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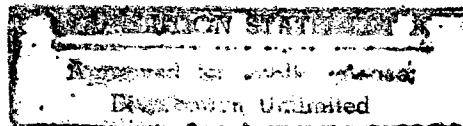
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China Report

SCIENCE AND TECHNOLOGY



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14 April 1986

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SCIENCE AND TECHNOLOGY

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NATIONAL DEVELOPMENTS

VICE MINISTER OF STATE S&T COMMISSION ON FUTURE S&T PLANS

Tianjin JISHU SHICHANG BAO in Chinese 21 Jan 86 p 1

[Article by Zhao Shixin [6392 0013 0207]: "Teng Teng, Vice Minister of the State Science and Technology Commission, Appears at the National Conference for Exchange of Experiences from Local Scientific and Technical Work"]

[Text] The other day, Teng Teng [3326 4696], vice minister of the State Science and Technology Commission, proposed at the National Conference for Exchange of Experiences from Local Scientific and Technical Work that we should earnestly implement the "spark plan." He said that the Central Committee and the State Council have approved the "spark plan" implemented by the State Science and Technology Commission, and that during the "Seventh 5-year Plan," they will develop 100 kinds of complete technologies suitable for town and township enterprises, as well as for undertaking large scale production. They will set up 500 technology demonstration town and township enterprises, and provide complete sets of techniques and technologies, management regulations, product designs, and methods for quality control for them. There will be annual short term training of 200,000 rural intellectual youth and low level cadres to allow them to master one or two advanced technologies suited to a locale, so that over 5 years 1 million people will have been trained.

Comrade Teng Teng pointed out that during the implementation, one thing will be stress on the main points. At the same time as we continue to study and tackle key problems in the planting and cultivation industry, we will vigorously disseminate technology that will make factory-type production out of domestic fowl, water fowl, and aquatic products cultivation, as well as of livestock raising. Efforts will be focused on processing technologies and complete sets of equipment to set up factories for agricultural products, and on gathering scientific and technical capabilities to serve raising the technical standards for rural household and market town construction. We will extend and apply new technologies, as well as develop small products, children's electronic toys, and tools for learning, all of which will be of new product quality, new design thinking, and will provide conveniences for people's daily living, and will help to serve travel. A second thing will be projects that form climates and that will have a direct effect on people's lives, and the first breakthroughs will be quickly spread around. The State Science and Technology Commission plans breakthroughs this year in the problem

of mechanized chicken raising. Each area should take on projects that have the greatest effect on that area. A third thing is implementation and organization, where people will concentrate on those things. The State Science and Technology Commission has established a planning office for implementation of the "spark plan," which is just now getting organized. A fourth thing is that we will pay close attention to exchange of information. We will center on implementation of the "spark plan," releasing information at regular intervals and exchanging experiences.

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NATIONAL DEVELOPMENTS

CONFERENCE ON 'SPARK PLAN' HELD IN BEIJING

Tianjin SHICHANG JISHU BAO 14 Jan 86 p 1

[Text] Recently, the State Science and Technology Commission brought together in Beijing directors of 17 provincial and municipal science and technology commissions from Shanghai, Tianjin, Beijing, Jiangsu, Zhejiang, Fujian, Jiangxi, Anhui, Hunan, Hubei, Shandong, Sichuan, Liaoning, Shaanxi, Guangdong, Heilongjiang, and Hebei to discuss questions regarding the implementation of the "spark plan." Leaders of the State Science and Technology System, Song Jian, Wu Mingyu [0702 2494 3842], and Yang Jun [2799 3182], attended and spoke at the meeting.

The conference relayed and studied the instructions of comrades Hu Yaobang, Zhao Ziyang, Wan Li, and Tian Jiyun regarding the "spark plan," and talked as well of the spirit of the Central Committee Rural Working Conference. The 17 provincial and municipal science and technology commission directors all spoke. They spoke both of the significance of the "spark plan" and of plans and suggestions regarding implementation of the plan.

Everyone felt that with the "spark plan" science and technology would be motivated to support town and township enterprises, which would serve development of the rural economy. This is an undertaking of both practical and long-term significance, and is a major strategic measure worth considering. It is a distinctive way toward Chinese urbanization. People also said that the benefits to implementing the "spark plan" are that it has the close attention and support of leaders in the CPC Central Committee and State Council as well as of relevant departments within the central authorities; there are scientific and technical advantages for scientists and technicians, scientific and technical achievements, and scientific and technical information; it has the support and acceptance of 800 million farmers; and it has vigorous financial support in all areas, making the "spark plan" completely possible.

Everyone pointed out as well, that in implementing the "spark plan" the focus should be on projects that are in close touch with the lives of the people and that have great practical significance for promoting local economies. Each provincial and municipal science and technology commission director proposed suggestions for implementation that were combined with actual conditions in his province: each area must enhance its publicity and study; and also, based

on the overall national goals for the "spark plan," an implementation plan for each area should be worked out; we should strengthen organizational leadership and information exchange; and we should resolve particular principles in the "spark plan" to ensure the smooth operation of transfers of rights to technology, dissemination of achievements, product sales, and distribution of economic profits.

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NATIONAL DEVELOPMENTS

MILITARY-CIVILIAN COOPERATION AGREEMENT ANNOUNCED

Tianjin JISHU SHICHANG BAO in Chinese 14 Jan 86 p 1

[Article by Jin Guoxun [6855 0948 8113]]

[Text] Recently, the Ministry of Ordnance Industry and Heilongjiang Provincial People's Government formally signed an agreement for ministerial and provincial cooperation in Harbin after full negotiations.

The focus of work for this cooperation is to handle development of civilian products and the transfer of military technology to the civilian sector, adjustment of small third-line [industry] product structures and distribution, and to allow military industrial enterprises to better serve national economic construction. To this purpose, both parties jointly established ministerial and provincial cooperative leading small groups, and also took up a particular agenda with the Heilongjiang Province National Defense Science Industry Office as the administrative structure for ministry and province cooperation.

The Minister of the Ministry of Ordnance Industry, Zou Jiahua [6760 1367 5478], and the Governor of Heilongjiang Province, Hou Jie [0186 2212], each spoke at the ceremony for the agreement signing. They emphasized that signing this agreement of cooperation indicated that the traditional friendship and cooperation between the Ministry of Ordnance Industry and Heilongjiang Province had entered a new stage, which signifies that in implementing the resolution by the Central Committee regarding the restructuring of the economic system, the ministry and the province have taken an important step. This is a necessary and natural result of developing trends. That military industry enterprises should be part of the integration of military with the civilian sector is a long-term strategic principle, and to break up the past situation of self confinement and sole production of military goods will vigorously develop civilian goods. Not all military industry enterprises will take on civilian goods, which is not extraordinary since they cannot just discontinue things at will. Both sides have indicated that they will begin from the needs of the marketplace and will strive for real results. They will break up the barriers between military and civilian, between professions, between regions, and between different ownerships in order to invigorate the local economies, expand foreign trade and export, and work together to raise the living standards of the people. They also made particular suggestions regarding future work.

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NATIONAL DEVELOPMENTS

DEFENSE RESEARCH FUNDS ALLOCATION SYSTEM TO CHANGE

Beijing KEJIBAO in Chinese 8 Jan 86 p 1

[Article: "National Defense Science and Technology Commission Drafts Provisional Funds Allocation System and Will Convert to Compensation Contract System"]

[Text] An experience-exchange conference on reform of the national defense science and technology system called by the National Defense Science and Technology Working Committee was recently held in Beijing. Leaders of ministries involved in military production, the military arms and services and some research institutes and plants that are involved in spot experiments with reform described their experience and discussed ways of further improving the reform of the national defense science and technology system.

In slightly more than a year, based on the central authorities' decision on reform of the economic system and the science and technology system and in keeping with the spirit of the relevant state regulations, reform of the national defense science and technology system has experienced a new deepening and broadening; in particular, outstanding success has been achieved and new experience accumulated in the provisional implementation of the compensation contract system.

The central substance of this reform of the national defense science and technology system is the revamping of the national defense research and development funds allocation system and the establishment of the compensation contract system in response to the needs of developing a planned commodity economy and of converting scientific and technical results into commodities. This reform helps achieve an overall balance in research and development expense payments and tasks and guarantees implementation of the Central Military Commission's policy directive to "shorten the battle lines, highlight key focuses, make a vigorous effort in scientific research, and speed up modernization"; in addition it helps clarify the economic and technical tasks of research departments and user departments, motivates them, and encourages the scientific research institutes to engage in overall planning, to allocate some of their manpower to research on civilian products, and to convert some military technologies to civilian use. After implementation of the compensation contract system, the research and development units will sign agreements directly with the user departments, which in legal terms is a relationship between party A and party B, but in operational terms is a cooperative relationship for the purpose of carrying out a common research task.

NATIONAL DEVELOPMENTS

SOME RECENT DOMESTIC COOPERATIVE PROJECTS DESCRIBED

Tianjin JISHU SHICHANG BAO in Chinese 21 Jan 86 p 1

[Article by Tian Guohua [3944 0948 5478]: "Economic and Technical Cooperation Developed Dramatically During the 'Sixth 5-year Plan'"]

[Text] From the working conference on the national economy this reporter has learned that during the "Sixth 5-year Plan," multi-channel, multi-level, and multi-mode horizontal economic relations increased daily and that economic and technical cooperation increased dramatically, both of which were positive effects on invigoration of the economy, promoting production, improving economic results, and hastening the progress of our modernization efforts. From 1981 to 1983, there were more than 14,600 economic and technical cooperative projects arranged throughout the country, and in 1984 another 17,000. According to incomplete statistics, there were 35,000 economic and technical cooperative projects arranged from January through October, which surpasses the total cooperative projects over the previous 4 years. About 70 percent of those projects have already been implemented, with cooperative funding totaling 6 billion yuan; there has been an exchange of talent involving nearly 50,000 people. In addition, the total value of cooperation in goods and materials has exceeded 10 billion yuan.

Currently, there are five trends in economic and technical cooperation:

1. Relations and cooperation within fields have been strengthened, which has stimulated the development of regional economies. There have been six major open and relaxed economic and technical cooperation zones set up in this country, which using the advantages of cooperative areas have opened up broad based cooperation in the aspects of economics, technology, funding, and resources. There have also been relations and cooperation within fields both within provinces and between neighboring provinces and cities.

2. Economic integrated bodies of various formats have promoted the restructuring of central cities, strengthening enterprise vitality. There have been three principle forms: economic integrated bodies between cities, as for example where Shenyang is the central city, and seven other cities, like Benxi and Fushun, have established a networked Central Liaoning Economic Integrated Body; the town and village economic integrated body formed by cities and townships, as for example where Changzhou and other cities focus on

well-known local produce, are supported by key enterprises, and have formed a town and village integrated body; enterprise economic integrated bodies, as for example where Nanjing has set up 217 economic integrated bodies in which 572 enterprises take part. According to statistics on 75 joint projects that are already in production, output value in 1985 could increase by 330 million yuan, for new revenues of 44 million yuan.

3. The proportion of technical cooperation projects among national economic cooperation projects is steadily increasing. In 1984 it was 40 percent and in 1985 rose to more than 60 percent. This has accelerated the transfer of technical achievements and the integration of science research with production.

4. The transfer of military technology to civilian use has been stepped up. Since 1985, all departments in national defense industries and affiliated enterprises have discussed more than 20,000 projects for the transfer of military technology to civilian use. The joining of first line and third line regions has also progressed, and a number of deals for production of civilian products have been made.

5. Support for economic construction in "old, scarce, border, and poor" regions. As for example where provinces and cities like Beijing and relevant departments have joined with Yen'an Prefecture to run 12 factories jointly, transfer the rights to 65 technologies, and are funded at more than 16 million yuan, all of which has worked at removing difficulties and backwardness.

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NATIONAL DEVELOPMENTS

SHANGHAI'S IMPORTED TECHNOLOGIES DOMESTIC PRODUCTION PROGRESS

Shanghai JIEFANG RIBAO in Chinese 7 Jan 86 p 1

[Article: "Shanghai Improves Ability for Domestic Production of Imported Technologies"]

[Text] Guided by the policies of opening to foreign countries and technical progress, Shanghai has imported several advanced foreign technologies, and assimilation and creative development have led to gratifying results in their domestic production.

Statistics on more than 40 importation projects in such industries as mechanical and electrical equipment, instrument making, chemical engineering and textiles indicate that the importation of complete technology sets and individual pieces of equipment has already led to an internal spare parts provision and key materials self-sufficiency rate of about 80 percent. In particular, the domestic production of several imported technology sets, such as production lines for glass-packaged diodes, resistors and black-and-white picture tubes and the production technology for aviation guidance wires, NTN steel ball-bearing balls, axial-flow blowers, electric welders, single-sided face grinding machines [dayuanji 1129 0955 2623] and the like has now been completely or almost completely mastered. In addition, preliminary statistics on the mechanical and electrical equipment, light industry, chemical engineering, textiles and pharmaceutical branches indicate that domestic production of 296 single pieces of equipment or products has been essentially mastered and that their technical characteristics and quality are equivalent to those of foreign models.

Shanghai's improved ability to master the domestic production of imported technologies has the following features.

First, the great majority of technology imports are closely related to a revamping of the technical structure and product mix of traditional industries. The Shanghai Soda Water Plant combined the strong points of several foreign companies and made thorough use of a Xingfu Cola bottling line built with existing technologies, thus achieving domestic production at a stroke.

Second, the domestic production of imported equipment, assemblies, components and key materials is all geared to the end product. This characteristic is exhibited most thoroughly by the emerging industrial departments. Some 62 percent of all imported color television parts and components are now domestically produced; this is the highest figure in the country.

Third, the coordination of technology imports with domestic research and development has promoted the mastering of domestic production. When the Shanghai Electric Welding Machinery Plant was assimilating imported technology for the series S spot welder, it found that the electronic circuitry furnished by the exporting country used HTL [high threshold logic] integrated circuit components, which were not then domestically produced. Plant personnel looked into the circuit principles and control logic furnished by the supplier, then independently designed circuitry using CMOS [complementary metal-oxide-silicon] integrated circuit components, achieving complete success and further raising the welding machines' operating reliability.

Fourth, industrywide, trans-industry and trans-area technical cooperation, has been pursued, forming powerful engineering task forces. The Shanghai Air Conditioner Plant imported a total 411 varieties of totally enclosed compressors and floor model air conditioners, more than half of the spare parts for which were foreign-produced. Because of insufficient foreign technical data, these parts were hard to machine and produce. But with the support of more than 30 plants in Shanghai and 10 brother plants in other provinces and cities, the plant smoothly solved the problems with more than 200 types of parts supplied from abroad, thereby increasing the proportion of spare parts domestically produced to an ideal level.

