be classified into subspecies IIIb since the biochemical reactions of sodium malonate and lactose as well as ONPG were positive. Antigenic analysis showed that it represented a new serotype with an antigenic formula of $43:z_{52}:e, n, x, z_{15}$ ....

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ANALYSIS OF CORE POLYSACCHARIDES OF ESCHERICHIA COLI CELL WALL, RECEPTOR SITES OF BACTERIOPHAGE E-4

40091057e Beijing WEISHENGWU XUEBAO [ACTA MICROBIOLOGICA SINICA] in Chinese Vol 28 No 1, Mar 88 pp 74-81

[English abstract of article by He Xiaoqing [0149 2556 7230], et al., of the Phage-typing Reference Laboratory of Salmonella typhimurium, CMCC(B), Jiangxi Hygienic and Anti-epidemic Station, Nanchang]

[Text] In this paper, analysis of the core polysaccharides of Escherichia coli cell walls and of receptor sites of the phage E-4, and also of phage O-1, is carried out.

Nine types of core polysaccharides of the E. coli cell wall were determined by biological and gas chromatographic methods. In addition to R1, R2, R3, R4, K-12 and B already known, three new core types, tentatively named N1, N2 and N3, were found. The core type of Shigella flexneri was already known as R3, while that of Sh. sonnei was identified as R1.

The receptor sites of phage E-4 were located as the subterminal galactose of R1, R3, and R4 core polysaccharides. According to the lysopattern of phage E-4, estimates of 50 percent phage-inhibition ($PhI_{50}$) of LPS μg/ml and experiments of phage E-4 resistant Escherichia isolates, it is shown that the receptor sites of phage E-4 have some fine alterations and these organisms represent eight distince phage-types. These alterations were unrelated to the core types, i.e., the molecular ratio of monosaccharides.

Experiments also confirmed that the truly effective receptor sites of phage O-1 present on the E. coli cell wall were of the R2 core type.

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# CYTOGENETIC RESEARCH ON DESYNAPTIC VARIATION OF SOMACLONE FROM SOMATIC CELL CULTURE OF INDICA RICE

40091058a Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 15 No 2, Apr 88 pp 86-88

[English abstract of article by Ling Dinghou [0407 1353 0624], et al., of the South China Institute of Botany, Chinese Academy of Sciences, Guangzhou]

[Text] Among the regenerated plants from the somatic cell culture of IR54, one sterile plant with a seed setting frequency of 2.34 percent was found to be a partial desynaptic mutant. The chromosome pairing in the early prophase of meiosis was normal. Various numbers of univalents in metaphase I and laggards diakinesis in anaphase I were observed. The maximum number of laggards in an anaphasic cell was 10. In metaphase I, the normal chromosome pairing (12II) made up only 17.7 percent of all cells observed. The imbalance of chromosome distribution in the meiosis resulted in the sterility of the regenerated plant.

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## CYTOGENETIC STUDIES OF CHEMICALLY-INDUCED PARTHENOGENIC MAIZE PLANTS

40091058b Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 15 No 2, Apr 88 pp 89-94

[English abstract of article by Zhao Zuoyu [6392 0146 1342], et al., of the Institute of Genetics, Chinese Academy of Sciences, Beijing]

[Text] The chromosomal constitution and stability in parthenogenic maize plants induced by chemical treatment have been studied. Root-tip cells from 145 parthenogenic seedlings and the pollen mother cells (PMC) from 88 parthenogenic plants were analyzed. More than half of the plants had mixoploid root-tips, and all the mixoploid plants had diploid PMCs, with one plant being abnormal. The abnormal plant had a mixoploid PMC. Progeny of this plant included aneuploids, such as trisomic and tetrasomic. The results indicate that not only diploid pure lines, but also aneuploids have been produced by this method.

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# ATTACUS RICINI CHROMOSOMAL DNA FRAGMENTS ACTIVE AS PROKARYOTIC PROMOTERS IN ESCHERICHIA COLI

40091058c Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 15 No 2, Apr 88 pp 102-110

[English abstract of article by Liu Xiaoming [0491 1420 2494], et al., of the Shanghai Institute of Biochemistry, Chinese Academy of Sciences]

[Text] The HindIII fragments of Attacus ricini chromosomal DNA, which worked as the promoter for the tetracycline resistance gene in the promoter cloning plasmid pHE5 of Escherichia coli, were studied. The colony distribution of tetracycline resistance was determined. Twenty clones showed a high level of tetracycline resistance (over 200 micrograms of tetracycline per ml). One of these high $T_c^r$ plasmids, the pARP201, was further characterized in detail. After restriction mapping, most of its 1.9 kb inserted fragment was removed with the aid of Bg/II. The remaining 0.5 kb of the foreign fragment in the pARP201-derived plasmid, pARP-DB, showed a full capacity as a promoter when compared with the original entire insert. Partial sequencing of this fragment showed that it bore a good resemblance to the prokaryotic promoter model.

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ISOLATION, CHARACTERIZATION OF ANTIFREEZE POLYPEPTIDE MESSENGER RNA FROM SHORTHORN SCULPIN

40091058d Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 15 No 2, Apr 88 pp 111-116

[English abstract of article by Song Shiduo [1345 6108 6995] of the Department of Medicine, Second Teaching Hospital, Tianjin Medical College; Choy I. Hew of the Department of Clinical Biochemistry and Biochemistry, Toronto University, Canada]

[Text] The messenger RNA coding for the serum antifreeze polypeptide of the Shorthorn Sculpin, Myoxocephalus scorpins, was extracted from the liver polysomes of fish caught in November and was purified by oligo(dT)-cellulose chromatography and sucrose gradient centrifugation. The length of the mRNA was 580 nucleotides, measured by agarose gel electrophoresis in the presence of methyl mercury. In the cell-free translation system, the molecular weight of its primary translation product was 15000 as estimated by sodium dodecyl sulfate gel electrophoresis.

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# ANALYSIS OF HIGH-RESOLUTION G-BANDING PATTERN IN FISH CHROMOSOMES TREATED WITH BrdU

40091058e Beijing YICHUAN XUEBAO [ACTA GENETICA SINICA] in Chinese Vol 15 No 2, Apr 88 pp 117-121

[English abstract of article by Liu Lingyun [0491 0407 0061] of the Department of Biology, Beijing Normal University]

[Text] The chromosome high-resolution G-banding technique was applied to study and analyze the high-resolution G-banding pattern in fish, especially in Monopterus albus chromosomes treated with BrdU. Comparing the high-resolution G-banded karyotype of full-metaphase chromosomes with that of different mitotic figures with different degrees of contraction, it was observed that chromosomes with different lengths have different numbers of bands. The band numbers increased with an increase in the chromosomal length. However, not all of the chromosome bands increased so obviously. In the same mitotic figure, some chromosome bands, such as those of chromosomes Nos 4 and 6, did not increase, although the length of the elongated early-metaphase or late-prophase chromosomes was longer than that of the full-metaphase. The band numbers of each chromosome seem to be definite, therefore, when the chromosomes become too elongated, the bands are not as clear as those of metaphase chromosomes.

The increase in chromosome band numbers in the author's experiment shows the obvious subdivision of dark bands. For example, one dark band in the shortened chromosomes can be subdivided into three, five or seven subbands on the elongated chromosomes (Nos 1, 2, 4, 5 and X chromosomes). When the chromosomes contract and shorten gradually from the prophase to the metaphase, these subbands also fuse into the original bands. The degree of contraction and the contraction time of each band on one chromosome are not equal. The experiment indicates that a large dosage of BrdU not only blocks the fish cell cycle at the middle of the S phase, but also elongates chromosomes. However, a small dosage does not elongate chromosomes noticeably.

The relationship between the BrdU treatment and G-banding and the problem of the relative constance of chromosome band numbers of the chromosomal elongation and contraction treated with BrdU are discussed.

This subject is supported by the National Natural Science Fund of China.

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## BRIEFS

ARTIFICIAL PADDY RICE SEED--Having succeeded in growing artificial celery and cauliflower seeds, a research team led by associate professors Zou Gaozhi, Ni Dexiang, and Ji Caigue of the Research Institute of Genetics in Fudan University have again succeeded in producing artificial paddy rice seed from embryoids. Embryoids covered with artificial seed coats, the so-called "artificial seeds," have the advantages of genetic stability, this overcoming problems encountered by the hard-to-grow seeds, and are able to quickly produce large quantities of plants. The chemically stable new material for embryoid coating is strong enough to resist hazards confronted in transportation, planting, budding, and in the seedling processes. Although plant somatic cell culture and tissue culture techniques have been widely used in many economic crops, problems of high cost and technological barriers still exist in growing such seed-producing plants as paddy rice. The researchers in Fudan University thus worked hard to develop new techniques to overcome these barriers in order to enhance large-scale production of paddy rice seeds by industrializing the product. [Summary] [40081072a Beijing GUANGMING RIBAO [GUANGMING DAILY] in Chinese 8 Mar 88 p 1]

FIRST COMMERCIAL GENE-ENGINEERING BACTERIUM--In order to be totally independent of importing the key enzyme acylase for the semi-synthesized penicillin process, China has placed acylase research as a key Seventh Five-Year Plan biotechnology project. Recently, the Pharmaceutical Research Institute, in collaboration with Northern China Pharmaceutical Company, has researched the production of penicillin acylase gene engineering bacteria. Test results proved the success of the research from the product's high level enzymatic activity and its high yield index. [Summary] [40081072b Beijing GUANGMING RIBAO [GUANGMING DAILY] in Chinese 1 May 88 p 1]

INDICA RICE BIO-ENGINEERING RESEARCH--An important project to improve the quality of indica rice by cellular genetic engineering techniques has been conducted at Nanjing Agricultural University since 1980. Prof. Yang Shihu first developed the techniques to prepare suspensions able to separate high-vitality protoplasts to ensure a continuous free protoplast supply. He then studied Y-8 protoplast cultural media as a support media for protoplast cell divisions, and developed a combined care method for protoplast care to promote speed of cell division. A mixture of cultural media and various hormonal reagents must suitable to grow the protoplasts into intact green plants was also developed. The achievement is not only of great significance to the

improving of the quality of indica rice by bio-engineering, but also to developing techniques to culture other grain crops. [Summary] [40081072c Beijing GUANGMING RIBAO [GUANGMING DAILY] in Chinese 10 May 88 p 1]

HUMAN GENE EXPRESSION IN PLANTS--The Research Institute of Genetics of Chinese Academy of Sciences has succeeded in growing a human protein-producing plant, the first transformed plant to express human gene and produce human protein. Graduate student Chen Ju, under direction of Prof. Li Xianghui successfully obtained a new transformed tobacco plant capable of producing interferon through the incorporated human gene sequence by introducing one of the mosaic molecules of interferon--the human alpha ($\alpha$) molecule--into tobacco plant cells. Since interferon can selectively target the virus and virus-infected human cells with no destruction of healthy cell functions, it can be an anti-virus drug for plant cells, too. The success of incorporating human gene into plant cells is of great value in producing low-cost human proteins and new disease-resistant plants by genetic engineering techniques. [Summary] [40081072d Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 31 May 88 p 4]

RED BLOOD CELL PRESERVATION--The PLA General Hospital has successfully created a new method to preserve red blood cells under linear hypothermy and cryogenic freezing for more than 2 years by treating the RBC with dimethyl sulfoxide. The achievement is of great significance to wartime blood transfusions, self-blood transfusions, and cryobiology studies. [Summary] [40081069b Shanghai JIEFANG RIBAO in Chinese 8 Apr 88 p 1]

ANTI-VIRUS BIOLOGICAL MISSILE PRODUCED--An anti-virus "biological missile" consisting of coxsackie virus polyclonal antibody as a carrier and the wide-spectrum anti-coxsackie virus interferon as a "warhead" has been constructed by the research team led by Professor Liu Xinyun in Shanghai Medical University. Tests either in vitro or in vivo demonstrated that the missile's anti-virus function is so effective that it is superior to that of interferon alone or combined interferon and antibodies. Moreover, the results of radioimmunoassay revealed that in vivo, the biological missile possesses not only highly specific target tendency by concentrating the interferon around the virus-infected areas, but also high stability and low toxicity. [Summary] [40081069a Shanghai JIEFANG RIBAO in Chinese 14 Mar 88 p 7]

/12858

R&D Chinese-Made System Software, UNIX System

40080092 Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese 10 Feb 88 p 18

[Article by Sun Yufang [1327 3768 2455] and Zhong Cuihao [0112 5488 6275] of the Chinese Academy of Sciences Software Institute]

[Text] In the early period of computer software development, software was divided broadly into application software and system software according to different application goals. Traditionally speaking, system software includes operating systems, assembler programs, compiler systems, debugging programs, library maintenance programs, linking loaders, and other service systems. The present situation would seem to indicate that system software also should include file management, I/O subsystems, and other service programs as well as DBMS, basic network communication systems, and so on.

In foreign countries, system software usually is developed independently by the manufacturer or assigned to a third party for development and then sold to the user either with the computer or separately. Market demand has generated an abundance of system software in foreign countries, but system software development in China has taken a circuitous route. Prior to the late 1970's, for various reasons, system software development in China closed the door to international intercourse and even the small number of computers produced were single prototypes that were usually outfitted with the "three old components": management systems or operating systems, assembler languages, and one or two high-level languages. No database management systems or basic network communication systems were provided, and there was even a severe lack of certain basic application software. They were extremely hard to use and system resources could not be used fully.

As we entered the 1980's, microcomputers became popular in China and we imported several large, medium, and small computers, but there was no market for Chinese-made computers. Moreover, some system software we developed fell into disuse because it had no hardware foundation and was totally incompatible with foreign systems. "Complete foreignization" followed. IBM dominates software for medium and large computers, while minicomputer and superminicomputer software is ruled by DEC's PDP-11 and the VAX computer. Microcomputers mainly use PC-DOS (MS-DOS). In society,

the premise that "there is no way out for system software in China" became popular, and a neglect of system software pushed large numbers of system software specialists and technical personnel into other fields. As a result, most young people were unwilling to work intensively on system software, creating shortages in system software staffs which were already quite weak. Nevertheless, developments over the past few years have shown us that we must work to develop our own system software. It has become imperative that we make a major effort to train and develop system software development staffs because:

1. The Chinese-made computer hardware which we develop and produce must have its own matching software.

2. To protect their own interests, several foreign hardware firms have solidified much of the more mature system software (like certain parts of the operating system) into chips. These special chips usually cannot be bought on the market. Thus, if we lack strong system software staffs matched with system software which we can control ourselves, we will trail far behind others and be restricted by foreign companies.

3. Given the needs of certain industries and spheres in China, we must develop our own system software, either on the basis of certain foreign technologies or independently.

4. In the long term, we must have a group of system software specialists and develop our own system software, and we should develop application systems suited to China's national conditions on this foundation. Otherwise, it will be impossible to catch up with or surpass advanced foreign levels in the computer field.

We do not plan to discuss here the question of training system software personnel, but instead will offer some preliminary views on the production of system software in China.