Shanghai has accomplished great things in mastering the domestic production of imported technology, but there are still many problems in this work. One is a lack of industrial-branch development plans to guide technology importation. Importation projects submitted for approval are generally based on the needs of particular organizations, with overemphasis on increasing short-term economic benefits and with insufficient emphasis on assimilation and on the long-term benefits of strengthening the industry in question; the projects are not sufficiently linked to long-term development plans of the enterprise involved or of the entire industrial branch. As a result, there is generally an overemphasis on immediate usability and insufficient stress is placed on mastering domestic production of the imported technologies. A second problem is ineffective functioning of the technology import organizations and technology assimilation bodies, with a lack of coordination and of unified command by an authoritative body. Some industry bureaus and some industrial corporations actually have no one in charge of technology assimilation. Internally, many enterprises approach importation and technical modernization as two separate activities, so that neither side ends up paying attention to domestic production of imported technology. A third problem is a shortage of funds for assimilation, so that many key technology projects bog down because of lack of funds. In addition, overimportation of technologies, duplication, blind importation and go-it-alone

importation lead to great shortages of materials and spare parts; this is another reason for the difficulty in proceeding with the domestic production of technologies.

Knowledgeable persons believe that to solve these problems, not only must the relevant departments in Shanghai take the requisite administrative and economic measures, but in particular a basic awareness of the importance of a changeover to domestic production must be fostered. China's approach to modernization involves self-reliance and self-sufficiency. Importation is only a means to an end; foreign technology is imported for the purpose of strengthening our self-sufficiency. In addition, China is a developing country whose industries have yet to flourish, and the acute shortage of foreign exchange will be a long-standing problem; for a long period we will be unable to rely on foreign exchange for the importation of foreign equipment, spare parts and materials. All views that emphasize importation at the expense of development of domestic production capabilities, that focus on importation and ignore the overall situation, or that thoughtlessly use up foreign exchange and regard the creation of foreign exchange as a "soft" task are one-sided.

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NATIONAL DEVELOPMENTS

MAKING SCIENCE, TECHNOLOGY AVAILABLE TO RURAL AREAS URGED

Beijing GUANGMING RIBAO in Chinese 9 Jan 86 p 1

[Article by staff commentator: "Let the Shooting Star of Science and Technology Illuminate the Rural Areas"]

[Text] The Hebei provincial science commission arranged for specialist scientists and technicians to go into the mountains, to take science and technology to rural villages, and to promote the economic invigoration of the Taihang mountain area. Their results have been outstanding, and are truly inspiring! Their actual experience has shown that as various policies are thoroughly implemented, in order to better invigorate the rural economy we must pay special attention to the function of science and technology.

Since the 3d Plenary Session of the 11th CPC Central Committee, a series of party principles and policies have stimulated the enthusiasm of hundreds of millions of farmers for production. However, the interest of people in labor is even higher but their physical stamina is of course limited, and in comparison the capacity of science and technology is very great. As trends develop, science and technology will exhibit an ever growing function as production forces. Because of this, only by making science and technology available to the countryside in a never ending stream can we greatly bring down the costs of production, raise labor productivity, and impel the rural economy on to even greater heights.

Invigorating the rural economy requires dependence upon science and technology, and there are now more and more people who understand this principle. But in actually doing it, the results in each area have not been the same. Here we have both a problem of true "dependence" and false "dependence," as well as a problem of just how to "depend." Experience from the Taihang mountains has shown that for science and technology to serve the rural economy it must keep pace with developments in the rural economy, and must be integrated with the development and use of the advantages and resources of particular areas. In areas like that of the Taihang mountains where the economy is somewhat in difficulty, and where scientists and technicians are sent into the mountains and down to the farms, we must first put complete sets of the appropriate technologies into the hands of farmers to help them turn poverty into riches, technology that is low cost, fast acting, greatly rewarding, and of low risk. These technologies are not usually

"noticeable," but can always reap great economic results and can serve as "coal in winter" or "rain in the nick of time." Only when farmers have seen the power of science and technology, have received its benefits, can they generate an urgency to take up science and technology. At the same time, only if production develops and farmers become wealthy can funds be accumulated to develop even higher levels of technical projects and can the conditions be created in which technical development will deeply and broadly extend to various industries in agriculture, forestry, animal husbandry, by-products, and fisheries, or even various areas in industry, building, shipping, and services.

Taking science and technology to the homes of the people is an enormous and far-ranging task. To accomplish this great and complicated task, it is not enough to just rely upon the efforts of a small number of specialists and scientists and technicians, but rather this must be integrated with the technical capacities of the more numerous farmers. One reason for the more outstanding accomplishments of technical development in the Taihang mountains was that at the same time that they organized specialists and technicians to go into the mountains for technical development, they also undertook all kinds of intellectual development, and in a planned way technically trained nearly a million farmers in the Taihang mountains, consequently effectively raising their technical quality and strengthening their capacities for processing and absorbing new technology. Through the reform of the science and technology system, the enthusiasm of scientists and technicians for catering to economic construction has been aroused. By then going on to create this sort of "everlasting" army of farmer technicians we can greatly hasten the pace at which science and technology is transferred, and can impel the shooting star of science and technology to quickly illuminate the mountain and village countrysides and promote further prosperity and development for the rural commodity economy.

12586

CSO: 4008/2055

NATIONAL DEVELOPMENTS

TECHNOLOGY-FIRST IMPORTATION PROMOTED

Fuzhou FUJIAN LUNTAN [FUJIAN FORUM] in Chinese 5 Jul 85 pp 13-16

[Article by Chen Jingcheng [7115 2529 4141]: "Problems in Technology Absorption"]

[Text] As the open door policy has become an accomplished fact, China's technology import has entered a new stage. In the 6-year period from 1979 through 1984, Fujian imported a total of \$490 million worth of technology and equipment using government foreign exchange and foreign capital (the actual amount of foreign capital used was \$168 million), and RMB funds for importing complete sets of equipment were approximately 2 billion yuan, equivalent to Fujian's investments in fixed assets in a year and a half. If we make good use of these imports, they will go a long way toward changing Fujian's backward look and enable us to quadruple our gross industrial and agricultural output value earlier than scheduled.

We import technology in order to absorb [xiaohua 3194 0553] foreign scientific and technological achievements and apply them to our modernization. But the absorption of advanced technology observes its own laws. Only by coming to grips with such laws, mapping out a correct strategy, and combining absorption with innovation can we truly spur modernization.

A. An Effective "Absorption" Policy Stems from an Effective "Import" Policy

The object of absorption is imported technology. To absorb the world's advanced technology in a systematic way, we should hammer out an effective strategy based on other countries' experience in technology absorption and tempered with China's own realities. Accordingly, we must begin by exploring the basic issue of what is an effective import policy.

What is technology import? This question has generated much controversy in China for many years. Internationally, "technology import" is known as "technology transfer." The draft text of the "International Technology Transfer Regulations," drawn up by the United Nations [UN] on 20 April 1981, defines "technology transfer" as the "transfer of the systematic knowledge of manufacturing a product, applying a process or providing a service, but does not include the simple buying, selling or leasing of goods." Therefore, technology import is not the buying or selling of conventional commodities or equipment, but is a form of trade in technical knowledge, or at least one

dominated by technical knowledge. (For instance, it includes the key equipment that accompanies technical licensing trade.) According to this guiding principle, technology import is the import of "software," or of "software" predominantly. In other words, it is dominated by intangible intellectual products, not tangible ones.

There are some who argue that the material embodiments of patented inventions or technologies--key equipment, testing methods, and even production lines--should also be included in the scope of technology import; that is, equipment purchases are also technology import and that technology import should not exclude the purchase of equipment. In the past, this view was the conventional wisdom in China. According to statistics, of the over \$10 billion worth of imports we have contracted for since the 1970's, plants accounted for 80 percent and single pieces of equipment 17 percent, while genuine technology imports only 3 percent. Plants made up 89 percent of imported technology and equipment in the 1950's, 90 percent in the 1960's, and were a high 95 percent in 1978-79. Of the 407 pieces of technology approved for import by Fujian Province in the 6 years from 1869 to 1984, only 3 were genuine technology imports, namely, Japan's piston ring technology imported by Nanping Automobile Assembly Plant; the Italian Lu-Que [phonetic] Co's patented technology and equipment for cephalosporin imported by Fuzhou Antibiotics Plant, and Zanussi Co's patented refrigeration technology and production lines imported by Zhangzhou General Machinery Co. With a total price tag of \$3,582,700, they represent 1.15 percent of total outlays for imported technology, or 27 percent if we include Xiamen's purchase of a production line from Kodak Co to make sensitive materials, a project which still awaits government approval. We are a laggard in the field of technology import compared to Shanghai. In recent years, about 70 percent of the technology imports of Shanghai's electrical machinery industry were predominantly "software."

Needless to say, there is a stage when it is imperative that we extensively import key equipment and production lines so as to speed up the modernization of fixed assets. The need is made particularly urgent by the disruption and destruction caused by the "Cultural Revolution." Our industrial equipment is suffering from severe wear and tear, has become obsolete and cannot do a good production job, so there is a dire need for new equipment to expand our reproduction capacity. If we fail to make use of favorable circumstances and import advanced equipment at the right time, but choose instead to make our own hardware after we have absorbed the imported technology, our rate of development may be affected. But we should see that this kind of import is an inferior form of import and strategically undesirable. We should outgrow this stage as soon as possible and import mostly technology instead of equipment for the following reasons:

1. That we import mostly technology is dictated by the need for China's science and technology to catch up with the world's explosive technological revolution. The UN definition of technology transfer is a crystallization of international experience. We should follow it in order to improve the standard of China's technological development and put our industrial development on a level where it can absorb and assimilate relatively advanced science and technology.

2. With our solid industrial base, we have an immense capacity for absorbing imported science and technology. Since the establishment of the People's Republic of China, both our industrial technology and material base have made much progress. We have millions of scientific researchers and engineering and technical personnel and 800 billion yuan worth of fixed assets. Our machine tools alone number 3 million. We still need to import a small number of sophisticated plants and numerous pieces of key equipment in the days ahead. But the most elementary stage when our technology imports were dominated by plants is over. Now we must leap through as soon as possible the intermediate stage during which we import mostly single pieces of machinery and key equipment and steadily enter the stage when we import mostly technology.

3. The import of "software" economizes on foreign exchange. The import of technology, equipment and production lines all costs huge sums of money and cannot go on for long, whereas the import of technology, that is, the import of design blueprints, technical data and patented and licensed technology, is much less expensive and we can use the foreign exchange thus saved to finance other developments. If too much foreign exchange is spent to purchase machinery, there will not be enough left to invest in the absorption of technology and technology import itself becomes less than totally useful. At present, our province's 200 scientific and technical research units are so acutely short of funds, particularly foreign exchange, that the import of prototypes and absorb technology is completely out of the question. Only with great difficulty can the most enterprising of them manage to raise some foreign exchange on their own to carry out technology absorption in a small way.

4. Avoid duplication and irrational import. By making technology and not equipment the bulk of our imports, we can absorb foreign technology piece by piece in a more systematic, goal-oriented way and promote the development of technology at home. But when we import mostly hardware, we tend to be unduly concerned with instant productivity gains. We tend to focus on what we can use right now and ignore actually making what we can use. Since whoever has foreign exchange can import equipment, the result is widespread duplication and irrational import. In the past few years, Fujian imported a total of 14 high-frequency vacuum canning production lines, over 100 injection molders, scores of knitting machines of all kinds, and dozens of freezers of various types. These imports have much to do with the double-digit growth rate of the province's gross industrial output value last year. But since most of these imports are hardware, not technology, the output growth rate cannot be sustained for long because it is not built upon the autonomous development of technology absorption and hence lacks staying power. An imported piece of technology has to be replaced when it wears out. Moreover, we even have to import spare parts.

We are not opposed to the import of key equipment or single pieces of machinery under certain circumstances. But we should regard such imports as commodities and not lump them together with technology imports. Only thus can we preserve the import of technology as a special area essential to achieving the four modernizations and apply special policies and management. Only thus can we catch up with and surpass international technological standards.

B. Stumbling Blocks to Technology Absorption

By clarifying the guiding principles for technology import, we have objectively set the strategic direction for the absorption of advanced technology. And the success and otherwise of absorption determines the outcome of technology import as a whole and plays an important part in the historic process of catching up with the world technologically. At present, however, there still exist in China many stumbling blocks to technology absorption.

First, we lack a clear and long-term industrial development strategy. Nor do we have a coordinated strategy linking together all sectors and all regions. Technology absorption is not an end in itself but should serve the needs of social production and consumption and depends on the development strategy of production and technology. As far as our province is concerned, we still do not have a clear industrial development strategy as yet and there is no consensus on which mainstay industries we should develop. Hence the high degree of irrationality with which we import, absorb and develop technology.

Moreover, the state does not have a sound and well-coordinated management system when it comes to importing technology. The state management currently in existence is generally confined to project examination and approval and becomes downright superficial in such important areas as absorption (How should a piece of technology be absorbed? By whom?) and popularization (refinement, innovation). We have an import plan, but no absorption plan. We emphasize the import of equipment and ignore that of technology. The scientific and technical development plans of the science and technology commission are divorced from the import plan of the economic and planning commissions. The science and technology commission has not been allowed to play its full managerial, guiding, and leadership roles in technology import. Today, many technology import departments have become in effect foreign material procurement departments, while overseas study missions have become mere buying missions.

Nor has there been a systematic effort to draw up laws to regulate technology import. In fact, legislation in this area lags badly behind other forms of economic legislation. Essentially a government management system in technology import has yet to take shape.

Third, we are seriously short of funds, materials and personnel to carry out technology absorption. One of our most glaring problems at the moment is that while we have the foreign exchange and funds to import technology, we do not have similar resources to absorb it. To develop technology, the Fujian Mechanics Research Institute has no choice but to pinch and save to come up with some foreign exchange on its own in order to absorb some of its less sophisticated imports. Enterprises are even less able to raise funds to absorb technology. Developed nations spare no money to invest in research and development [R&D]. Whatever they cannot absorb they will not import. In China, however, it is extremely difficult to raise funds for absorption. In Japan, 72 percent of R&D funds come from the private sector and only 28 percent are provided by the government. We are the first province in the country to put stress on intelligence. And technology absorption is an

important aspect of developing intelligence. As things now stand, the dire shortage of funds and foreign exchange for technology absorption is primarily caused by their misuse. We pay so much attention to import that we ignore assimilation. Some joint ventures spend foreign exchange importing such things as banisters, doorknobs, and screwdrivers. Others are even more irresponsible and insist that even their sofas, swivel chairs, and bedpans be foreign-made. Meanwhile scientific research and design departments are starved for funds, for artificial reasons and not because there is an actual shortage of money. As for materials and personnel, they are even more rarely made available to the assimilation departments.

There are other factors impeding technology absorption. For instance, the interflow of scientific and technical information is less than smooth; channels are few and access to data is limited. There is no guarantee for the material incentives of absorbing and popularizing imported technology. Also lacking is a scientific verification system for imported technology. And so on. All these problems must be solved urgently.

C. An Exploration of Technology Import and Absorption Policies

1. We must map out our technology development strategy and increase the contribution technology makes to national economic growth. In this way, the absorption of imported technology will play an effective role in promoting technology development. Statistically, the application of scientific and technical achievements accounts for 70 percent of the growth of the Soviet economy in the late 1970's. From 1965 through 1970, about 76 percent of the growth of the Japanese economy was fueled by technical innovations and the application of new technology. Science and technology are increasingly stimulating productivity. From 1979 through 1982, the contribution of technical progress to the growth of China's gross industrial output value was 26.8 percent. Since Fujian is relatively backward in science and technology and has less than 200 scientific and technical organizations, 40 percent fewer than Guangzhou, the contribution attributable to scientific progress is correspondingly lower than that in Guangzhou. Hence it is imperative that we take technology development even more seriously and strengthen the guidance and planning in technology absorption and increase investments in that area. We must fully understand that to bridge the economic gap, we must first narrow the scientific gap. We must be firmly resolved to change our former unworkable approach of solely relying on equipment and labor and discard our preoccupation with instant, short-term gains.

2. We must establish a technology import management system which revolves around absorption. To strengthen our leadership over technology import, we should set up a powerful and centralized national technology import agency to exercise leadership over the selection of technology for import and the planning of industrial technology development, coordinate between technology development and technology import, oversee the absorption, popularization and planning of imported technology, and draw up laws and policies to regulate the import of technology. In this way, we can put an end to the fragmentation characteristic of the way in which the government now manages imported technology. As far as project evaluation and assessment is concerned, the absorption plan of a piece of imported technology should be more strictly

examined before approval is granted so that whatever is imported can really be absorbed. Imported technology should be classified in accordance with a number of criteria and governed by different absorption plans. Specifically, an item which involves sophisticated technology, is expensive and must be marketed nationally, should be included in the state imported technology absorption plan. Alternatively, its absorption can be jointly undertaken by the central government and a province. If a province has the technical and financial capability to absorb and popularize a piece of technology, it should be allowed to do so. If an enterprise or a scientific research unit can absorb an item, it should be included in the enterprise's absorption plan. All these evaluation and classification procedures should be part and parcel of the examination-and-approval process so that import and absorption are integrated.

3. Economic mechanisms should be adopted to ensure successful absorption. The following preferential measures may be taken: (1) Import preference: Tariffs may be lowered on all equipment used in absorption, research and vocational training. Their tariff rates must be made lower than those on imported production equipment. (2) Product tax preference: Under the present system, an enterprise must pay taxes and repay loans before it can derive any benefit from technology absorption. It is proposed that within a specified number of years we waive or reduce the income taxes payable by an enterprise on the earnings derived from the sale of products resulting from the absorption of a piece of technology. This is designed to promote enterprise attention to and enthusiasm for technology absorption. (3) Funding preference. An allowance should be paid to an enterprise covering 50 percent of what it spends to import "software" and on related technological research. Moreover, there should be a 3-year accelerated depreciation for research equipment. There should also be preferential interest rates for loans to enterprises which carry out their own absorption. (4) Preference for absorption achievements: Such achievements should be treated in the same way as scientific research achievements and made eligible for material rewards. (5) The absorption achievements of a scientific research unit or enterprise are converted into products by manufacturing units. If the scientific research unit has raised its own funds, it should be reimbursed by the department that applies the achievement.

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CSO: 4006/140

NATIONAL DEVELOPMENTS

NEW COMPANY FOR RISK VENTURE INVESTMENT GOES INTO OPERATION

Tianjin JISHU SHICHANG BAO in Chinese 14 Jan 86 p 1

[Text] On 11 January the China Association of Economic News Reporters held a press conference to announce that the China New Technology Venture Investment Company has been formally opened. This is the first national financial enterprise in China to deal exclusively with new technology risk venture investment. It was formally established 28 December 1985 with approval from the State Council by registering at the State Office of Industrial and Commercial Management.

The China New Technology Venture Investment Company is a socialist nationally owned limited-liability company. Its primary goal is that by engaging in new technology venture investment of various forms new technical achievements can achieve higher application standards, which will allow them to shift toward industrial production more numerously and more quickly, to construct final products with a commercial future, and consequently to gain economic results. The primary objects of investment are those small and medium-sized enterprises engaged in technical transformation and developing applications for new technologies that cannot easily obtain funds through existing investment channels. Its fields of investment will concentrate on developing products for information, biology, electronics, new materials, and other new technologies and applications.

At the news conference, the Minister in Charge of the State Science and Technology Commission, Song Jian, said that this company was established with the support of leaders in the State Council and with the approval of the State Council. He also said that risk venture investment is an important channel for accelerating the commercialization of scientific and technical products. It will use a very limited amount of money to change new technologies into industrial products, and that it is an incubator for new technology. The New Technology Risk Venture Investment Company is a guide for developing rising new industries, and is a bridge by which new technologies get to enterprises.

12586

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NATIONAL DEVELOPMENTS

SHANGHAI TALENT BANK AIDS S&T PERSONNEL MOBILITY

Beijing RENMIN RIBAO in Chinese 19 Jan 86 p 3

[Article by Xiao Guan [5135 7070]: "Shanghai Talent Bank Helps in the Rational Mobility of More Than 500 Scientists and Technicians"]

[Text] The nearly 1-year old Shanghai Science and Technology Talent Development Bank has achieved pleasant results in the aspect of exploring a reform of the personnel system. They have helped in the rational mobility of 507 scientists and technicians, finding work in their specialties; they have held more than 50 training classes, allowing more than 2,000 operations management personnel to receive specialist training.

On 26 January 1985, the first talent bank in this country: the Shanghai Science and Technology Development Bank, was formally established. For the past year, with the ardent help of administrative personnel the majority of the scientists and technicians who were being rationally moved about found positions that could better use their talent, and have been quite satisfied. Based on a comparative survey by the talent bank of 230 scientists and technicians, where 45 percent were formerly engaged in work related to their specialties or fundamentally so, now 92 percent are so engaged; where 35 percent were formerly able to basically fulfill their functions, now 86 percent can; where formerly 41 percent were happy at what they were doing, now 91 percent are. A comrade at the talent bank said, "We are serving scientists and technicians. Our greatest joy is when scientists and technicians can do their utmost for the four modernizations."

The Shanghai talent bank uses abundant data on talent to arrange for scientists and technicians to serve the needs of all aspects of society. They have successively held more than 50 training classes in enterprise management, economic contracts, science and technology contracts, and finance and taxation laws, which have taught specialist knowledge to more than 2,000 scientists, technicians, and management personnel, and which have generated excellent social and economic results. Of more than 1,200 scientists, technicians, and management personnel participating in training in economic contract law, more than 90 percent received the "legal person certificate of commission" as issued by industrial, commercial, and administrative departments.

It is worth pointing out that the Shanghai Science and Technology Talent Development Bank has achieved these results in its initial stage, but that this has not improved its sorry situation. There are currently many difficulties for the talent bank, which urgently hopes to obtain the concern and support of relevant departments to allow this new entity that has appeared during the restructuring to grow and mature.

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CSO: 4008/2055

NATIONAL DEVELOPMENTS

INTERVIEW WITH LIN ZONGTANG ON PERMANENT TECHNOLOGY MARKETS

Tianjin JISHU SHICHANG BAO in Chinese 24 Dec 85 pp 1, 2

[Text] It was recently pointed out by the State Economic Commission that we would be strengthening work in the technology markets throughout the economic system, so reporters from this paper interviewed Lin Zongtang [2651 1350 2768], deputy director of the State Economic Commission, regarding questions of how to run permanent economic and technology markets.

Question: Why must the economic commission system thoroughly intensify consciousness of "dependence" and strive to pay close attention to the construction of technology markets in the permanent economy?

Answer: In order to solidify and develop the largely good situation in which China now finds itself, and to even better guarantee the vigor and prosperity of our economy in the 1990's, the party Central Committee has demanded that we enthusiastically enter into the great actuality of the Seventh 5-year Plan in the spirit of revolutionary innovation and developing progress, and that we solve three problems with all the diligence we can muster. The first is to further adjust industrial structures to meet the requirements of the modernization of the national economy and to be appropriate to improvements in the level of the people's expenditures and changes in the structures of expenditures; the second is to change resolutely the focus of construction completely over to the technical transformation and renovation of existing enterprises, and the extension thereof, and to take the path of extended reproduction with an internal focus; third is to handle properly relations between areas in the development of the economy, and to urge forward the rationalization of regional economic distribution. Only if at the same time as we continue to improve enterprise economic results we seriously resolve these overall problems can we then raise labor productivity and overall economic results for all of society.

To realize the tasks mentioned above, we must diligently intensify the absorption of technology by enterprises and their capacities for development, and further implement the principle formulated by the party Central Committee and State Council that "economic construction must rely upon science and technology, and science and technology must cater to economic construction." If our economic commission system is to intensify the capacity for technical development in our enterprises, it must exert a great deal of effort on the

"reliance" aspect, for each enterprise must intensify its consciousness of "reliance." If enterprises do not "rely upon" science and technology, there will be no market for technical commodities. Where technology is a commodity is chiefly where it is sold to enterprises. The development of technology markets ought to proceed from the needs of buyers and serve the technical advancement of enterprises. Enterprises throughout the country are governed by the economic commission system, as we best understand the development and needs of enterprises. Because of this, we ought to be one of the prime organizers of technology markets.

Comrade Deng Xiaoping has said that the task of the restructuring of our economic system is to better resolve the problems of the integration of science and technology with the economy, and a new economic system and science and technology system should be beneficial to economic development, as well as to technical advancement. Comrade Deng Xiaoping has also said that what most concerns him is the respect of knowledge and of talent. As soon as the value of knowledge is recognized by society, there will be positions for intellectuals. If the value of technical achievements is not realized, respect for knowledge and talent will be just empty words. We ought to allow the great majority of scientific and technical achievements to become commodities. We will allow scientists and technicians to serve all of society, we will break up all sorts of restraints, and will open up the technology markets.

Comrade Zhao Ziyang has also said that restructuring will begin from the commercialization of technology, and we will take the opening of technology markets and the implementation of technology commercialization as points at which to make breakthroughs. Technical commodities should be allowed to sell well. When technology is worth money, the value created by the technology is worth more, so benefits to scientists and technicians are greater and they will pay greater attention to the transfer of rights to technical achievements.

Therefore, technology markets are the bridges and links in the circulation of technical commodities, and they serve as mutual channels for research and production, as well as to join them closely. To give full play to this function, we not only will arrange various special technology trade fairs, but more importantly in a practical way will arrange for permanent economic and technical markets to give our technical trade activities a regular and particular arena for activity. Currently, local technology dissemination and exchange sites, some industrial exhibition centers, and conservation technology service centers, under the direction of local economic commissions, are just now shifting the focus of their work onto the track of opening up permanent economic and technology markets, which has great foresight.

Technology trade is an operations activity that is complicated and highly technical. The production of technical commodities primarily depends upon people's intellectual efforts, and certification of technical products must always pass through the appraisal of applications; expenses (applications) for technical commodities must also be accompanied by corresponding technical service. Therefore, this even more urgently requires construction of

permanent economic and technical markets to stimulate the regular development of technology trade.

At the same time, permanent technology markets are a permanent structure that place a high degree of responsibility on the buyers and sellers. Only with them can a high degree of trust be established for the technology markets, from which we can go on to set up gradually a highly efficient, multi-functional technology market system. This kind of highly efficient, multi-functional technology market system is intimately related to national, group, and individual technology market systems. Without a large group of permanent technology markets at its core, our technology trade could not possibly develop fully, and it would be difficult to set up a complete set of market laws. Nor could we motivate technical advancement through market organizations, intensifying the capacity of enterprises to develop technically.

Doing a good job with permanent economic and technology markets is also a way to transfer foreign technology into this country and to shift coastal technologies inland, urban technologies to the countryside, and military industry technologies to the needs of civilians. Especially in the case of transferring military industry technology to civilian use, when local areas are setting up economic and technology markets, they should make good use of the power of military industrial technology to allow them even greater opportunities to develop the superiorities of their technology. Comrade Zhao Ziyang has paid much attention to this point. Comrade Deng Xiaoping has also mentioned that military industry departments have much cutting edge technology of great potential, and many of the finest college graduates and graduate students have entered the military industry system. At present military tasking is slight, but a great deal of the capacity is bound up. Because of this, an important strategic national principle is how to transfer this abundant technical capacity into civilian production to serve the four modernizations. However, how to do this is a very big question. Certain technologies would not need to be purchased abroad, for they are in our military industry departments. For example, the question of hermetically sealing in civilian production has not been up to standard, there is leakage of oil, water, and air, but the problem has long been solved in the military industry. In the past, these channels have not been open, and everything had to be imported from abroad. We hope that through the use of the technology markets we can once and for all transfer military industrial technology into civilian production. We will cooperate with all areas to manage permanent economic and technology markets and to make contributions to the enhancement of the capacities for technology absorption and development by hundreds of thousands of enterprises.

Setting up permanent economic and technology markets will make it even easier to develop technology trade both at home and abroad, and will strengthen the capacity of enterprises to develop technology. The capacity of enterprises for technical development and the capacity to absorb both foreign and domestic advanced technical achievements are complementary. When the capacity of an enterprise for technical development has been strengthened, its capacity for absorbing technology will also be enhanced. And conversely, as more advanced technology is absorbed, its capacity for development is necessarily greater.

Only when enterprise development capacity is enhanced and the capacity for absorption is strengthened can scientific and technical achievements be more quickly transformed into social production forces. Therefore, actively establishing and managing permanent economic and technology markets is an urgent task facing us in the new "Seventh 5-year Plan" construction period. We will cooperate closely with the National Science Commission, and for everything that is to be particularly emphasized we will jointly work at the technology markets. We hope that local economic commissions will diligently study the directions of leading comrades in the Central Committee to do a particularly good job at building the permanent economic and technology markets. Those that have already been set up should be strengthened, and those not yet established should be done so with great care. We should be like those economic commissions in Liaoning Province and the cities of Wuhan and Anshan, which have actively created the right conditions, have resolutely adopted measures, and have paid close attention to opportunities to establish carefully many permanent economic and technology markets.

Question: What are your feelings about the current situation regarding China's technology markets?

Answer: China's activities in technology trade began in 1979. Our technology markets are currently flourishing, and technology trade activities have already begun in 29 provinces, autonomous regions, and cities directly under the Central Government, and some prefectures have set up technology trade structures or organizations. After a succession of permanent technology markets in Hubei, Tianjin, Beijing, Liaoning, Yunnan, and Jiangsu, they are now being set up in all major cities throughout the country. All relevant departments of the central authorities have begun to set up bureaus, sections, or offices for the exclusive management of work on technology markets, generally having had no one in charge of this work.

To coordinate the development of work on our technology markets and to make technology trade prosper, a National Technology Market Coordinating Team was set up with the approval of the State Council in March 1985. China's technology markets and technology trade activities have gone from nothing to what they are today, from small to large, and into all aspects of technical and production fields to become important components of socialist commodity markets. They have also played increasingly important roles in our socialist economic construction. Based on incomplete statistics for the last 2 years, there have been 56,000 deals reached through contracts for a total value of 3.2 billion yuan. Two technology achievement trade fairs, for example, have been held by the Nei Monggol economic commission, which has also formulated "Methods for Subsidizing Technology Achievement Business Projects." The second trade fair has just been concluded, where the rights to more than 400 technical achievements have been recommended for transfer, and where there were more than 400 difficult problems put up for bid. The trade fair was only 20 days in length, but 341 contractual deals were made, some 85 percent of technology projects the rights to which were on the market. Contracted deals were worth 15,340 yuan for a predicted output value that could reach 150 million yuan with an income from taxation of 50 million yuan.