I. The Current Situation in Chinese System Software and Countermeasures for Production in China

1. Representative system software imported by China

For operating systems, the main ones are DOS, VMS, MVS (large IBM computers), and UNIX. DOS is used mainly in PCs and the popularization of PCs has created many DOS users in China. It has limited functions and a very restricted range of uses. Moreover, we must note a trend: IBM is making a major effort to promote its PS/2 computers and their operating system OS/2, and several companies have promoted UNIX for Intel 80386 computers, so there is a problem with long-term development of DOS. Most developers and common users, whether willingly or not, want to shift either to OS/2 or UNIX.

VMS has stronger functions and is the primary operating system for the VAX, but it is completely restricted to the VAX and cannot be used with other microcomputers, minicomputers (including superminicomputers), or medium and large computers.

MVS-type operating systems for large and medium-sized IBM computers also are restricted to IBM computers and cannot be transferred to other categories of machines. While development of DOS has been rather intensive and there has been some development of VMX [sic], it would appear that no substantial progress has been made in work on MVS. History from 1972 to today completely confirms this point.

As for language compiler systems, database management systems, and network communication systems, the main course at present is to import them along with the operating system. Some are partially developed and others simply go into normal use. Production in China would be rather difficult. So, what operating system should we choose for breakthroughs and what path should we take?

2. Breakthroughs with the UNIX system in system software production in China

Given the foundation of work at present and feasibility, we feel that China can produce UNIX systems and that this choice of breakthroughs is correct. Moreover, as mentioned previously, if DOS does not continue to develop in the future, what would be the use of producing it in China? As for VMS, we feel that production within China would be important, but even with the difficulty of bypassing it, whether or not it can be approved for DEC still is a problem. Moreover, it is impossible or highly unlikely that operating systems for large IBM computers will be produced in China, and there would be difficult copyright questions. In addition, production of VMS and MVS in China would only solve software problems for two types of machines. In comparison, production of UNIX systems within China is more important, conditions are more mature, and it is entirely possible.

The promotion of UNIX international standards and its lack of hardware limitations would permit us to transplant and rewrite it for all types of machines once it is produced in China. For the user, UNIX appears as the same interface and provides a single environment, so it is easy to use. Naturally, less time and effort would be needed for training, extension, circulation, and so on. Moreover, if we observe international standards, it would aid international cooperation with other nations, research units, and companies. In addition, computer manufacturers would not set up other groups to develop new operating systems because of differences in computer models. This would be certain to reduce investments substantially and it would aid manufacturers in promoting new hardware products.

As for feasibility, we feel that the conditions are more mature for making breakthroughs with UNIX for production in China compared to other systems. There already are many specialists and technical personnel who have been involved in studying and developing UNIX systems for many years, and they have made several achievements. Moreover, all multi-user microcomputers imported by China now basically employ UNIX or a variant of it. Several imported superminicomputers also use UNIX or a variant, and much developmental work has been done or is in progress in China on the UNIX level.

We also can buy UNIX source programs. This would enable us to integrate with Chinese-made computer hardware and international standards to develop our own version of UNIX, and we could own the copyright for this version. At present, ATT has sold more than 6,000 UNIX source program patents and many foreign countries designed their own UNIX variants after buying the patent from ATT. We should refer to these successful examples and experiences.

In addition, we already have ideas on how to move toward production in China and some have been put into practice. We welcome discussion by all computer S&T workers.

II. Conclusion

System software development and production in China is a difficult task of major significance facing system software workers in China's computer field. We have focused on system software over the past few years, particularly in R&D work on the UNIX system and the related languages, database management systems, and network communication systems. Given the development situation for UNIX internationally and in China, we call on the relevant administrative departments to work quickly to coordinate forces in a major effort to support work for development and production in China. We also hope that China's computer workers will join together to develop and extend this system.

12539/9604

## First Domestic Fuzzy Inference Engine Discrete Component Prototype Computer

40080139 Beijing GUANGMING RIBAO in Chinese 7 May 88 p 1

[Article by reporters Yao Qi and Gao Xin]

[Summary] China's first fuzzy inference engine discrete component prototype has been jointly developed by Dr Zhang Hongmin [1728 3163 2404] and other Ph.D.s led by Prof Wang Peizhuang [3076 1014 8369] of the Fuzzy Mathematics Institute in the Mathematics Department of Beijing Teachers' University, with the active coordination of the Xi'an Air Force Engineering Institute and the Northeast Engineering Institute. This is only the second such prototype to be developed in the world, the first being that of the Japanese Professor T. Yamakawa, announced on 11 July of last year. The inferential operating speed of 10 MHz in Professor Yamakawa's system has been raised to over 15 MHz in the Chinese prototype, and the computer's performance in several experiments on control of inverted pendulum (pole-shaped) objects has been improved. This is a major breakthrough in fuzzy information processing technology and an important achievement for research and development of new generation computers; it signifies that China is in open competition with the United States and Japan at this new starting line.

A fuzzy inference engine is an embryonic form of fuzzy computer, or a computer able to recognize fuzzy objects [i.e., objects falling into graded sets] and make decisions based on them, just as the human brain works. Fuzzy information processing is therefore a key element in research on artificial intelligence and intelligent computers.

Fuzzy mathematics has developed rapidly all over the world since first expounded in 1965. Important applications have been demonstrated for expert systems, pattern recognition, automatic control, and decision making in the soft sciences [especially medical diagnosis]. These achievements have aroused interest and competition among industrial and commercial circles, as well as in the academic world.

Following the announcement last July, the Japanese newspaper ASAHI SHIMBUN wrote: "Persons in authority expect that (Prof. Yamakawa's) fuzzy computer will be the fundamental technology for sixth-generation computers."

NIKKEI COMPUTER predicted: "It is no longer just an idle dream that, following applied research and commercialization of fuzzy theory, we will come into an era in which computers will replace men for currently unimaginable applications." Several departments of the U.S. Government, including Defense and NASA, have shown profound interest in this computer.

The high-speed, highly interference-resistant real-time control capabilities of the prototype open up new horizons in defense and civilian sectors in areas such as offshore drilling platform stability control, attitude control for rockets, safe touchdown for aircraft, and process control in chemical engineering. The development of this prototype fuzzy computer, achieved by Prof. Wang Peizhuang's group through independent Chinese mathematical conceptions and circuit design, has been supported by grants from the State Education Commission and the National Natural Science Foundation. Professor Wang's team is now engaged in further refining the fuzzy computer system.

/9604

On the Design of the Parallel Inference System NDPIS

40090093b Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese Vol 25 No 3, Mar 88 pp 1-7

[English abstract of article by Xu Jiafu [1776 1367 4395] et al, Computer Software Institute, Nanjing University]

[Text] NDPIS, a parallel inference system with KLND as its Kernel Language, is presented. Use of the kernel language for novel computer systems, its theoretical model, computation organization, program organization, machine organization and their implementation techniques are investigated. Some new ideas and processing techniques are put forward. [Received Feb 87.]

/06662

A Fundamental Development Environment Under UNIX

40090093c Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese Vol 25 No 3, Mar 88 pp 39-44

[English abstract of article by Zhou Ximing [0719 1585 2494] (Shanghai Institute of Computer Technology)]

[Text] A fundamental development environment under UNIX is presented. By using some UNIX tools, it provides systematic approaches to some common problems in software development that include the organization, sharing and protection of various files, software revision control, formatting and editing of textual files, and creation of small tools. This environment helps to improve development productivity and product quality. [Received Mar 87.]

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An Investigation of the Deductive Database

40090093d Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese Vol 25 No 3, Mar 88 pp 57-60

[English abstract of article by Cai Yinxiu [5591 0692 4423], Beijing Institute of Aeronautics and Astronautics and Pei Min [5952 3787], Beijing Automatic Engineering College]

[Text] An investigation of the deductive database will support knowledge information processing, which is a significant research field in current computer science. An experimental Deductive Database Management System (DDBMS) based on Prolog is introduced. [Received Feb 87.]