As the technology markets develop, the pace at which technical achievements are transformed into production forces will quicken. Through technology business, the Hubei provincial economic commission has raised the achievement application rate from 20 percent in 1980 to 60 percent in 1984. The rate of transfer rights for achievements in Shanghai in past years has been only from 20 to 30 percent, but with the development of technology markets, among the 1,558 achievements developed by the Shanghai municipal economic commission system, 834 went into production, or 52.6 percent. The potential for Shanghai is very great, and much more can be done.

Actual practice over the last few years has shown that technology markets are a product of restructuring, that they are a creation of the public, and are a vital force. Overall, the commercialization of technology has created the conditions for the resolution of the "two different entities" problem concerning scientific research and production, and the development of technology markets has opened up new resources for research funds for research units. It has created conditions for the reform of science research planning and of the science research funds management system. It has opened up new avenues for the quicker absorption and commercialization of imported technology, and has promoted hierarchical, multi-channel, and multi-format large scale transfer, large scale dissemination, and large scale improvement of China's modernized technology markets. It can be predicted that this kind of transfer and dissemination will have extremely important and far reaching significance for improving the overall picture of China's work and for eliminating gaps between urban and rural areas.

The commercialization of technical achievements and the opening up of technology markets are requirements of the restructuring of China's economic system, the restructuring of the science and technology system, and the restructuring of the educational system, and are requirements for strengthening the capacities of enterprises to develop technology, for propelling advances in enterprise technology, and for promoting this country's technology and industrial revolutions. They are a necessary product of the development of China's socialist commodity economy, and we cannot regard them as unimportant. However, for various reasons there are still some problems at present as our economic commission system opens up the technology markets. First of all, regarding the opening up of these new things that are technology markets, there are differences in the way different provinces and cities understand it, and there has been too little respect for it. Consequently, the development of technology markets has been insufficiently even, some have already been set up, others are just now in the process, and the activities of others have been very slow. The degree to which attention is paid large scale enterprise technology markets has not been as good as that to small and medium-sized enterprises and town and township enterprises. The understanding of "reliance" by small enterprises and town and township enterprises has been extremely strong, an aspect in which large enterprises have not matched the small to medium-sized enterprises. Medium-sized enterprises have not been as good as small ones, and small ones have not been as good as town and township enterprises. Comrade Zhao Ziyang already predicted this when he discussed technology markets, and it is natural.

Question: How do you feel about the problems that have appeared in current technology trade?

Answer: Technology markets are still in their initial stages, and the first national trade fair for technical achievements pushed them forward somewhat. Local economic commissions have begun to set them up in succession, and they will be constantly strengthened and perfected and constantly improved. There will be a process that has gone from nothing to something, from the small to the large, from low levels to higher levels, and from the simple to the accomplished. As I understand it, there are currently two problems with the technology markets: one is that business in the technology markets of some major cities has been rather bleak, not particularly prosperous; second, there has been a certain amount of fraud at trade fairs, where enterprises have been deceived. For example, one alkali plant in Tianjin invited a middle school teacher who had evaded family planning to do technical guidance. They bought 74 tons of alkaline earth that had only 20 percent alkaline content, which is quite low, the usual content being 80 percent and above. They worked at it a long time but could not make much of it, then the teacher ran away with 600 yuan. Later, they asked another person, this time from Shandong, to help. This person wanted 140,000 yuan in fees for transfer rights, but once again the money ended up in the hands of a swindler. Several times the plant sent people to press matters, but they ended up out more than 1,000 yuan in travel expenses. Later, the courts caught up with this swindler, but only 70,000 yuan was recovered. At present, the plant is refining 88 tons of pure alkali at a cost of 1,120 yuan per ton but with a market value of only 480 yuan. They have lost 640 yuan with every ton they sold, so there is nothing but to close the plant. There have been similar occurrences elsewhere that have harmed farmers, enterprises, and the state. The problem is serious, but technology markets are a new thing, and it is not so strange that problems would arise in its initial stages. We need to pay attention to research and provide more guidance.

The party group of the State Economic Commission has been quite mindful of opening up economic and technology markets. To this end, the state economic commission has established management structures for the technology markets, and has as well set up State Economic Commission economic and technology market development centers. The State Economic Commission has also issued special documents requiring that leaders of economic commissions at each level be certain to pay close attention to work on technology markets. Following upon that, we then convened the Guiyang conference with the participation of seven provinces and municipalities to focus research and discussion on the problems of strengthening permanent economic and technology markets. In the middle of October, all provinces, municipalities, and autonomous regions divided into six small groups in which they studied the problems of creating a new aspect for economic and technology markets and of establishing permanent economic and technology markets. Through work like this, everyone's awareness will be heightened, directions will be made clear, and confidence will be confirmed. Overall, there is already a good momentum going for the building of permanent economic and technical markets everywhere.

Question: What are the primary tasks of economic and technology markets? How can their management be improved and enhanced?

Answer: The questions regarding the mission of opening up permanent economic and technology markets and of establishing technology markets that have Chinese characteristics were dealt with at the national economic system and technology market working conference called recently by the State Economic Commission on behalf of the State Council when the comrades were discussing the fourth draft of the "Provisional Resolution Regarding the Fostering of Technology Markets" and the "Trial Methods for Management of National Economic and Technology Markets (draft)," so I will not say more here. The mission of opening up technology markets was written of this way in the "Provisional Resolution Regarding the Fostering of Technology Markets" as drafted by the State Economic Commission, that we would, one, foster the production of technical products; two, arrange for the circulation of technical commodities; three, monitor the expenses for technical commodities; four, do well at follow-up technical servicing. Everyone is still discussing and studying these problems.

As for the question of improving and enhancing the management of technology markets, we should not be panic stricken by the problems that have appeared as we have advanced, but neither should we let things go unchecked, nor lower our guard, allowing small problems to develop. On this point I would like to remind everyone that close attention should be paid to unfortunate things occurring in the technology markets that harm enterprises, the state, and the people, and these things should not be allowed to points of no return. There are certain problems occurring just now to which we must pay close attention and for which we should provide guidance. In regard to this, I have the following few ideas:

One is that we should correct our thinking. What we are working on are socialist technology markets, not capitalism. Fraud, swindling factories, and covetousness of money are not socialist, but are capitalist practices. We definitely cannot allow these harmful things to exist, for we serve enterprises and customers wholeheartedly, and do not seek any way to harm enterprises and customers; we are working toward modernization, not to earning money. Therefore, we must earnestly correct our guiding ideology and oppose ideologies that are "anything to earn money." Two, technical commodities must pass appraisal, testing, and verification, and everyone should be requested to think of ways to do that. Three, permanent technology markets must be registered. Four, sign contracts and fulfill responsibilities to them. Five, pay attention to follow-up service, and be fully responsible after technology has been transferred, all the way until transformed into production forces. Six, losses should be compensated for that which cannot be transformed into production forces, which should be written clearly into contracts. For cases of fraud, economic criminal offenses should be punished with strong measures and seriously. I recommend that local economic commissions handle a few of these cases as models, and any communist party member involved should be expelled from the party. Seven, we should pay close attention to the exchange of technical information and allow publications to fulfill their functions. To open up technology markets we must first deal with technical information. The Anhui provincial economic commission has published a publication called

"Complete Technology Products," which has information on more than 5,000 technical products, and is very good. The TECHNOLOGY MARKET WEEKLY has made great contributions over the last 5 years to publicizing the commercialization of technology. To enhance work in these aspects, the State Science and Technology Commission, the State Economic Commission, and the National Defense Science, Technology, and Industry Commission have jointly issued communications determining that TECHNOLOGY MARKET WEEKLY be made a national newspaper to better serve the opening up of national technology markets. As I said at the 4th Conference for Communications Personnel, I hope that local economic commissions will fully utilize and actively subscribe to the TECHNOLOGY MARKET WEEKLY. I hope as well that TECHNOLOGY MARKET WEEKLY will begin special columns on economic and technology markets, and will take note of and disseminate information that improves the capacity for exports and the earning of foreign exchange.

To improve and enhance the management of technology markets, everyone at the National Economic System and Technology Market working conference convened recently by the State Economic Commission improved and unified our understanding through study of the two "Resolutions" of the Central Committee, "Suggestions for the Seventh 5-year Plan," and the "Provisional Resolution by the State Council Regarding the Transfer of Rights to Technology," as well as through discussion and revision of the "Provisional Resolution Regarding the Fostering of Technology Markets" and the "Trial Methods for Management of National Economic and Technology Markets." We want to establish quickly an economic and technology market network system. It is just as we said, that we will pay close attention to the construction of permanent economic and technology markets in a way that does not miss out on opportunities. We ought to remember those two statements by Comrade Hu Yaobang, "motivate a mighty force to climb the mountains to pick peaches" and "join together in struggle before making overall plans."

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NATIONAL DEVELOPMENTS

TECHNOLOGY TRANSFORMS TAIHANG MOUNTAIN POVERTY AREAS

Beijing GUANGMING RIBAO in Chinese 9 Jan 86 p 1

[Article by Xu Jiuwu [1776 0046 2976] and Zhao Guangjun [6392 1639 0193]: "Science Commission of Hebei Province Organizes More Than 700 Scientists and Technicians Bound for the Taihang Mountains"]

[Text] Since winter, the people in the nearly 700 km Taihang mountain area have had the joy of a bountiful harvest. A total of 77 professors and lecturers from Hebei Agricultural College joined with more than 600 specialists and technicians from 25 counties in 7 prefectures and cities to make science and technology available to the many people there, fighting a fine battle to turn poverty into riches. Since its initial steps in 1982, this Taihang mountains technical development project organized and implemented by the Hebei provincial science commission has fully completed the tasks set for it by the National Science Commission. From it, the more than 7 million yuan investment has returned economic results of more than 300 million yuan, and has made the per capita income of the 8 million mountain residents to jump from 75 to more than 300 yuan.

In 1982, faced with the poverty and tragedies of the inhabitants of the Taihang mountains, the Hebei provincial science commission, basing itself on the experiences of the experimental station at Yangguzhuang, proposed making breakthroughs in the quantities of dried and fresh fruit production and in developing small domestic livestock (poultry), selecting 10 projects, among which were walnuts, Chinese chestnuts, persimmon, large jujube, domestic rabbit, and chickens. They proposed also to broaden applications of technology and help inhabitants of the mountainous area to turn poverty to riches. At first, professors from Hebei Agricultural College held training classes in "the home of the red date"-- Zanhuang and Fuping counties, guiding jujube pruning, and making available bumper crop techniques like insect eradication and disease prevention. Some of the cadres and people of the area shook their heads and said, "The insects mature in the date, so there's no use using insecticides." But by the end of autumn, wherever the trees had been scientifically managed red dates filled the branches, there were no insects nor disease, and yields were 3 and 4 times greater than average. The farmers were convinced and said that the orchards in the mountains had all become "money trees," and that the agricultural college professor's methods were truly effective. Spurred on by the experimental station, the Taihang

mountainous region disseminated 17 sets of appropriate technologies, which quickly resulted in a flourishing scene with pens full of chickens and rabbits and prosperous orchards. Over the last 4 years, the dried and fresh fruit production increased by more than 600 million jin, and domestic livestock (poultry) increased by more than 50 million head.

Science and technology have brought a new vigor to the mountain economy, and the natural resources of the Taihang mountain region quickly recovered and developed, which has created the conditions for the rise of industries. To meet the needs of production development, Hebei Province has set up more projects in development centers for the processing, storage, preservation, and decay prevention of agricultural, forestry, and animal husbandry products. Topics for experiment have been raised from 10 to 30, and experimental bases have been increased from 59 to 130, and demonstration areas have been expanded to include 5,000 mountain villages. All of this has promoted advances in the technology for processing and production, as well as the development of science research model industries. It has also greatly quickened the pace at which natural resource advantages transform into commercial advantages. Twenty different kinds of central experimental factories and a whole string of more than 20,000 vendors of science research, production, and marketing have appeared in the Taihang mountain region. Some 500,000 people are engaged in business, with an output value of nearly 500 million yuan. The lofty Taihang has the first generation of an agricultural industrial contingent that has left the soil but not the village.

Technical exploitation in the Taihang mountain range is a systematic process that is multi-discipline, multi-departmental, and multi-professional. To enhance the organization and coordination of this process, Hebei Province has organized a strong guidance system run by a deputy governor, who has transferred 8 deputy commissioners, 30 deputy county magistrates, and more than 100 basic level cadres. They are using intellectual development to set in motion technical development, they have undertaken large scale technical training of nearly 1 million farmers, and more than 700 specialists and technicians have joined with innumerable farmer technicians and a myriad of science and technology demonstration households to hasten greatly the progress of technical development.

"For Hebei to stand up on its own, we will probably have to rely on Taihang Shan." This prediction was made by Comrade Hu Yaobang during an inspection of Hebei in 1981, and has now been transformed into specific action by the people of Hebei. The "technical development and research in the Taihang mountain region" has been evaluated highly by leading comrades in the National Science Commission, and this project has already been listed among the "most urgent plans" in the "Seventh 5-year Plan."

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NATIONAL DEVELOPMENTS

TECHNOLOGY MARKETS FLOURISH IN HEBEI

Tianjin JISHU SHICHANG BAO in Chinese 14 Jan 86 p 1

[Article by Bo Mu [2672 2606]: "Vital Signs Good for Hebei Technology Markets"]

[Text] At present, there are already 88 permanent technology markets in Hebei Province, with 2,580 people working in them. There have been 4,166 achievements that have been implemented, disseminated, or transferred by virtue of these markets, 5,405 various kinds of technical personnel have found employment or been introduced, 1,184 research and production integrated bodies have been established, 1,060 new products have gone into production, and about 190 million yuan in economic results have been generated.

A broad look at the abrupt development of the Hebei technology markets provides the following five characteristics: 1. That the initial scope of the technology markets is multi-level and multi-format. Based on scientific and technical service centers of all levels, they are hierarchical technology markets composed of scientific and technical specialist structures from colleges and universities, research institutes, scientific and technical service structures from military industry units, civilian research institutes, and all mines and factories, as well as of scientific and technical consulting structures from science association units. And there are also technology markets of multiple formats that are permanent, mobile, and "covered wagons" of scientific and technical information. 2. Technology markets at all levels persist in the direction of serving the economy. Centering on the planning and policy making of the local government, the primary objects of their service are town and township enterprises and small and medium-sized enterprises. 3. After the financial circles entered the technology markets, a continuous line was formed from the transfer of rights to loans to service. At the time of the first national technical achievements trade fair, the provincial Bank of Industry and Commerce produced 5 million yuan in loans, and recently at the third technical achievements trade fair, the Bank of Industry and Commerce and the Bank of Agriculture produced more than 10 million yuan in loans, so they have actively supported activities at the trade fair, and have thereby ensured a certain vitality in technology markets of all levels. 4. The scope of service at technology markets has gradually expanded, and formats have tended to be livelier and more varied. Things like the dissemination and transfer of technical achievements, the broadcast and distribution of

scientific and technical information, consulting and exchanges by scientific and technical talent, the development and importation of technology, the mediation and organization of research and production integrated bodies, the advanced studies and training for various sorts of technicians, as well as the importation of foreign scientific and technical achievements have all become part of the market operations and service. 5. Enhancing management of the technology markets, issuing trial methods of compensated transfer of the rights to technology and provisional methods for management of technology markets, persistently implementing the principles of "openness, invigoration, fostering, and guidance," and a sense of the informal and practical have all made contributions toward vigorously promoting the economy of Hebei Province.