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Design of Coding Series for Computer-based Chinese Information Processing Systems

40090093e Beijing JISUANJI YANJIU YU FAZHAN [COMPUTER RESEARCH AND DEVELOPMENT] in Chinese Vol 25 No 4, Apr 88 pp 37-43

[English abstract of article by Zhao Pozhang [6392 3789 3864], Beijing Institute of Information and Control

[Text] The various kinds of Chinese information coding are presented from the viewpoint of information coding. Then relations among Chinese codes in operating systems are described. The coding series constructions of 7-bit, 8-bit and EBCDIC [Extended Binary Coded Decimal Interchange Code] for Chinese information are also discussed. [Received Jun 86.]

/06662

# The Design and Implementation of Network-Interconnection Gateways

40090076a Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese, Vol 11 No 3, Mar 88 pp 146-152

[Article by Xiong Yan [3574 3543] and Yang Yanming [2799 5888 2494], University of Science and Technology of China; received 18 December 1986]

[Abstract] The design principle and implementation method for using two gateways to interconnect Ethernet, Omninet, C-net and M-net (which is developed by our university) are presented. Internetwork high-level communication protocols of electronic mail, file transfer, broadcast and sessions among LANs are implemented at the host level. Over a greater area a complete internetwork communication network is formed.

/09599

A New Class of tEC Code and tBEL Code

40090076b Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese, Vol 11 No 3, Mar 88 pp 162-168

[Article by Zhang Huanguo [1728 3562 0948], Wuhan University and Qin Zhongping [6009 0022 1627], Central China Institute of Technology; received 17 September 1986]

[Abstract] A new class of t-error correcting code (tEC code) and a new class of t-byte error locating code (tBEL code) are presented. With the true distance as designed, the tEC code is structural and easy to design. Its information rate is much higher than the Reed-Solomon code, so it is especially suitable for correcting errors in optical storage. The tBEL code can not only detect errors in arbitrary t bytes, but also locate them.

/09599

Vectorization and Array Structuring for Multilayer Loops

40090094a Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 11 No 4, Apr 88 pp 220-231

[English abstract of article by Fan Zhihua [5400 2784 5478], Beijing Institute of System Engineering]

[Text] References [1-18] formulate the theory of vectorization for single-layer loops with array elements as nodes. This paper makes a systematic and brief extension of their results to multilayer loops. [Received 28 Aug 86.]

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New Knowledge Digestion and Assimilation for Expanding Knowledge Bases

40090094b Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese
Vol 11 No 4, Apr 88 pp 251-256

[English abstract of article by Li Deyi [2621 1795 3015], Institute of China Electronic Systems Engineering Company]

[Text] The definition of the meta predicate "demo" is given which can amalgamate object languages and meta languages in logic programming. Based on the notion of amalgamating language, four concepts used in expanding knowledge bases, called provability, contradiction, redundancy and independency, are discussed. The implementation via Prolog of a knowledge base system dealing with new knowledge digestion and assimilation is also described. [Received 17 Apr 86.]

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URPR [Unrolling, Pipelining and Rerolling]--An Extension of URCR for Software Pipelining

40090094c Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 11 No 5, May 88 pp 257-269

[English abstract of article by Su Bogong [5685 0130 3797] and Ding Shiyuan [0002 1102 0337], Tsinghua University]

[Text] The software pipeline technique is an effective approach to optimizing loops in array processor programs, but existing methods of software pipelining are of high complexity and the results may not be satisfactory. The URPR algorithm, an extension of URCR, the compaction algorithm of microcode loop, is introduced. First, the loops are unrolled (the number of unrolled loop bodies relies on the inter-body data dependency); second, the unrolled loop bodies are pipelined one by one; and finally, a new optimized loop body is obtained after rerolling. Preliminary tests indicates that URPR results in lower complexity. [Received 27 Oct 86.]

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## BRIEFS

EXPERT SYSTEM ENVIRONMENT 'LIDBSE'--The Shanghai Computer Software Laboratory and Fudan University's Computer Department recently completed joint development of LIDBSE, a rule-based expert systems environment implemented with Pascal language on an IBM PC/XT and founded on the LIDBS relational database. With this environment, the user can generate expert systems in various specialized areas such as consulting, policy making, and diagnosis. Features of LIDBSE include (1) a mutually independent knowledge base and inference engine set up from the relational database, (2) implementation of the internal representation and maintenance of the knowledge base via the relational database operating language SQL (structured query language). The inference engine consists of four subsystems: forward reasoning, simplified path tracing, inference interpretation and fuzzy inference. [Summary] [40080136a Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 11, 23 Mar 88 p 19; Chongqing WEIXING JISUANJI in Chinese Vol 8 No 2, Mar 88 pp 45-48]

NEW 32-BIT GREAT WALL PRODUCTS--On 20 April, Chang Cheng [Great Wall] Group China Computer Development Company formally announced its new series and new products. These include the Great Wall 386 new-generation 32-bit supermicrocomputer system and the GW 0520EM, 0520DH, 286B and 286E enhanced microcomputer systems. The new line, simultaneously unveiled in Beijing, Shanghai, Tianjin, Chengdu, Changsha, Wuhan, Shenzhen, and Hong Kong, is intended to compete on the international market as quickly as possible, and to strengthen the enhanced GW export series introduced in June 1987. New features include: (1) Expanded data storage, high performance and higher speed. The GW 386 is 3-4 times faster than the IBM PC/AT, and the enhanced products are 1-2 times as fast as the AT or XT. (2) The independently produced CEGA Chinese enhanced color monitor and the CMGA Chinese monochrome monitor systems, with improved resolution in the processing of characters and graphics. (3) Serialization of model categories, to satisfy the needs of users at home and abroad for equipment at all levels. (4) Software and hardware compatible with popular foreign models. (5) Low price, for competitive power on domestic and foreign markets. The appearance of these computers, now being batch produced at Shenzhen and Beijing, signifies the entry of Chinese-made microcomputers into the 32-bit development stage: Chinese microcomputer technology has now matured and meets international standards. [Summary] [40080136b Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 15, 20 Apr 88 p 1] [Editorial note: a follow-up article providing details of the new products will appear in full translation in an upcoming JPRS report.]

VLSI CHINESE-CHARACTER DOT-MATRIX CHIP--A set of national-standard Chinese-character-font dot-matrix chips has been jointly developed by the China Standardized Technology Development Company (commissioned by the State Bureau of Standardization), the Beijing Sitong (Stone) Group, and Institute 2 of the Second Artillery [i.e., Missile Forces] and will be mass marketed in the near future. Very large scale integration (1Mb-4Mb) is used in the manufacture of these chips, which are designed for computer processing of information. The set includes the 15x16-dot chips GB5199A and GB5199B; the 24x24-dot chips GB5007A, GB5007B, and GB5007C; and the 32x32-dot chip GB6345. Compared to the GB2312-80, the new chips can handle over 400 additional symbols: romanized half-angle symbols, ASCII code half-angle symbols, half-angle pinyin symbols, tabulation symbols, etc. In order to popularize these chips, the State Bureau of Standardization has decided that the profit margin for domestic sales shall not exceed 20 percent of cost. [Summary] [40080136c Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 16, 27 Apr 88 p 1]

INTEGRATED PROGRAM DEVELOPMENT ENVIRONMENT--A Pascal-language-oriented integrated program development environment/automatic graphics generating system developed by the Computer Science Department of Fudan University underwent accreditation a few days ago. Experts from the Shanghai Software Development Center, the East China Computing Institute and other institutions unanimously agreed that its functional integration, user interface, and augmented semantic analysis are all original, and that its theory and technology have reached worldwide state-of-the-art. This software development environment provides full support for program coding, execution, debugging, and comprehension; greatly improves software development efficiency; improves software reliability; and reduces development expense. This achievement is highly significant to the development of China's software industry. [Summary] [40080136d Beijing JISUANJI SHIJIE [CHINA COMPUTERWORLD] in Chinese No 16, 27 Apr 88 p 1] /9604