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NATIONAL DEVELOPMENTS

TIANJIN TECHNOLOGY TRANSFORMATION EFFORTS DESCRIBED

Tianjin JISHU SHICHANG BAO in Chinese 24 Dec 85 p 1

[Text] According to a recent dispatch from comrades in charge of the Tianjin Office of Technology Transformation, since last year Tianjin has strengthened its overall and unified leadership in technology transformation, and has actively given play to the roles of organizations at all levels and to relevant service departments. Major technology transformation projects have implemented the "three guarantees," technology transformation work has had outstanding results, and technology transformation projects listed as major ones by the municipal technology transformation leading team have progressed rapidly. Of 44 major projects in 1984, 28 were completed in that year or were finished for the most part; of the 48 major projects in 1985 (including 16 brought over from the previous year), 32 were expected to be completed or nearly so by this year. Overall investment for 76 projects was more than 2 billion yuan with an area involved in civil engineering of more than 1.34 million square meters, and 60 of those projects that are complete or nearly so have had an investment of 1.16 billion and a civil engineering work area of 840,000 square meters. Construction of these 60 projects has played an important part in hastening the pace of technical progress in Tianjin, in changing commodity structures throughout the city, in improving the level of domestic supply for major commodities, in upgrading commodities, and in improving economic results and social results. After these 60 projects have reached their full designed capacities, it is estimated that they can increase output value by 2.2 billion yuan; tax revenue will increase by 740 million yuan.

That Tianjin has enhanced its overall and unified leadership during technology transformation is also evident in the fact that the city has uniformly worked out accounting for major projects. For major projects in planning that have not been adversely affected by projects outside of planning, all organizations from municipal to basic levels focus their efforts on major projects; also, the "three guarantees" are implemented for major projects, namely, any project included among municipal major technology transformation projects must guarantee construction, guarantee the provision of materials, and guarantee that funds will be used. It is also required that major projects be completed within a certain time, that methods be adopted to control tightly activities involving "connections" and the reversing of the arrangement of time limits, where first of all a time limit is determined, and then based on the

requirements of the time limit the time for handing over the completed project is fixed, as are the times for design and production of blueprints, and the construction capabilities are arranged based on the requirements of the project time. The planning departments have established a major products reception day system, whereby the relevant documents for major design projects are "circulated on a priority basis," generally within 1 day, where construction comes first and is followed by the paperwork, and design departments give preference to design of major projects. Because 'fast' is often connected with major technology transformation projects, the time for recovery of investment is reduced. The Zhenhua Weaving and Dyeing Plant invested more than 100 million yuan and formally began construction in 1984, the project being finished in 1985. Construction took 2 years, and the investment was recovered in 5 years. By reducing the construction period by 1 year a savings of 10 million yuan was realized, annual tax revenue is figured to have increased by 30 million yuan, and over 3 years the savings in expenditures and increase in revenue will be 120 million yuan. In selecting major projects, Tianjin has most remarkably paid attention to major professions, major enterprises, and major commodities. Among major professions, they have paid close attention to enterprises that will lead the way for others. Through the transformation of major enterprises, the technology level of all enterprises will be improved.

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NATIONAL DEVELOPMENTS

EFFECTS OF PATENT LAWS REVIEWED

Tianjin JISHU SHICHANG BAO in Chinese 24 Dec 85 p 3

[Article by Li Fuying [2621 1381 5391]: "A Look at China's Implementation of Patent Law"]

[Text] Since China's patent laws were put into effect beginning in April of this year, they have elicited strong reactions from both at home and abroad. Domestically, they have broadly aroused the enthusiasm of a great number of inventors to engage in inventive creativity; internationally, they have won a reputation in both developed and developing nations, and altogether more than 30 countries have applied for patents in China. By 14 December, the number of applications accepted by the China Patent Office for invention patents, new utilizations patents, and industrial design patents had already reached 13,573, with about 40 to 50 applications added every day. It is estimated that by year's end [1985] they will exceed 14,000.

A structural analysis of the number of patent applications shows that among the 13,573 applications handled, 59.9 percent were invention patents, 3,915 being domestic and 4,217 being foreign; 35.7 percent were for new utilizations, 4,754 being domestic and 87 foreign; 4.4 percent were for industrial design, 244 of which were domestic and 356 foreign. One can see that foreign applications for invention patents and industrial design patents exceed those from this country, while applications for new utilizations patents were fewer. This is possibly because the situation regarding China's new use patents is not sufficiently understood abroad. Because new utilizations patents in West Germany have been very attractive internationally, the methods for China's new utilizations patents are fundamentally the same as in West Germany, and are characterized by quick approval and simple procedures.

Among the patent applications described above, 8,378 were for job related inventions, of which 4,129 were domestic and 4,249 were foreign; 5,195 were for non-job related inventions, of which 4,784 were domestic and 411 were foreign. That is, while patent applications for domestic non-job related inventions were greater than patent applications for job-related inventions, foreign applications were just the opposite. This shows that applications for patents by individual inventors in China is the more active, and that unit enthusiasm is insufficient. Among units, the number of applications by high

level colleges and institutions is greater, by research institutions is less than that, and by industrial enterprises the least.

For the hundreds of thousands of industrial enterprises in this country, one reason that enthusiasm for applying for patents has not been well aroused is that publicity regarding patent law has not been widespread and thorough and has thus not attracted the respect of enterprise leaders; another reason is that currently many enterprises have not changed direction from production models to exploitative models, and they have not yet put technical competition onto their agendas. From now on, the problem of how to integrate closely the patent system with invigoration of the enterprise economy must be better resolved from theory through practice.

Among the 4,660 applications for patents from abroad, the majority of applications are from developed countries, there being 3,989 from the seven countries of Japan, the United States, West Germany, Holland, England, Switzerland, and France. This shows that the generally good trends in China's politics and economy and our expansive technology markets have a strong attraction for foreign countries; our open door policy has created the conditions for the introduction of foreign advanced equipment. At present, foreigners coming to China to apply for patents is still an exploratory thing, and some are still watching from afar, still hesitant. If our patent investigation work is reasonable and there are conscientious protections for the patent rights of foreign applicants, then the number of those coming to China from abroad to apply for patents will continue to increase.

Looking at the distribution of domestic patent applications, and with the exception of Xizang, there have been patent applications from each province, autonomous region, and municipality. Generally speaking, these basically reflect differences in levels of scientific and technical development and in industrial and economic bases. But this is not completely so. Patent work in Hunan Province has progressed very quickly because primary leaders in the province have paid personal attention to applications and to implementation. They have had 563 patent applications, fifth within the country, and above Tianjin, Shandong, Sichuan, Heilongjiang, and Zhejiang. To implement major projects regarding applying for patents, primary leaders in Hunan Province have taken leaders from the provincial planning commission, science commission, and economic commission to on-site offices, and have provided support for expenses. The number of patent applications from Beijing Municipality continues to rank first, having 16.6 percent (1,480) of the domestic 8,913 applications, while the industrial base of Beijing Municipality and the level of its scientific and technical development are not necessarily stronger than those of Shanghai; Shanghai had 780 applications, in second place. Shanxi has a certain industrial base and its standard of scientific and technical development is not low, but it has very few applications, only 134, and ranks 19th behind Henan, Guangdong, Hebei, Jiangxi, and Guangxi. We can see from the situation above that whether leaders from all places have respected patent work is the determining condition for whether patent work can be opened up.

We can see from the first announced group of patented projects that the implementation rate for projects is rather high, and that economic results

have been rather remarkable. Based on statistics, 65 of the first group published were new utilizations patent projects and had an implementation rate of 68 percent; among them, seven had great technical breakthroughs with economic results of more than 1 million yuan, and there were 11 where economic results exceeded 100,000 yuan. For this reason, continued vigorous publicizing of patent law, and especially for arousing the enthusiasm of industrial enterprises in applying for patents, and urging provincial and municipal leaders to pay personal attention to patent work will allow patent laws to be better implemented, and this is the work to which we should now pay close attention.

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NATIONAL DEVELOPMENTS

SHANGHAI SUBMITS 750 PATENT APPLICATIONS

Shanghai JIEFANG RIBAO in Chinese 29 Dec 85 p 1

[Article: "Shanghai Submits 750 Patent Applications"]

[Text] This year the Shanghai area made a start in forming a patent activities system consisting of patent management, patent representation and patent documentation functions. From the publication of the patent law in April until this November, Shanghai submitted a total of 750 patent applications, the second largest number in the country. Starting in May it submitted about 70 applications a month.

In addition, this year Shanghai held three patent-pending technology fairs; 50 agreements have already been signed and a total of 20 million yuan worth of business has been done. Certain technologies for which patents are pending are already in production.

The first group of patent applications submitted after promulgation of the patent law was published recently. Comrades of the economic chamber of Shanghai's Higher People's Court have stated that preparations for hearing patent infringement disputes have been made.

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NATIONAL DEVELOPMENTS

PRC-U.S. MEDICAL SEMINAR BROADCAST VIA SATELLITE

OW211727 Beijing XINHUA in English 1652 GMT 21 Feb 86

[Text] Beijing, 21 Feb (XINHUA)---The average life-span of the Chinese people is expected to increase from 68 years in 1984 to 70 years or more in 2000, and the infant mortality rate will drop to 10 to 15 per thousand from 1981's 35 per thousand.

This prediction was made by Wang Tianyen, a professor at the Beijing Medical University, at a Sino-American Medical Seminar held tonight through tv satellite transmission, the first of its kind in the history of sino-foreign academic exchanges.

The seminar, the theme of which was the development of medical science and the function of medical information in the year 2000, was sponsored by the Beijing Medical University and the Sackler Center for Health Communication of Tufts University in Boston, and financed by the Sackler foundation.

Five Chinese and five American medical professors attended the two-hour seminar on both sides of the Pacific Ocean, which began at 21:30, Beijing time.

In his speech, Professor Wang said people above the age of 60 will make up to 10 percent of the Chinese population in 2000, while children below 14 will make up 14 to 15 percent of the population.

He predicted that chronic diseases and accidental injuries will become major causes of death in China in the 21st century. So, priority will go to medical care for the aged, emergency aid and health care in the coming century.

Other Chinese professors also made speeches at the seminar.

The topics of the American professors' speeches included medical information science and technology, medical publications and the role of communication satellites in medical education.

The Chinese and American professors held a short discussion after the speeches.

Chen Minzhang, China's vice public health minister, and Winston Lord, U.S. ambassador to China, attended the seminar in Beijing, while Dr. Arthur M. Sackler attended the seminar in Boston.

NATIONAL DEVELOPMENTS

CHINA DEVELOPS SECONDARY MEDICAL EDUCATION

OW211638 Beijing XINHUA in English 1623 GMT 21 Feb 86

[Text] Beijing, 21 Feb (XINHUA)--China has 507 secondary medical schools with 210,000 students now, according to "Health News".

The medical schools have 25,600 teachers, 22 percent more than in 1981, the paper reported.

They have trained 1,182,000 nurses, pharmacists and other medical workers since 1949.

Secondary education in traditional Chinese medicine has been developing rapidly in recent years, according to the paper; China has 19 schools of traditional medicine, while 79 other medical schools have opened traditional medicine specialities, including herbal medicine, acupuncture and moxibustion, massage and traditional nursing.

The paper reported that 83 of the secondary medical schools have been set up in areas inhabited by minority nationalities.

The ministry of public health allocated 4.7 million yuan to equip 44 medical schools in the last five years, according to the paper.

In addition, China has 118 medical colleges with a total attendance of 149,000 now.

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CSO: 4010/1034

NATIONAL DEVELOPMENTS

MEDICAL EQUIPMENT EXHIBITION OPENS IN BEIJING

OW182003 Beijing XINHUA in English 1912 GMT 18 Mar 86

[Text] Beijing, 18 Mar (XINHUA)--A week-long exhibition of medical equipment which opened here today is displaying 500 products by medical scientific research and production teams from 23 provinces and cities and eight ministries.

Wang Guoli, vice-president of the China National Corporation of Medical Equipment Industry, said at today's opening ceremony that the industry had developed quickly over the past five years. Automated and semi-automated production lines for syringes, thermometers and scalpels had gone into operation, and the products were close to advanced world standards.

By using microelectronic, ultrasonic, fibre optic, laser, super-cryogenic, nuclear and isotope techniques, the industry had produced large high-quality precision medical instruments and apparatus.

Wang said that last year, the total output value of the medical equipment industry was 1.16 billion yuan, 78.5 percent higher than in 1980.

He said that by the end of 1985, the industry had more than 330 factories employing 100,000 people, with its main products classified into 20 categories, including apparatus involving radioactive rays, electronics, optics and biochemical analysis.

There were also 90 medical equipment factories attached to other industrial ministries and institutes.

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CSO: 4010/1034

NATIONAL DEVELOPMENTS

STATE COUNCIL CREATES NATURAL SCIENCE FOUNDATION

OW270732 Beijing XINHUA in English 0652 GMT 27 Feb 86

[Text] Beijing, 27 Feb (XINHUA)--China's State Council, its highest governing body, has decided to establish a Natural Science Foundation to support basic and applied research, the council said today.

Tang Aoqing, a leading chemist, will chair the foundation committee, according to a council circular made public here today.

The circular said the state will be the main source of funds for the foundation but that contributions from units and individuals at home and abroad will be welcome.

The foundation committee consists of 25 scientists and management specialists.

The circular said the foundation will also establish an advisory committee of 50 Chinese and foreign scholars, experts and industrialists invited by Tang to propose scientific policy and to assess grant proposals.

The state council said the committee's major tasks will include developing guidelines for basic and applied research, organizing scientific grant review panels, providing advice on basic and applied research policy, and expanding cooperation with foundations and academic organizations in other countries.

All scientific workers in China will be eligible to apply for grants from the fund, the circular said.

Although most of the foundation's resources will be used for the research and management expenses of specific projects, the circular said, funds will also be spent on supporting the research work of promising young scientists as well as international cooperation and academic exchanges.

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CSO: 4010/1034

NATIONAL DEVELOPMENTS

CAS SHANGHAI BRANCH HAS INTERNATIONAL ORIENTATION IN ITS RESEARCH

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 3 Dec 85 p 4

[Article: "Shanghai CAS Branch Orients Itself Toward the World in Basic Research, Persistently Reorganizes Itself, Achieves Some High-Quality Results"]

[Text] During the reorganization of the science and technology system, the institutes of the Shanghai Branch, CAS, are concentrating on stable, sustained progress in their basic research and have achieved some rather advanced results in it.

These institutes have personnel who are engaged in rather high-level basic research; many of them are nationally and internationally known scientists. Since the decision on reorganization of the science and technology system was put into effect, the institutes of the Shanghai branch have not slackened their basic research, but have advanced steadily during the process of readjustment. This year, as the allocation system has been reorganized and the scientific fund system has been instituted, many institutes have emphasized their main focuses and have singled out certain research topics, generally of major theoretical significance and latent economic value. These topics are thus highly competitive in funds applications. Of the 120 projects that 14 institutes in Shanghai submitted for CAS internal funding, 95, or 79 percent of the total, were approved. The Institute of Organic Chemistry and the Institute of Biochemistry took a realistic approach: despite their limited operating budgets they nonetheless managed to squeeze out some money to set up funds within the institutes, making it possible to handle separately certain projects for which funding applications could not then be submitted and to give some support to certain significant work or to projects on which work was just starting.

Based on the characteristics of their basic research, the various institutes emphasized an international orientation and a focus on the world state of the art and on international competitiveness in specialized fields. The Institute of Cell Biology has established a world orientation and has developed international scholarly exchanges. This year, in addition to joining

with the Mapu [phonetic] Society, the Hamburg Foundation and the Krupp Foundation in West Germany to establish China's first laboratory open to visiting scholars, it has also held Chinese-Japanese symposiums on cell engineering and a Chinese-West German symposium on developmental biology, which have helped to raise the level of research at the institute.

In organizing their research topics, many institutes have emphasized applied basic research that has applications prospects and latent economic value. In order to overcome an overemphasis on publications in its basic research, the Institute of Organic Chemistry announced that basic research must develop in three directions: major scientific questions in its own field of study, scientific problems that arise in general applications, and research with long-term applications potential. The Institute of Biochemistry and the Silicates Institute are attaching full importance to strengthening applied basic research in biological engineering and new materials.

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CSO: 4008/2057

NATIONAL DEVELOPMENTS

COOPERATION BETWEEN CAS, UNIVERSITIES URGED

Shanghai JIEFANG RIBAO in Chinese 7 Jan 86 p 1

[Article: "Strengthen Cooperation Between the Academy of Science and the Advanced Schools"]

[Text] In order to strengthen ties and cooperation between the Academy of Science and the advanced schools, more than 80 leaders and specialists of the Shanghai Branch of the CAS, led by its chairman Cao Tianqin [2580 1131 2953], visited Fudan University to learn from colleagues in their respective fields and to exchange experience.

CAS research units in Shanghai and Fudan University have a tradition of friendship and cooperation. In 1958 the academy and the university worked together and jointly created some new scientific research bodies. At the same time, many research personnel with particular strengths in the CAS did part-time teaching at Fudan University or went to work full time there; in addition, some eminent scientists at Fudan University were invited to become academic members of the CAS, and the university sent large numbers of excellent personnel to the academy.

During the exchange of experience, Fudan University party committee secretary Lin Ke [2651 0344], president of the university Xie Xide [6200 1585 1795], and CAS Shanghai Branch head Cai Tianqin stated that during the Seventh 5-Year Plan it would be necessary to strengthen their ties further, to make thorough use of the strengths of both sides in applied and basic research, and to produce more results and more trained personnel for state scientific research and for education. Leaders and specialists of the Shanghai Branch of the CAS and of Fudan University Qing Zhichun [1987 1807 4783], Chi Zhiqiang [3069 1807 1730], Ding Gongliang [0002 0361 6852], Hua Zhongyi [5478 0022 0001], Gu Chaohao [6253 6389 6275], Tan Jiazhen [6151 1367 2823], Feng Depei [7458 1795 1014] and Wu Ziliang [0702 5261 5328] took part in this activity.

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NATIONAL DEVELOPMENTS

THREE BASIC ISSUES IN GEOLOGICAL WORK DISCUSSED

Beijing ZHONGGUO DIZHI [CHINA GEOLOGY] in Chinese No 11, Nov 85 pp 1-5

[Article by Cheng Yuqi [4453 5940 3217]: "Understanding of the Three Basic Issues in Geological Work"]

[Text] Doing geological work well, requires that relevant comrades have a more correct understanding of several basic issues in geological work, that is, an understanding that conforms better with the objective situation in geological work. Only in this way can the work develop and conform to the objective laws of geological work itself and thus while taking into account the economic laws which should be adhered to in geological work, it may be possible to obtain better results and benefits. I would like to discuss the understanding of a few people with regard to the following three basic issues, please criticize and correct me.

I. General Understanding of Geological Work: the Object and Work Methods of Geological Work and Essential and Target Tasks and Functions

The object of geological work is primarily the earth's surface layer--the crust--especially the large and small geological bodies of its upper part, including sedimentary formations, volcanic sedimentary formations, volcanic formations, metamorphic formations and various types of intrusive masses, magmatic complexes and the like; sometimes it also involves places deeper in the earth and the hydrosphere and the atmosphere. Not only do geological bodies have different, and frequently complex, material constituents, different chemical properties, physical properties and structural forms, but also are in different geological periods and spaces and are affected practically by a series of physical, chemical, and physio-chemical and even biological functions, so that different and constantly complex evolutions (chemical and physical changes) are constantly occurring. Except for some common features, the traits and laws displayed by these changes frequently have temporal or regional characteristics. For example, there are frequently certain or major differences in the geological chemical background and ore formation characteristics of different regions. Thus, in addition to applying the corresponding geological scientific knowledge and relevant methods in a targeted way when carrying out geological work, it is also necessary to have knowledge of chemistry, physics, and biology and related methods and engineering techniques to know and understand the object of geological work.

This also explains why geological work must apply comprehensive scientific and technological methods and professional work also should focus on common objects and targets, build close horizontal linkages, and strengthen cooperation before it can obtain better results and benefits. One-track methods and methods in which relevant specialist and technological methods are not linked or "fighting in coordination" is not more, faster, better, cheaper, but even may do harm to the work.

In addition to this, a geological body has an objective existence and is not something which can be changed by human will, but is the product of nature acting as a great laboratory, a result of scientific experimentation. In addition to the part of the work which carries out special topic laboratory geological researches and simulates natural phenomena and functions, geological work generally cannot cultivate and nurture its work object as agriculture and animal husbandry and the biological sciences can, nor can it trial-manufacture its own work object as engineering and technology can, but in experimental geological work simulated conditions and scales can be achieved. Also there are frequently very large limitations and the factors of temporal and complex spatial relationships generally are hard to deal with and the conditions hard to simulate. For this reason, the most fundamental method of geological work is to carry out observation, recording, describing, collecting, identification, testing of the objects of its work and carrying out comprehensive analysis and research of the data and materials collected and the relevant geological phenomena and functions of the same geological body; generally a continuing process of constantly deepening knowledge of field work, laboratory work, field work again, laboratory work again, as a totality is a comprehensive investigative and research process. This in essence is also the process of obtaining knowledge of law from nature which Chairman Mao stated in "On Practice," "practice, understand; practice again, understand again." In work we should constantly observe phenomena and analyze problems from all angles and it is also necessary to pay special attention to the dialectical relationship between spatial and temporal changes of related phenomena and functions, the most fundamental point being, of course, that from a developed and comprehensive viewpoint we should treat the object of our work and conscientiously research the inherent links between geological phenomena and factors.

Geological work is a type of scientific and technological work. Considered from the angle of science its primary aim is to understand, master and clarify the work object's physical composition, structure, form evolution and geological characteristics in many areas, obtaining some understanding of the laws, including the geological laws inherent in rock-formation laws. The work results it obtains are data and materials in a series of scientific and technological areas, and in report and appear form using text, maps, and tables. It transmits these results to relevant personnel, agencies, schools, factories and mines, and even all of society and all of mankind. Basically, mineral reserves and overall quantity of mineral resources of different grades are also scientific and technological data and materials. Clearly, in terms of geological work as a whole, it belongs to the realm of intellectual, and even informational scientific and technological work. These results are to serve China's socialist construction of achieving the four modernizations and even

for all human society's use of nature (primarily the mineral resources in underground water) and transformation of nature; at the same time it is also to serve China's, or even the whole world's, scientific and technological development, especially geological and technological development. That is, geological work provides for the realization of the above goals a range of scientific and technological data and materials and theoretical guidance and at the same time makes a contribution to the constant enrichment of the scientific and technological treasurehouse. This can also be said to be the ultimate goal of geological work as well as its overall mission.

With regard to the service range of geological work, it can be divided into three aspects: one, basic geological work--primarily regional geological survey--that is, geological mapping of many countries, at the same time including regional geophysical work, geochemical work and other essentially regional work. Two, mineral geology work, including mineral (mineral area) survey and exploration work. Three, geohydrology, engineering geology and environmental geology work. Of course, the second and third classes themselves include some specialized basic work. With regard to its relationship with national economic construction and China's socialist construction, it is the work of the early phase and the advance phase, has the function of vanguard or scout and at the same time is the foundation of this work. Beginning relevant economic construction projects without carrying out the necessary geological work may cause these projects to suffer losses and sometimes even for situations in which not even a single step can be taken to appear; without doing this work carefully, similarly, related construction projects may be damaged.

II. Basic Demands of Geological Work

The seven basic demands discussed below are constructed on the foundation of the general understanding of geological work discussed above and at the same time they also reflect some characteristics of geological work.

(1) The integration of field work and laboratory work. Above we mentioned that geological work is a process of repeatedly going from field to laboratory work for only in this way can knowledge of the work object be perfected and thus engaging in geological work must closely integrate field work and laboratory work. There are no exceptions, regardless of whether it is basic geology, mineral geology, hydro or engineering geology, physical exploration, chemical exploration, etc. But, two points should be made: one is that the constituent parts of each type of work generally should not be tasks undertaken separately by two people or two groups of people, but should be completed in an orderly fashion by the same worker or the same work group personnel. Two, the time ratio of these two tasks should be rational and there will be differences in the ratios of different work stages, but generally speaking, ordinarily it will take up about half, thus it should not be thought that the longer time in the field the better. From another angle, achieving the demand of integrating field and laboratory, one can also say that to a considerable degree is the integration of survey and research.

(2) Integration of macro and micro. Observation with the naked eye makes up a certain proportion of geological work; at the same time simple tools must be used, such as magnifying glass, knife, magnet, streak plate, ultraviolet lamp, counter, etc., simple measurement methods, such as weak salt and acid spot test, carbonate mineral dye test, blowpipe analysis, etc., and such simple tools (instruments) and methods are becoming more numerous daily; we should use even more microscopes and other optical equipment and other physical and physical chemical methods to better assess mineral ores and use chemical analysis and physical analysis methods to determine constant and variable factors and even the isotope content of the same element, etc. Only if we integrate the macro and micro methods and comprehensively research the data and materials obtained can we gradually narrow the observational and investigative range and at the same time strengthen its corresponding depth and breadth and can geological work be greater, faster, better and cheaper. Having a preference for the macro can be defective because of its crudeness and relying on the micro can be defected because of its one-sidedness, even to the point of having a very narrow view and not seeing the forest for the trees. These two one-sided attitudes can damage work.

(3) Integration of direct and indirect observation. Direct observation frequently makes up a large or very large part of geological work. To a very large extent exploration work belongs to the category of indirect observation. Yet, the chemical methods such as analysis of minerals and rock chemical elements, physical methods and different physical methods used in mineral and rock discrimination and determination from the perspective of measurement and determination of specimens and samples, can be said to be the results of direct observation, while from the perspective of the geological body and geological phenomena, they are actually of a direct observational nature. These complex situations demonstrate very well the comprehensive nature of geological working methods. But at the same time that they are based on work objects and tasks, comprehensive methods with different content are selected which play a decisive role with regard to whether or not geological work can obtain better results and benefits. As science and technology advance, it seems that the proportion of indirect observation will steadily increase and better results and benefits be obtained. But under any circumstances, direct observation still is necessary, has a fundamental nature, and frequently has a decisive macro significance.

(4) Integration of physical labor and mental labor. Physical labor makes up a large proportion of field geology work, but climbing mountains, making long arduous journeys and collecting specimens and samples is not purely physical labor, at the same time there is also thinking which involves mental labor. Of course, laboratory work is primarily mental labor. But as far as geological work as a whole is concerned, since field and laboratory work should be integrated, it is also necessary to integrate physical labor and mental labor.

(5) Integration of point and area. Developing geological work should integrate point and area organically. Geological work of any nature and precision has a definite scope, but the specific task still must begin with the points or parts and only when the work results of many points (parts) have been accumulated can the geological situation in a certain area be understood and

understood comprehensively. This is the way it is done whether it is geological mapping, regional mineral surveying, surface exploration or chemical exploration work and other area type work. But before beginning point or part work, one definitely should understand the area situation (including the geological situation and some other natural conditions) thus it is necessary to carry out area reconnaissance also including collection and comprehensive analysis of all relevant materials. Only in this way can the site for beginning work be rationally selected and specific proposals for expanding the work area from the point to the area be formulated. In the early stages of regional ore reconnaissance, the initial ore site and mineralized zone or work section should first be carefully selected on the basis of the understanding of the area so that the results of point or part in-depth work will have broader significance in the area and careful selection can also improve understanding of the area and expand the area of ore-forming prospects, promises breakthroughs and plays a role as "dissecting a sparrow" (analyzing a typical case). This is what is called the method of "surveying the whole area but starting with the point."

The proposals mentioned above formulated for rational progress in the work area are work steps and proposals based on such specific situations as the demands of the mission, geological and natural geographic features, degree of geological survey research, and even the personnel allocation and working conditions, considering obtaining the best possible results, and striving to complete the mission in a faster, better and cheaper fashion. Thus the mechanical assignment of observation point lines or measurement point lines is not reasonable. Of course different work methods also have their differences. In addition, the method of spreading over an entire area from one point should not be treated mechanically either. At the same time, depending on work needs, when work is going on at a point, the situation in the nearby area also must be understood at the same time.

The so-called integration of point and area is essentially a matter of the relationship between the part and the whole. Since 1979 work has been under way in the entire geological system to divide up the ore areas with the aim of obtaining some systematic knowledge of the distribution and formation of relevant ores and ore groups on the basis of mastering the comprehensive ore-formation features of different regions, provinces, cities, areas up to the entire nation so that further regions and sections for developing ore reconnaissance work can be carefully selected. These regions and sections are the part and can be viewed as a "point" within a large area; this also is a work allocations which thoroughly implements the principle of "regional development and key point breakthroughs." Between the typical ore-bed summary and the ore-producing region division work of the ore-formation region in which the corresponding ore-bed is located is also a relationship between point and area. The simultaneous deployment of these two tasks is also one way of integrating point and area.

Point and area work are complementary, mutually beneficial, and frequently also carried out alternately.

(6) Integration of theory and practice. To carry out geological work better, it is necessary to apply or refer to the rational knowledge of predecessors with regard to the work object and relevant geological phenomena and geological issues, that is, there should be a definite theoretical guidance for carrying out geological work. However, theory should be integrated with practice, and whether or not it can be used and to what degree it is suitable should be tested in practice and on this basis the original theory must be supplemented or revised. This is one aspect of the integration of theory and practice. Concentrating energies on improving rational knowledge without taking its possible results and benefits into account is wrong; but burying one's head in practice and being satisfied with mechanical control or series of observation records without emphasizing comprehensive research on the materials and elevating them to rational knowledge is also wrong. This is another side of the problem of the integration of theory and practice. In the final analysis, the essence of the integration of theory and practice is handling the dialectical relationship of theory and practice.