## ACID RAIN DAMAGE HEAVY IN SOUTHERN REGIONS

40081068 Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 28 Apr 88 p 4

[Summary] In order to determine the current state of acid rain damage in China, an academic seminar on "Agricultural Damage Due to Acid Rain and Its Countermeasures" was held to discuss the problem. According to records from 198 survey stations, the main acid rain damage areas in China are in cities south of Qinling and Huaihe which include Sichuan, Guizhou, Hunan, Guangxi, and Guangdong provinces and in Shanghai and some coastal cities in Zhejiang and Fujian. Polluted areas are gradually extending from the suburbs and industrial zones to rural areas. According to estimates, the total acid rain polluted cultivable land is more than 40,000,000 mu (about 6,588,000 acres), and annual economic loss approaches 2 billion dollars. Surveys conducted by Chinese Science Association in 1987 on heavily acid rain polluted areas in South China revealed that pine forests covering 90,000 mu were completely destroyed by heavy discharges from nearby sulfur plants, and 40 percent of the firs on Mount Emei were killed by acid rain pollution. One of Emeishan's marvellous spectacles--the sea of clouds--is actually caused by acid fog. The main pollutant in acid rain in China is sulfur dioxide that is mainly discharged by city factories, village industries, or from coal burners of thousands of households. The intensity and dispersion of acid rain are still increasing and expanding and if the discharge is not strictly controlled in some areas of southern China, the cultivable land will be severely acidified. According to experts, the acid rain problem in China will not produce a great impact in neighboring countries because it is caused by factories with low chimneys. To prevent further damage to the natural ecology, reducing sulfur dioxide discharge and afforesting acid rain damaged areas with acid-resistant plants are the most urgent tasks that China has before it.

/12858

## Measurement for Dynamic Deformation by Mismatch White Speckle Method

40090071a Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 8 No 1, Feb 88 pp 11-14

[Article by Cao Zhengyuan [2580 2973 0337], Chen Fang [7115 2455], Fang Ruhua [2455 1172 5478], and Chen Pingping [7115 5493 5493] of Institute of Photo-Mechanics, Tongji University]

[Abstract] When using white light to measure dynamic deformation of a material with a high speed camera system such as a model WZDD-1 photoelastic meter, the sensitivity is limited to 10 lines/mm due to the resolution of the instrument and the lowering of the effective cutoff frequency from focusing error. It is only suitable for materials of low elastic modulus and high deformation.

In this work, frequency analysis of an incoherent imaging system is employed to analyze the sensitivity of the dynamic white speckle method. A mismatch technique is used to enlarge the spacing between two speckles. In addition, a dynamic photoelastic method is used to simultaneously record the isocromate patterns under the same load. Thus, it is possible to isolate the main stress or directly determine the stress from strain to complete the stress-strain analysis of the structure. It is also capable of measuring other dynamic characteristics of the material.

This technique has been used experimentally on a photoelastic epoxy. It is found to be accurate enough for engineering applications.

12553/06662

# Operating Conditions of Free-electron Lasers With Radiation Pump

40090071b Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 8 No 1, Feb 88 pp 18-20

[Article by Lu Ruizheng [7120 3843 1767] and Lei Shizhan [7191 0099 3277] of Department of Physics, Tongji University and Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, respectively]

[Abstract] The output of a free-electron laser comes from the conversion of the kinetic energy of relativistic electrons to coherent radiation. In principle, its frequency is continuously tunable over a wide frequency range. In addition, the working medium is an electron beam which is not susceptible to non-linear effects. The energy conversion efficiency is also inherently high, approaching 50 percent. It is expected to play an important role in the laser field.

In 1951, Motz first pointed out that a relativistic electron could emit radiation when passing through a periodic electric or magnetic field in space. Madey demonstrated this principle experimentally in 1975. Based on equations, one way to obtain a very short wavelength free-electron laser is to use a Wiggler magnetic field of a very short period and the other is to increase the kinetic energy of the relativistic electron. The former is difficult because of mechanical limitation and the latter will require costly equipment.

This paper discusses the basic requirements to use light to excite a free-electron laser. Based on this analysis, the key issue is to have sufficient coherent length to achieve the required laser gain. This allows the photons emitted by the relativistic electron beam to maintain the same phase as the electrons interact with the excitation light beam. Obviously, the photons produced by the relativistic electrons is coherently superpositioned to possess laser characteristics.

12553/06662

A Thyratron Switched Nitrogen Laser

40090071c Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 8 No 1, Feb 88 pp 31-34

[Abstract] Nitrogen laser is widely used in dye laser pumping, laser chemistry because it works in the UV and it is inexpensive to operate. Most nitrogen lasers are made with a spark gap high voltage switch which happens to produce a wide bandwidth electrical signal upon discharge to interfere with many instruments. In addition, it cannot operate at high frequency. To this end, a thyratron switched nitrogen laser was developed.

In this paper, the operating principle of the device is described. A comparison of spark gap and thyratron switch is made. The effect of electrode material is discussed. With pure graphite electrode, the mean power output increases linearly with frequency up to 30 Hz. The optimum operating nitrogen pressure is 40 torr. The device can operate continuously up to 60 minutes with no gas flow and the mean power output drops to approximately the 70 percent level. With a slow gas flow, it can operate steadily over an extended period of time.

12553/06662

A High Multiplicity Cosmic Ray Event Observed in Chinese Satellite Emulsion

40090072a Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 12 No 2, Mar 88 pp 150-154

[Article by Cai Xun [5591 8113], Zhou Daicui [0719 0108 5050], Qian Wanyan [6929 1238 3601], and Luo Laiqi [5012 0171 1142] of Institute of Particle Physics, Huazhong Normal University, Wuhan]

[Abstract] This paper reports a high multiplicity cosmic ray event observed in the emulsion recovered from a Chinese satellite. Chinese made type N-4 emulsion was used as the target and detector. A total of 40 pieces of 400 μm thick plates were used. They were recovered from the "China No 7" satellite (launched in December 1976, altitude 200-500 km). A Zeiss microscope (16x10) was used for area scanning and a Russian made MBH-9 microscope was used to take measurements.

It was determined that the traces are associated with the fragments of a target nuclide and the target nuclide is AgBr. The method introduced by Castagnoli was used to estimate the incident energy and to provide a crude effective nuclear interaction model. The results are tabulated to compared with those reported in some references.

12553/06662

# Experiment on the Loss Impedance in an Electron Storage Ring

40090072b Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 12 No 2, Mar 88 pp 214-220

[Article by Pei Yuanji [5952 0337 0697] and Shen Xiaofeng [3088 2556 1496] of China National Synchrotron Radiation Laboratory, University of Science and Technology of China, Hefei, and Xu Jianming [1776 1696 6900] of Institute of High Energy Physics, Chinese Academy of Sciences, Beijing]

[Abstract] When a stored bunched electron beam passes through discontinuous structures in the vacuum chamber, the induced current and charge on the wall will excite several higher order mode magnetic fields which results in energy loss. This is equivalent to an impedance, i.e., loss impedance. Since the structure of a vacuum chamber is usually very complicated, it is difficult to calculate this loss impedance based on theory.

Rees and Sands introduced a technique to measure loss impedance by using a Gaussian current pulse to simulate the bunched electron beam. In this paper, the principle of this technique and the experimental set-up are discussed. A device was built and used to measure the loss impedance values associated with five vacuum chambers at HESYRL (Hefei Synchrotron Radiation Laboratory). Some of the results are in agreement with those obtained at DESY in West Germany.

12553/06662

# WIGNER-VILLE SPECTRUM ANALYSIS OF BACKSCATTERING PROCESSES OF MOVING MEDIUM

40090104a Beijing SHENGXUE XUEBAO [ACTA ACUSTICA] in Chinese Vol 13 No 3, May 88 pp 161-166

[English abstract of article by Zhu Weiqing [2612 4850 1987] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] In this paper, the author discusses the Wigner-Ville (WV) spectrum of backscattering processes of a moving medium, which equals the convolution of the power spectrum on a static medium, with the additional spectrum due to the medium movement. The Doppler frequency shift and split exist, as do the widening and non-symmetry of the spectrum peak in the WV spectrum due to the additional attribution of the medium movement. The number of spectrum peaks may be one, three or two with the increasing non-stationarity of the medium movement, corresponding to the quasi-stationary area, non-stationary area and strongly non-stationary area of the medium movement, respectively.

9717

NEW ARCHITECTURE OF ADAPTIVE LINE ENHANCER FOR TOWED LINE ARRAY

40090104b Beijing SHENGXUE XUEBAO [ACTA ACUSTICS] in Chinese Vol 13 No 3, May 88 pp 167-173

[English abstract of article by Li Qihu [2621 0796 5706] of the Institute of Acoustics, Chinese Academy of Sciences]

[Text] Towed line array has recently become a very active topic in the field of sonar signal processing. It is possible to use the adaptive line enhancer in the signal processing system of a towed line array. It is shown that the system gain of an adaptive line enhancer in which the LMS iterative algorithm is used is related to the input signal to noise ratio due to the presence of iterative noise. The line enhancer would be useless if the platform noise had not been cancelled. A cascade architecture of the adaptive noise canceller and adaptive line enhancer is proposed in this paper. The platform noise, as a strong interference, is cancelled by the adaptive noise canceller, enhancing the sinusoidal components in the output signal by the following line enhancer. It is possible to detect weak line spectrum components from strong noise background. The block diagram of such a cascade system and the performance analysis are given. The system simulation shows good agreement with the theoretical analysis.

9717

# PROPERTIES OF HIGHER HARMONIC OPERATION IN STORAGE RING FEL

40090100a Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese
Vol 15 No 5, 20 May 88 pp 257-259

[English abstract of article by Fu Ensheng [0265 1869 3932], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] In this paper, the authors propose that with wiggler magnetic parameter $K \geq 2$, using higher harmonic operation for a storage ring free electron laser, not only can shorter wavelength coherent radiation be obtained, but also more gain can be obtained than when using the fundamental harmonic with the same wavelength. At the same time, the initial laser intensity needed for the higher harmonic operation is lower than that required for the fundamental harmonic operation. The description of a possible experiment is also presented.

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# THEORETICAL ANALYSIS, EXPERIMENTAL STUDY OF STABILITY OF SIX MIRROR RING CAVITY WITH LARGE RADIUS OF CURVATURE

40090100b Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 15 No 5, 20 May 88 pp 260-263, 259

[English abstract of article by Zhao Xinmiao [6392 2450 5379], et al., of the Department of Precision Instruments Engineering, Tianjin University]

[Text] The stable zone of a six mirror ring cavity in a colliding pulse mode-locked (CPM) laser was theoretically analyzed, and a simple and precise analytical solution was obtained. In this paper, a new method for improving the ring cavity stability is presented. The parameter changes of the light beam in the cavity are analyzed, computed and discussed, showing the method is feasible.

9717

# OPTIMUM VALUE OF OPTICAL OUTPUT POWER FOR SEMICONDUCTOR LASERS

40090100c Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 15 No 5, 20 May 88 pp 264-267

[English abstract of article by Wang Dehuang [3769 1795 3552] of the Department of Physics, Beijing University; Xu Wanjin [1776 8001 0513] of the Institute of Nonferrous Metals and Rare Earths Applications, Beijing]

[Text] The relationship between the optical output power and facet reflectivities for semiconductor lasers is analyzed. The results of numerical calculation show that the optimum optical output power can be obtained by controlling the reflectivities of the front and rear facets coated with dielectric films. In addition, the analyzed results show that the output power is greatly increased as cavity losses, stripe width and active region thickness are decreased.

9717

NOVEL LASER DOPPLER VIBROMETER

40090100d Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese
Vol 15 No 5, 20 May 88 pp 276-278, 299

[English abstract of article by Sun Yusheng [1327 3254 3932], et al., of Shanghai Institute of Laser Technology]

[Text] This paper introduces a laser Doppler vibrometer and a new counting processing method using a microcomputer. This device offers the advantages of simultaneous measurement of the vibrating amplitude and frequency, high accuracy, simple structure and reliable performance. It is operated conveniently and has wide applications.

9717

# MEASUREMENT OF PICOSECOND LASER PULSE WIDTHS WITH SECOND HARMONIC WAVES GENERATED FROM GaAs SURFACES

40090100e Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 15 No 5, 20 May 88 pp 283-285, 288

[English abstract of article by Ma Haiming [7456 3189 2494], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] This paper describes the principle, experimental method and results of the measurement of picosecond laser pulse widths by means of second harmonic waves generated from GaAs surfaces. The possibility of measuring femtosecond laser pulse widths with second harmonic waves generated from the surfaces of semiconductors is discussed.

9717

# OPTICAL PROCESSING METHODS OF IMAGE INFORMATION COMPRESSION--ODPCM METHOD RESEARCHED

40090100f Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 15 No 5, 20 May 88 pp 295-299

[English abstract of article by Lin Ning [2651 1337], et al., of the Optical Engineering Department, Huazhong University of Science and Technology, Wuhan]

[Text] Theoretical analysis is made of the ODPCM method for simulating image information compression with digital differential pulse code modulation (DPCM) by the incoherent optical information processing technique, and an information compression experiment performed with binary input image is described in detail. Finally, a comprehensive analysis and discussion is presented of the experimental results and future trends.

9717

# LONG-TERM STABILIZATION OF SINGLE LONGITUDINAL MODE FOR EXTERNAL CAVITY SEMICONDUCTOR LASERS

40090100g Shanghai ZHONGGUO JIGUANG [CHINESE JOURNAL OF LASERS] in Chinese Vol 15 No 5, 20 May 88 pp 300-301

[English abstract of article by Zhang Hanyi [1728 3352 0001], et al., of the Department of Radio Electronics, Qinghua University, Beijing]

[Text] Long-term frequency stabilization of a single longitudinal mode (SLM) external cavity semiconductor laser has been demonstrated by using a multi-segment composite-cavity configuration and automatic frequency control loop with feedback to the external cavity length. The time period of free mode hopping SLM operation has been observed to be more than 24 hours, with a frequency shift of about 28 MHz and linewidth of less than 200 KHz.

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Low Magnetic Field Gyrotron

40100028 Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in English Vol 16 No 2, Mar 88, p 115

[Article by Guo Hezhong [6753 0735 1813] (Institute of Electronics, Chinese Academy of Sciences, Beijing) (Received Jul 87, revised Nov 87)

[Text] The gyrotron is a microwave vacuum tube which operates on the basis of interaction between an electron beam and microwave fields where coupling is achieved by the cyclotron resonance condition. This type of coupling allows the beam and microwave circuit dimensions to be large compared to a wavelength. Hence, the gyrotron is able to avoid the power density problems encountered in conventional klystrons and traveling wave tubes at the millimeter waveband. Generally, the applied magnetic field B for gyro-devices is proportional to frequency, F:

$$B(KGs) \sim 0.35F(GHz)\frac{r}{n},$$

r = relativistic mass factor,
n = harmonic number.