(7) Close integration and coordination of different scientific and technological methods. Above we discussed the necessity of adopting comprehensive methods in geological work from the standpoint of the complexity of the material composition, structural development and evolution of form of the objects of geological work; we also discussed how carrying out geological work should integrate the macro and the micro and the integration of direct observation and indirect observation. It can be seen that the organic coordination between specific tasks and the related specialized methods plays a key role in whether or not geological work can be smoothly carried out and optimal results and benefits obtained. Of course, the position, weight and role of different specialized work in different geological work projects and different work stages is not the same, this is determined by the characteristics of different sciences and technologies themselves and the place they occupy in science and technology. It seems that simply analyzing the relationship between aims and methods in geological work does not completely conform to the objective situation and at the very least is simplifying the internal relationships of complex geological work. Thus, it is very important to stress scientific management and related professional construction and reform in geological work. This demands that personnel who are engaged in relevant managerial work must integrate the characteristics of geological work and study the systems engineering of internal specialized work at various work stages.

III. On the Issue of Training Geological Personnel

The training of geological personnel can be divided into the two stages of the period of classroom schooling and on-the-job training and improvement after beginning to work.

Specialized personnel trained for geological work in school generally are divided into three levels: polytechnic school, university geological science (professional), and graduate student. There are definite or considerable differences in the proportion of students at these three levels in various countries, which is determined by specific conditions of different countries

(including differences in level of education), for example, the proportion of graduate students in the United States is far greater than in England, thus we should not copy mechanically by consulting scientific and technological advancements abroad and the experience of the industrially developed countries, but we should proceed in the light of China's actual circumstances and the ratio of specializations and different periods of China's socialist construction should not be the same either. The overall target is to train a group of scientific and technical personnel who understand and are enthusiastic about the profession of geology and who are willing to make contributions at different levels to the socialist enterprise. Considered from the angle of the specialization, school training guides the students in the elementary course and lays a good foundation so that after they participate in work they will be adaptable and can keep up with the needs of work development and the needs of scientific and technological development; at the same time the students also should be given some cultural training. In terms of educational method, in addition to instructing them in knowledge and skills, inspirational education should also be strengthened to mobilize fully the initiative and enthusiasm of the students for learning, and their logical reasoning ability and organizational skills should be cultivated so they understand some scientific managerial and even economic and technological managerial knowledge.

There are differences in the specific educational demands of the three levels discussed above. To improve the adaptability of students after they are on the job, the first measure is that the divisions between faculty and specialization in university geology (profession) and polytechnic school should not be too fine, so that a good foundation can be laid for training people with talent to be expert at one thing and good in many or even for some schools to consider only creating one large department and guide the specialization direction of the students though different in curricula and graduation requirements (theses). Next, students should master to a certain degree well-rooted fundamental knowledge (theory) of natural science and a fairly well rooted basic disciplinary knowledge (theory), basic skills, and some specialized basic knowledge and skills. The students are young and their memories are good and learning ability is strong and if the scientific foundation is well laid, in the 30 or 40 years on the job they will also be able quickly to learn, master and apply new theories and technologies. Third is that in addition to classroom methods and skills, the students also should learn basic field methods, and geology students should master basic geological mapping skills, but of the students who have graduated in the past few years, generally speaking, a considerably greater number have lacked the training received by graduates of the 1960's and 1970's, and this should promptly be reformed. There should be differences in the ratio of specific demands on polytechnic and university education. And the range of graduate student studies and specialized research should be much narrower, but the primary goal of their training, it seems, should be on the foundation of strengthening the breadth and depth of natural science and specialized knowledge (theory), cultivating the ability to work independently, mastering "survey research" of specialized geological work and more complete methods in the process of summarizing and improving science and technology so that after beginning work they can "draw inferences about other cases from one case," extend applications, and improve the quality of the work they undertake and its results and benefits; the topic

of their graduate theses generally should not be the specialized direction of their entire lives. In terms of foreign languages, university graduates should at least achieve the level of being able to read scientific and technical literature in one foreign language, the demand on polytechnic graduates is somewhat lower but graduate students should achieve elementary reading ability in two foreign languages.

At the working stage, the specialized level of working personnel should be improved through training in practice, and in addition to strengthening the regular vocational study and activity, as needed and as possible, relevant personnel should have opportunities to participate in long-term and short-term vocational study classes and training classes. The overall target is, on the foundation of school training, to make the specialized direction of working personnel to fall into a general pattern, becoming specialized talent which is expert in one area and good in many others within a certain range and has a certain theoretical training and practical work ability and who can take on and complete tasks which achieve the seven demands for geological work described above. To achieve this target, it is necessary to pay attention to rational employment of working personnel, professionalization of geological work, guarantees of working conditions, strengthening of scientific management and ideological and political work, etc. These can be said to be the basic guarantees of this stage of the job of training geological workers.

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8226/12379
CSO: 4008/32

NATIONAL DEVELOPMENTS

BRIEFS

TECHNOLOGY MARKETS OPEN IN WUHAN--Economic and technology markets recently began formal operations in the city of Wuhan. This is a permanent, fixed technology market of the economic commission system that deals with operations service activities in projects like the transfer of rights to technical achievements, bidding on problem solving, consulting services, the employment of talent, exhibitions of new products and outstanding products, and the absorption and assimilation of foreign samples and prototypes. At present, they have already gathered more than 2,840 new technical achievements from 98 colleges and institutions and from research units, 96 projects for bidding on problem solving and for technical cooperation from industrial enterprises, information requested by more than 200 talented individuals, information on adjusting and regulating more than 30 pieces of equipment, as well as more than 30 transfers of rights to the achievements of individuals. [Text] [Article by Tao Weijin [7118 1919 6855]] [Tianjin JISHU SHICHANG BAO in Chinese 14 Jan 86 p 1] 12586

GUANGZHOU S&T MARKET ACTIVITY--In opening up new technology markets, the city of Guangzhou has actively adopted the principles of "openness, invigoration, fostering, and guidance" to hold technical trade fairs that are of varied formats. In 1985 Guangzhou held all together 10 different types of technical trade fairs, made deals for more than 1,000 projects for a total volume of 200 million yuan, and gained definite social and economic results. Guangzhou technical trade activities are currently very active, many technical trade fairs have turned from the comprehensive to the specialized, from large scale to small and medium, and from government subsidized to the development of independent operations with self-absorbed gains and losses; technical trade has centered on the "short, even, quick" projects; horizontal relations between science research and production have gradually strengthened, and at the Guangzhou technical trade fairs, joint operations and shared development projects are 65 percent of the deals made; all technology that is about to be imported from abroad is first bid upon in the technology markets, and foreign technology that has been imported is also put into the technology markets for users to choose. [Text] [Article by Liu Mei [2692 2734]] [Tianjin JISHU SHICHANG BAO in Chinese 14 Jan 86 p 1] 12586

HOTEL COMPUTER SYSTEM APPROVED--Guangzhou, 15 Mar (XINHUA)--A computer system for hotels has passed an appraisal meeting held by the State Tourism Administration. This system, which uses the medium of Chinese characters, can keep accounts automatically, and the bill is presented by pressing a button on the counter. The program can also provide transport, weather and market information. The program was jointly developed by the Shenzhen New Technology Development Company, the computer center of Xian Jiaotong University and Guangzhou's Liuhua Hotel. [Text] [Beijing XINHUA in English 1315 GMT 15 Mar 86 OW] 12624

LARGE-SCALE U.S. COMPUTER INSTALLED IN HEBEI--Installation of an imported U.S. [IBM] 4381 computer was completed recently at the Computer Station of the Provincial Planning Commission. This machine is equipped with a large-scale advanced MVS [multivirtual storage] operating system with 16 Meg internal memory, more than 8000 Meg magnetic disk space, 5 high-speed tape drives, a Chinese character laser printer, etc. As for software, it is equipped with Information Management System, communication system and network, and software subsystem. [Text] [Shijiazhuang HEBEI RIBAO in Chinese 18 Feb 86 p 2] /6091

CSO: 4008/1047

COMPUTER SIMULATION OF MEASUREMENT OF THERMAL CONDUCTIVITY OF SOLIDS BY
TRANSIENT HOT-WIRE TECHNIQUE

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF
SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 447-459

[Article by Yu Jilin [5713 0679 2651] and Song Youwang [1345 0642 3769] of
the Department of Modern Mechanics and the Department of Engineering Thermo-
physics, respectively, China University of Science and Technology]

[English Abstract] The results are presented of a computer simulation of
the measurement of thermal conductivity of solids by the transient hot-wire
technique in which two sample pieces are used to clamp the wire. The influ-
ence of the air layer between the two pieces on the accuracy is estimated
to be within ± 1 percent under the conditions considered. (Paper received
16 April 1985.)

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CSO: 4010/1036

COMPUTER-AIDED SYNTHESIS OF BROADBAND MATCHING NETWORKS

Tianjin TIANJIN DAXUE XUEBAO [JOURNAL OF TIANJIN UNIVERSITY] in Chinese
No 4, Oct 85 pp 24-32

[Article by Wu Yongshi [0702 6102 6108] and Zhang Yuguang [1728 3768 1639]
of the Department of Electronic Engineering, Tianjin University; project
supported by the Science Fund of the Chinese Academy of Sciences]

[English Abstract] Presented here is the amplitude-phase real frequency technique, a new procedure for the computer-aided synthesis of broadband matching networks. The amplitude and the phase response of the reflecting coefficient to the matching network can be found directly according to the maximum gain response in the passband without a prior choice of the network topology. The matching network can be synthesized by assuming a scattering function of the matching network to approximate the amplitude and phase response. In practice, the design proves that its results are better than that of the real frequency technique hitherto accepted.

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NEW TYPE MICROWAVE FM OSCILLATOR

Nanjing NANJING GONGXUEYUAN XUEBAO [JOURNAL OF NANJING INSTITUTE OF TECHNOLOGY]
in Chinese Vol 16 No 1, 20 Jan 86 pp 61-70

[Article by Lin Fuhua [2651 4395 5478] and Zhuang Kunjie [8369 2492 2638] of
the Department of Radio Engineering, Nanjing Institute of Technology]

[Summary] A new type of oscillator using multilink feedback loop is presented. High stability of frequency can be obtained, because the total time delay of the oscillator loop is larger, and it is slightly influenced by the noise or the parameter drift of the transistor either of which being the chief factor affecting the short-term stability. In order to achieve linear FM, a linear voltage controlled phase shifter must be involved in the loop. The greater the shift of the VCPS, the greater is the frequency shift of the VCO. An engineering design method of the linear FM oscillators is given. A variety of FM integrated microwave sources has been produced and applied to the microwave communication systems and broadcasting satellite receivers. [Paper received 21 December 1984.)

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CSO: 5500/4149

ULTRASONIC ATTENUATION, VELOCITY STUDIES OF LEAD MOLYBDATE SINGLE CRYSTAL AT ROOM TEMPERATURE

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 465-470

[Article by Wu Kunyu [0702 2492 5940] of the Department of Radio and Electronics, China University of Science and Technology, and Hua Wangxiang [5478 3769 4382] of the Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[English Abstract] Measurements of ultrasonic attenuation and velocity were carried out for longitudinal (or QL) and shear or (QS) waves in five different oriented lead molybdate single crystal specimens at room temperature. The attenuation is found to be roughly proportional to the square of the frequency over 10 to 200 MHz and to have an absorption peak at frequency 230 MHz for some pure modes. The cause of acoustic loss is considered to be viscous damping and the effect of impurities. (Paper received 14 March 1985.)

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APPROACH TO ROBUSTNESS THEORY OF ADAPTIVE CONTROL SYSTEMS

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in English Vol 15 No 4, Dec 85 pp 508-512

[Article by Wu Junjie [2976 0193 2638] of the Department of System and Management Sciences, China University of Science and Technology]

[Text]

In recent years, some works contribute to the robustness of adaptive systems both in basic theories and applications^[1-3], but there has been no procedure methodology yet. In this paper, we consider the model reference adaptive control of a linear time-invariant plant in the presence of bounded disturbances and establish the robustness theory of adaptive control system.

1. An Adaptive Law

Case 1. Using the state of the plant

We consider here the relatively simple case of a plant whose state variables can be measured in the presence of a vector additive disturbance, as well as the input to the plant. The plant and model are assumed to be described by the equation

$$\dot{X}_p = A_p X_p + B u + v_1, \quad \text{plant,} \quad (1)$$

$$\dot{\hat{X}}_p = \hat{X}_p + v_2,$$

$$\dot{X}_m = A_m X_m + B r, \quad \text{model.} \quad (2)$$

where $A_p, A_m \in R^{n \times n}$, $B \in R^{n \times 1}$, (A_p, B) is controllable; A_m and B are known; A_m is asymptotically stable; A_p , a constant matrix with unknown elements; $r(t) \in R^1 \times [0, \infty)$, a piecewise continuous bounded reference input; $v_1, v_2 \in R^n \times [0, \infty)$, the vectors of piecewise continuous bounded disturbance. It is further assumed that a matrix $K^* \in R^{1 \times n}$ exists so that

$$A_p + B K^* = A_m. \quad (3)$$

Our object is to determine a control input u so that the error between plant and model state, as well as all signals within the system, remains uniformly bounded. If the input to the plant in (1) is $u = r + K(t)X_p$, where $K \in R^{1 \times n}$, is to be

determined, we obtain

$$X_p = A_p + BK(t)X_p + Br + BK(t)v_2 + v_1. \quad (4)$$

an auxiliary signal generated by suitable generator, under the conditions of reference [1,2], the state error e evolution equation can be described as

$$\left. \begin{aligned} \dot{e} &= A_e e + b_e (k(t) - k^*)^T w + v_1, \\ e &= h_e^T e + v_2, \end{aligned} \right\} \quad (10)$$

where $k(t)$ is the adjustment controller parameter to be determined, k^* is a constant vector, $\|w\| \leq \|e\| + a_0$, a_0 is a positive constant depended on reference input, v_1 and v_2 , a appropriate dimensional uniformly bounded disturbances, e , is the measured output error in the presence of disturbance v_2 , the transfer function $W_m(s) = h_e^T (sI - A_e)^{-1} b_e$ is strictly positive real, we have

Theorem. The error e , as well as $k(t)$, w , is Lagrange stable if

$$\dot{z} = A_1 z + B_1 \cdot e, w, \quad (11a)$$

$$\left. \begin{aligned} K &= -C_1^T Z - D_1 \cdot e, w, \\ D_1^T &= D_1 > 0. \end{aligned} \right\} \quad (11b)$$

where $H_1(s) = C_1^T (sI - A_1)^{-1} B_1$ is positive real.

The proof is similar to Theorem 1's.