For larger n, B is therefore lower, and then the power supply equipment for producing a magnetic field should be facilitated considerably. But in the case of using an ordinary open cavity as the rf interaction structure for the gyrotron, when the harmonic number n is greater than or equal to 2, the efficiency and output power of the device are decreased a great deal. Fortunately, a new type of special complex cavity gyrotron has been successfully developed at the Institute of Electronics, CAS. GY-32 is an 8mm gyrotron oscillator operating at the second harmonic of the electron cyclotron frequency with an output power of more than 200kW and efficiency as high as 30 percent. It can work in a single pulse with pulse width of 20ms and in pulses with duty cycle of 10 percent. The users would find that the GY-32 has advantages of low magnetic field, high efficiency, long service life and is worth more than the cost.

General Characteristics

Frequency: 34.4 GHz (variable from 20GHz to 60GHz); Focusing: Electromagnet, $B_{max}$=6.7 kGs; Ion pump: Cool-cathode electromagnetic pump; RF connector: Circular waveguide, 5cm (dia); Cooling: Water (Collector, Tube body, and Window), Forced air (Electron gun region); Tube weight: 25kg; Tube length: 95cm.

Operating Data

Frequency: 34.4GHz (variable from 20GHz to 60GHz); Heater current: 4.5A; Heater voltage: 10V; Beam voltage: 60kV; Beam current: 12A; Control Anode voltage: 28kV; Output power: 200-230kW; Output mode: $TE_{03}$; Pulse width: 20ms (max); Efficiency: 30 percent; Magnetic field: 6700Gs (Cavity region), 1150Gs (Gun Region).

/06662

Multistage Sampling Rate Conversion for Circulator Wave Digital Filters

40090097a Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 29-35

[English abstract of article by Huang Dawei [7806 1129 5898] (Shanghai Institute of Railway Technology) et al.]

[Text] Multistage realization is one of the most efficient methods to change the sampling rate of signals. The optimum multistage design scheme for circulator wave digital filters and simple design methods for two-stage and three-stage implementation are discussed. The coefficient optimization for the multistage sampling rate conversion is also presented. (Received Jun 86, revised Mar 87)

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Adaptive Recursive Filter With Adjustable Error Smoothing Coefficients

40090097b Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 36-42

[English abstract of article by He Zhenya [0149 2182 0068] (Nanjing Institute of Technology) and Wang Huakui [3769 5478 1145] (Navy Institute of Electronic Engineering)]

[Text] An adaptive recursive filter with adjustable error smoothing coefficients is proposed. The upper and lower bounds of the rate of convergence, under some sufficient exciting conditions, for the parameters of the filter are derived. Finally, simulation results are given. (Received Oct 86, revised Jun 87).

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General Recursive Factorization Algorithm To Compute DFT($2^m$)

40090097c Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 43-50

[English abstract of article by Ma Weizhen [7456 4850 4394] (South China Institute of Technology, Guangzhou) and Yin Ruixiang [3009 3843 4382] (Jiangsu Television Broadcast University, Nanjing)]

[Text] A general recursive factorization algorithm (GRFA) for computing DFT($2^m$) on the basis of the Kronecker product expression of factorization of the matrix is presented. Using distinct factorization radices, we have derived Kronecker product expression of some recursive factorization algorithms such as conventional FFT, Nakayama MD-FFT, Martens RCFA, Duhamel-Hollmann SR-FFT, etc. As a result, the paper demonstrates that the minimum number of real multiplications required for DFT($2^m$) using GRFA is equal to $(m-3)2^m+4$. SR-FFT or RCFA is the optimal recursive factorization algorithm with minimum number of real multiplications to compute DFT($2^m$). (Received Jul 86, revised May 87).

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A New MOS Current-Mode Multiple-Valued Logic Circuit

40090097d Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 51-55

[English abstract of article by Tang Zheng [0781 2398] and Li Zhijian [2621 1807 1017] (Institute of Microelectronics, Qinghua University)]

[Text] A new MOS current-mode multiple-valued (MV) logic circuit is proposed. By taking 10-valued circuits as an example, various circuits required by the complete multiple-valued system are suggested. The possibility of applying these circuits to realize some practical systems is also studied. Testing of sample chips fabricated by the standard CMOS technology shows that this kind of multiple-valued logic circuit not only has complete logic functions, but also possesses the advantages of high integration density, simplicity of circuit structure, feasibility and good reliability, compared with other types of multiple-valued circuits. (Received Jan 87, revised Jun 87).

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New Fixed Order Fast Algorithms for Nonsymmetric Least-Squares Criteria

40090097e Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 75-84

[English abstract of article by You Xiaohu [1429 5135 5706] and He Zhenya [0149 2182 0068] (Nanjing Institute of Technology)]

[Text] A new fixed order of overnormalized fast algorithms is presented for unwindowed (or covariance), prewindowed and sliding windowed nonsymmetric recursive-least-square criteria, respectively, to meet the requirements of actual application under different conditions. The amount of computation required to iterate these algorithms is proportional to the order number of the model. (Received Jul 86, revised May 87).

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VLMS Adaptive Algorithm

40090097f Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 85-89

[English abstract of article by Jiang Xudong [5592 2485 2639] and Xiao Xianci [5135 0341 6337] (Chengdu Institute of Radio Engineering)]

[Text] The steepest descent algorithm which varies its step size constantly in seeking its minimum mean-square error is presented. Computer simulation results are presented to illustrate and verify that the VLMS algorithm is superior to the LMS algorithm for any statistical characteristics of noise. The complexity of computation of both algorithms is almost the same. (Received Jun 86, revised Nov 86).

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Convolution and Deconvolution by Generalized Discrete Fourier Transformation

40090097g Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 90-95

[English abstract of article by Yan Mingshen [7051 7686 3932] and Mao Yuhai [5403 0060 3189] (Qinghua University, Department of Electronic Engineering)]

[Text] Methods of convolution and deconvolution by single parameter GFT are proposed, and some of the important properties of GFT (0, a) have been given. The fast convolution and deconvolution can be realized by using GFT (0,a). A lot of operations can be saved by this method as compared with the time domain deconvolution method. (Received May 86, revised Dec 86).

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A Mathematical Representation for Tracking Multiple Radar-Targets

40090097h Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 102-107

[English abstract of article by Chen Binghe [7115 3521 0735] (Beijing Institute of Aeronautics and Astronautics)]

[Text] Based on development of multitarget tracking as a multiple-hypothesis test, a mathematical model for tracking multiple radar targets is proposed. Also a theoretical analysis of optimal data association of common multitarget tracking systems is included. The target states are estimated by a Kalman filter. Computer simulation shows that the mathematical representation described is very suitable for optimizing the processing of multitarget tracking. (Received Feb 86, revised Dec 86).

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Microwave Ferrite Dual-Mode High Power Polarizer

40090097i Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88, pp 122-124

[English abstract of article by Wei Kezhu [7614 0344 3796] (Nanjing Institute of Electronic Temperature, Jiangsu)]

[Text] By means of the birefringence effect of microwave ferrite materials dealing with the perturbation method, a microwave ferrite dual-mode high power polarizer is developed. By loading the low dielectric constant ceramic, the ferrite material can be saved, the characteristics and power capacity of the device are also improved. In general, the differential phase shift will be increased about 30-40 percent over the unloaded one. (Received Feb 87, revised Jun 87).

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CMOS Circuit Latch-Up Induced From Ionization and Latch Up Elimination Methods

40090098a Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese Vol 11 No 4, Apr 88 pp 1-7

[English abstract of article by Chen Panxun [7115 4149 6064] (Southwestern Applied Electronics Institute)]

[Text] The mechanism of CMOS circuit latch-up in ionization radiation environment, several latch-up elimination methods and the phenomenon of the latch-up window are presented. Major research results of eliminating latch-up abroad in the last decade are reviewed. Some viewpoints of the author are also introduced.

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The Effects of Gate Oxide Thickness on Radiation Damage in MOS System

40090098b Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese Vol 11 No 4, Apr 88 pp 17-23

[English abstract of article by Zhu Hui [2612 6540] et al. (Xinjiang Institute of Physics, Chinese Academy of Sciences)]

[Text] The dependences of the flatband voltage shift ($\Delta V_{FB}$) and the threshold voltage shift ($\Delta V_{TH}$) in a MOS system on the oxide thickness ($T_{ox}$) and on total irradiated dose (D) of electron-beam and $^{60}Co$ $\gamma$-ray are studied. It has been found that $\Delta V_{FB} \propto T_{ox}^3$ with +10V of gate bias during irradiation for n-Si substrate MOS capacitors; $\Delta V_{TH} \propto T_{ox}^3 D^{2/3}$, with "on" gate bias during irradiation for n- and P-channel MOS transistors; $\Delta V_{TP} \propto T_{ox}^2 D^{2/3}$, with "off" gate bias during irradiation for P-channel MOS transistors. These results are explained by Viswanathan model. According to $\sim T^3_{ox}$ dependence, the optimization of radiation hardening process for a MOS system is also briefly discussed. (Received 26 Dec 86).

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Simplified Lattice Realization of FIR Digital Filters

40080151a Beijing DIANZI KEXUE XUEKAN [JOURNAL OF ELECTRONICS] in Chinese
Vol 10 No 3, May 88 (manuscript received 15 Sep 86, revised 28 Mar 87)
pp 193-201

[Article by Zhang Yuhong [1728 3768 3163] and Bao Zheng [0202 6927],
Electronic Engineering Dept., Northwest Telecommunications Engineering
Institute, Xi'an]

[Abstract] A lattice filter is superior to its direct structure counterpart in numerical computational performance and structural modularity, but is more difficult to realize. A simplified lattice structure--a p-level lattice filter--for the realization of (2p+1)-dot or (2p+2)-dot FIR (finite impulse response) digital filters is proposed. Its hardware requirement is only half that of the conventional lattice filter, and comparable to that of the direct structure. Synthesis algorithms for transforming the direct structure into the simplified lattice structure are given. Furthermore, the lattice synthesis algorithms for linear phase FIR digital filters--which occupy an especially important position in signal processing--are simplified. The main results are illustrated by a practical example: the programmable moving target detector. Figures: 4, tables: 1, references: 8 (mostly U.S. and Japanese, several from IEEE TRANS ON ASSP, 1976-1983).

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# Main Reflector Module Sharing Technique for Dual Reflector Antennas and Its Optimization Method

40080151b Beijing DIANZI KEXUE XUEKAN [JOURNAL OF ELECTRONICS] in Chinese Vol 10 No 3, May 88 (manuscript received 2 Jan 87, revised 2 Jul 87) pp 238-243

[Article by Xu Guohua [1776 0948 5478] and Qi Yihong [3344 0001 1347], Northwest Telecommunications Engineering Institute, Xi'an]

[Abstract] Dual reflector antennas are becoming more and more important pieces of equipment for satellite ground receiving stations. In order to reduce production costs and raise the tempo of antenna production, a method is presented wherein dual reflector antennas share a main reflector module. Under conditions of fixed antenna efficiency, via optimization of the subreflectors, main reflectors with the same focus but different aperture can share or partially share one processing module. A fast convergent optimization method is given for the subreflectors, and satisfactory results are obtained. Figures: 1. References: Shi Huli [2457 3338 4539], DIANZI XUEBAO [ACTA ELECTRONICA SINICA], No 5, 1985, pp 59-64; P.J. Wood, MARCONI, Rev, 34 (1972), pp 149-172.

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## BRIEFS

FIRST 4-MM OROTRON--A 4-mm diffraction radiation oscillator, or orotron, developed by the High-Energy Electronics Center of the Chengdu Institute of Telecommunications Engineering passed accreditation on 12 January ]988. The orotron uses an open resonance cavity and a reflection diffraction grid as a high-frequency interaction system. It is a millimeter-wave and sub-millimeter-wave device with a great developmental future. The orotron acts as a source for wideband, intermediate-power mm and sub-mm waves and has been successfully employed in plasma diagnosis for controlled fusion, high-frequency-stability microwave measurements, radiation-spectrum instruments, measuring instruments for diagnosis and flaw detection [in metals], and in many areas of research such as communications, radars, and material science. Researchers Chen Jiayu [7115 0857 6877], Yu Shanfu [0060 0810 1133] and others in the High-Energy Center, under the leadership of Professor Liu Shenggang [0491 4141 0474] and with the active cooperation of Plants 776 and 778 of the Ministry of Electronics Industry, were responsible for the development of this first domestic orotron, which has a 60-87 GHz bandwidth and a maximum output power of 1.2 watts. [Summary] [Beijing DIANZI XUEBAO [ACTA ELECTRONICA SINICA] in Chinese Vol 16 No 2, Mar 88 p 15] /9274

LONG-HAUL OPTICAL CABLE CONSTRUCTION--Construction of China's first long-haul optical cable communications trunkline system--the Nanjing-Wuhan-Chongqing Optical Cable Digital Communications Project--officially began a few days ago. This trunkline, a key item in China's Seventh 5-Year Plan, runs over 2,200 km through Sichuan, Hubei, Jiangxi, Anhui, and Jiangsu Provinces, and is the nation's longest and highest-capacity trunkline in the east-west direction. After the project is completed, the system will be hooked up with the Beijing-Wuhan - Guangzhou, Beijing-Shanghai-Hangzhou, Chengdu-Chongqing and other 1800-channel coaxial cable communications trunklines, to form a critical domestic long-distance communications network. With respect to solving the difficult problem of interurban telephone service, this network will be actively used to alleviate the overstrained situation present with current communications channels. The trunkline will utilize state-of-the-art technology: 8-, 10-, and 12-strand optical cables will be employed, with each pair of strands making up one optical-channel digital communications system; each system is capable of handling 1,920 channels with a transmission rate of 140 Mbps. [Text] [Shanghai DIANXIN KUAIBAO [TELECOMMUNICATIONS INFORMATION] in Chinese No 3, Mar 88 p 4] /9274

PLANS FOR FIBER-OPTIC CONVERSION--The State Council's Leading Group for Development of Electronics Industry held a conference last year in Beijing for its Working Group on Applications of Fiber-Optic Communications. A fiber-optic promotional program was discussed, and among the proposals was one to discontinue expansion of coaxial cable systems after 1990. The traditional cable channels will then be gradually replaced with fiber-optic ones. By 1990, optical cable construction projects in China will lay a total of 10,000 km of line. By 1995, the plan calls for 75 percent of the materials to be domestically produced. [Text] [Beijing DIANXIN JISHU [TELECOMMUNICATIONS TECHNOLOGY] in Chinese No 4, Apr 88 p 48] /9274

DIGITAL MICROWAVE SYSTEMS--A key communications project for Jiangxi Province--the Honggan-Hongping [3163 6373 3163 5493] digital microwave (DMW) system--has been completed. This 500-km microwave circuit, consisting of over 10 microwave relay stations, is China's first high-capacity, high-speed, long-range DMW communications circuit. Another DMW system, with stations in the Shanghai suburbs of Fengxian, Nanhui, and Zhoupu, is now formally operational. This system was constructed by technical personnel from both China and Italy in a joint effort. [Text] [Beijing DIANXIN JISHU [TELECOMMUNICATIONS TECHNOLOGY] in Chinese No 4, Apr 88 p 47] /9274

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