II. Adaptation Mechanism Complete Theorem

The conditions

$$D_i^T = D_i > 0, \quad i = 1, \dots, n \quad (6b)$$

or

$$D_1^T = D_1 > 0 \quad (11b)$$

are sufficient but not necessary for the stability, i. e. if (6b), (11b) is invalid, the stability is sensitive to the initial error, reference input frequency, disturbance upbound, etc.^[1] $H_i(s)$, D_i , could be expressed as memory and proportional adaptation law respectively. When (6b), (11b) hold, $H_i(s) = 0$ ($i = 1, \dots, n$), the system remains stable robustness but losses the meaning of "adaptive", and its behavior would not be acceptable in general. This leads to the most important concept that the memory adaptation is the inherent characteristic of adaptive control system which is different in nature from other nonlinear control systems. Thereafter, we only discuss the memory adaptation law. Take $H_i(s)$ as the i th Adaptation Unite which transfer block denoted by AU_i , and the input to AU_i as the i th Adaptation Signal. For ease of expression, we submit the lower index i in AU_i and H_i . From (6a), (11a), the adjustment parameters are the output of AU excited by adaptation signal. In order to adjust the controller parameters on line, it is necessary that the AU is output functional controllable. Following the results of [4], we have the Adaptation Mechanism Complete Theorem as follows:

Theorem 2. The adaptive control system could track suitable controller

parameters if and only if $\text{rank}H(s)$ was at the full.

Notice that the output functional controllability of AU is the inherent characteristic, the state controllability depends on the realization.

III. The AU Bandwidth Matching Principle

It is important in practice that AU should restrain the disturbance, i.e. oscillatory dynamics, significant stochastic disturbance, noisy sensor measurements, reduced-order tolerance to transient, and which were characterized by the fast or slow time constants in other words, AU must include the bandwidth constraints. Because the reference model represents the behavior desired from the plant augmented with a suitable controller, and the bandwidth of the model, however, matches the reference input signal, we induce the following AU Bandwidth Matching Principle:

Theorem 3. The adaptive control system is robust if the bandwidth of AU matches the reference model or the reference input signal frequency range but with a double low cut-off frequency.

The above theorem is also called the AU Filtering Principle. In disturbance-free case, it can no longer ensure the asymptotic stability as before^[1]. When the adaptive control system is used for identification or observation, the bandwidth of AU , as well as that of "richness" test signal when necessary, should match the frequency range of the input to the plant. If so, AU could increase the signal-to-noise ratio.

Example.

$$H(s) = -\frac{1}{s}\Gamma, \quad \Gamma > 0,$$

$$H(s) = (sI - \sigma\Gamma)^{-1}\Gamma, \quad \Gamma > 0, \quad \sigma > 0.$$

where $\frac{1}{s}\Gamma$ appears in current works, $(sI - \sigma\Gamma)^{-1}\Gamma$ was first suggested in [1].

Here is a simplest AU structure

$$H(s) = -\frac{T_1 s + 1}{T_2^2 s + 2\xi T_2 s + 1}\Gamma, \quad \Gamma > 0, \quad 0 < \xi < 1.$$

The bandwidth could be quite different by choosing suitable time constants T_1 , T_2 and damping coefficient ξ .

IV. Discussion

In view that the adaptation loop is a feedback loop, it can be shown as

Fig. 1, in the state measurable case for ease of exposition, the adaptation loop is linear negative feedback because AU is a linear positive operator.

The adjustment parameters are the adaptation loop control variables whereas the nonauto-tuning controller parameters are the open loop control variables. By Theorem 3, the adaptation loop could adjust the parameters quickly, this shows that the adaptive control system may be used for the plant with terrible shift parameters.

It is known that a integrator $1/s$ could be approximated by inertia $T/(s+1)$ with a large time constant T , and a recursive least square (RLS) algorithm could be equivalent to the memory adaptation algorithm composed of a integrator. So that we could explain why STR based on RLS or its modification has got some advantage in a low process control, but failed in fast process control, and why it is sensitive to disturbances.

In comparison with the synthesis of classical control systems, we guess that there may exist a positive feedback adaptation loop with good behavior in a few case. They may display harmonious aesthetics of the universe.

The simulations have been under taking..

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CSO: 4010/1037

LIFE SCIENCES

EXPERTS REPORT ON GENETIC RESEARCH FINDINGS

OW151116 Beijing XINHUA in English 0757 GMT 15 Mar 86

[Text] Danjing, 15 Mar (XINHUA)--Chinese medical workers have discovered 182 new variants of chromosomes, which will help diagnose and control abortions and the birth of deformed or retarded babies.

Experts from the Chinese Cytogenetics Training Center said the 182 variants of chromosomes, first reported by Chinese scientists, will be included in the "Repository of Chromosomal Variants and Anomalies in Man" written by professor D. S. Borgaonkar M.D., chairman of the Clinical Genetics Branch of XV International Genetic Association.

Professor Borgaonkar, who came to China to attend an appraisal meeting of the new variants, said that Chinese scientists have provided important data for the study of human genetics, neoplasm genetics, clinical medicine and pre-clinical medicine.

Chen Jiazheng, a specialist in human genetics, said that China started the study of human genetics in the late 1970s.

Medical colleges and big hospitals all over China have set up research institutes or offices of medical cytogenetics, and opened genetic clinics and offered consultant services.

Chen said that more than 200 hospitals have adopted such techniques as chromosome analysis on chorion, chromosome analysis on amniotic cell and peripheral blood culture for chromosome analysis, to prevent the birth of deformed babies.

China will set up a repository of chromosomal variants and abnormalities among Chinese people based on the present findings, the expert said.

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CSO: 4010/1035

LIFE SCIENCES

SHANGHAI TO SET UP HOSPITAL FOR THE ELDERLY

OWO81818 Beijing XINHUA in English 1441 GMT 8 Mar 86

[Text] Shanghai, 8 Mar (XINHUA)--Shanghai health authorities are preparing to open the city's first geriatrics hospital in the summer, a medical official said here today.

This is part of the city's efforts to take better care of the 1,400,000 people over 60, who account for about 12 percent of the city's population.

The hospital, which will have 500 beds, is to offer services to prevent and treat cardiovascular and bone diseases and other illnesses suffered by old people.

The setting-up of the hospital will help complete a medicare network for the old people in the city.

The city medical authorities earlier set up rules for all city hospitals to give priority to the aged people in receiving patients. Twenty-two hospitals in the city opened outpatients departments for the aged and make regular home visits to more than 20,000 aged patients.

Committees on the aging problem have been set up at the municipal, district and county levels to study medicare, welfare, family and remarriage of the aged. In addition, there have been set up many universities, sports associations and retired engineers associations to organize activities for the senior citizens.

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CSO: 4010/1035

DETERMINATION OF THICKNESS, REFRACTIVE INDEX OF MAGNETIC GARNET FILMS BY
MULTIPLE ANGLE LASER ELLIPSOMETRY

Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 5 No 6, Dec 85
pp 251-253

[Article by Xu Meidi [1776 2734 1229], Chen Yusan [7115 5940 0005] and
Liu Xianglin [0491 3276 2651], Shanghai Institute of Metallurgy, Chinese
Academy of Sciences]

[Abstract] The paper describes the applications of ellipsometry for measuring thickness and the optical properties of magnetic single crystal films. Using multiple-angle incidence method, at $\lambda = 6328$ angstroms, the integer multiple m_1 of film thickness period $D\phi$ is directly determined in order to calculate the true film thickness of epitaxial films as $2\delta > 360^\circ$. The authors measured repeated errors of these film thicknesses and refractive indices at an angle of incidence 75.0° . Ellipsometry can also be used to measure other magnetic epitaxial and thin films. The epitaxial film is a dual surface film; its quality can be enhanced if single surface film is used, thus further upgrading the measurement accuracy. Two tables list data of true thickness and refractive indices of thin films measured with two incident angles, and repeated measurement deviations of thickness and refractive index of thin films with an incident angle at 75° . Two figures show reflection and refraction in single surface film, and principal optical path. The authors are grateful to Guo Maoduan [6753 4243 4551] for writing computer programs, Huang Yunlan [7806 7189 5695] for computation, and Wang Hongxiang [3769 3163 4382] for supplying epitaxial films. The paper was received for publication on 9 May 1985.

EXPERIMENTAL STUDY OF CO₂ LASER IN CRITICAL VIRTUAL CONCENTRIC RESONATOR

Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 5 No 6, Dec 85
pp 257-260

[Article by Zhang Rong [1728 5554], Institute No 633, Ministry of Aeronautics]

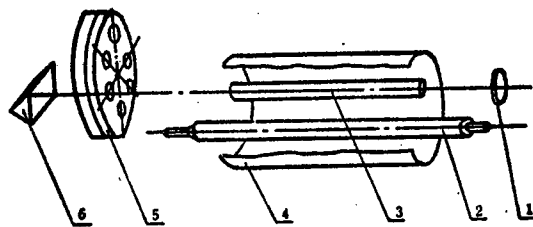
[Abstract] The experimental study of metastable resonators has been neglected by researchers. However, these resonators have the advantages of unstable resonators (such as spherical wave oscillation and large model volume) and stable resonators (such as output of all light spots), in addition to uniform distribution of light beam intensity. Therefore, metastable resonators are a relatively ideal resonator type. The virtual concentric metastable resonators are the optimal resonator type on account of the small divergence angle of light beam and uniform distribution of energy (see page 34 in "Jiguangqi Sheji Jichu" [Fundamentals of Laser Design] by He Guangsheng [6378 0342 3932]). The paper presents an experimental study of properties of critical virtual concentric metastable resonators. The results show that diffraction losses and adjustment precision of the resonators and laser gain must be considered for the mode selection using critical metastable resonators. Nine figures show the experimental setup, diffraction losses with varying $g_1 g_2$ values, the relations between $g_1 g_2$ values, on the one hand, and mode and difference of one-way diffraction losses, on the other, output energy curves of resonator, effects on output modes by slant mirrors and ratio of two curvature radii, relationship between resonator output power and mirror dip angle, and virtual concentric resonator and its equivalent forms. The author is grateful to Cheng Zhaogu [4453 0340 6253] for his counsel. The paper was received for publication on 9 May 1985.

EXPERIMENTAL STUDY ON CRATERS OF METAL SURFACE BY PARTIAL Q-SWITCHED LASER

Shanghai YINGYONG JIGUANG [APPLIED LASER] in Chinese Vol 5 No 6, Dec 85
pp 265-267, 256

[Article by Zhu Yanbin [2612 1693 1755], Chen Junjian [7115 0193 1017], Li Jun [2621 6511] and Zhang Fan [1728 1581], Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Abstract] The paper briefly presents experimental results on craters formed on brass, steel, aluminum alloy and other metals produced by a focusing laser. Variations of laser pulse shape can be achieved by the partial Q-switched technique. The authors designed a partial Q-switched dye container capable of gradation; the dye container designed is a component in a ruby laser. The Q-switched ruby laser capable of gradation is shown in the following figure.



Key:

1. Output reflective mirror
2. Straight tube xenon lamp
3. Ruby rod
4. Light focusing chamber
5. Gradation Q-switched dye container
6. Rectangular prism

Three other figures show laser waveforms produced by gradation Q-switched dye container, a setup focusing laser beams with different waveforms onto metal

surface, and craters on brass specimens. Four tables list data of the output property of ruby lasers, calculated volumes of craters from diameter and depth measured with a measurement microscope, surface craters in different metals, and sampling efficiency of different metal specimens at different laser operating states. The authors are grateful to Dai Guichen [2071 2710 2525] for his assistance. The paper was received for publication on 15 April 1985.

10424/8309

CSO: 4009/41

NEW POLE-ASSIGNMENT SELF-TUNING ALGORITHM

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 479-486

[Article by Gong Weibo [7895 4850 0590] and Yang Xueshan [2799 1331 3790], Department of System and Management Science, China University of Science and Technology]

[English Abstract] A new pole-assignment self-tuning regulation algorithm is presented that is much simpler than Wellstead's explicit algorithm, thus greatly reducing the computation load. Also under the same conditions as those of the explicit algorithm, the self-tuning property of the new algorithm was proved, and by successful simulation in computers, the new algorithm was shown to need less computation and to have good convergence. Because of its on-line operation, this algorithm has important practical significance. (Paper received 12 June 1984.)

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ELECTRIC CONDUCTANCE OF $\text{Ln}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ CATALYSTS CONTAINING RARE EARTH

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 426-433

[Article by Lin Peiyan [2651 1014 8827], Yu Min [0060 2404], Shi Wenjun [4258 2429 0193], and Wei Zhenyu [7614 7201 1342], of the Department of Modern Chemistry, China University of Science and Technology]

[English Abstract] The electric conductance of the $\text{Ln}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ catalysts ($\text{Ln} = \text{La}, \text{Ce}, \text{Pr}, \text{Nd}, \text{Sm}, \text{Gd}, \text{Tb}, \text{Dy}, \text{Ho}, \text{Er}$) was measured in a vacuum system, 24-58 Torr O_2 and C_2H_6 respectively at 25-370°C. The $\lg G-1/T$ relations appeared as a mixed conductor in the vacuum system. The higher the electric conductance was, the lower the activity of the oxidation of C_2H_6 would be, for the four single perovskite catalysts. Generally, oxidation activity of C_2H_6 became high when the catalysts in which the slope of the $\lg G-1/T$ curve under an O_2 atmosphere at high temperature became low. The change of electric conductance with time was also measured on $\text{Nd}_{0.7}\text{Sr}_{0.3}\text{MnO}_3$ under 25 Torr CO and O_2 respectively. It was found that the direction of the change of electric conductance for CO and O_2 are the same. (Paper received 7 February 1985, and supported by the Science Fund of the Chinese Academy of Sciences.)

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Chemistry

NEW TECHNIQUE FOR IMPROVING PERFORMANCE OF ALKALINE MANGANESE DIOXIDE-ZINC CELL

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 434-438

[Article by Lin Fengliang [2651 2800 0404] and Cai Futi [5591 0265 4398], Department of Modern Chemistry, Hefei Cell Plant, China University of Science and Technology]

[English Abstract] A new production technique has been developed to improve the properties of the alkaline manganese dioxide-zinc cell. The technique and some experimental results are described, including the effect of cathode composition and ring-formation [crimping?] pressure on the cell properties. The results show that the fabrication procedures of the cell have been considerably simplified by this technique. Specific energy as high as 72 Wh/kg of the resulting cells has been obtained under the condition of continuous discharge through a resistance load of 2Ω . (Paper received 20 April 1985.)

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CSO: 4009/1037

Communications

ANALYSIS OF DEGREE OF POLARIZATION OF OPTICAL WAVE IN SINGLE-MODE OPTICAL FIBER UNDER RANDOM COUPLING

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 76-82

[Article by Huang Shangyuan [7806 0006 0337], Lin Zongqi [2651 1350 3823], and Fan Weimin [5400 0251 3046], of the Shanghai Jiaotong University]

[English Abstract] A model for discrete mode-coupling centers with random coupling coefficients and equal intervals is proposed to simulate an actual single-mode optical fiber. It has proved to be impossible for the degree of polarization (DOP) in a single-mode fiber with random mode coupling to approach zero with increasing fiber length. Numerical results show that the ensemble average of DOP will approach a non-zero asymptotic value which depends on coupling intensity, light source spectrum, fiber birefringence and spatial frequency of the coupling centers. (Paper received 11 December 1984.)

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Communications

HIGH-ORDER FINITE ELEMENT METHOD FOR WAVEGUIDES OF ARBITRARY CROSS-SECTION

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 62-69

[Article by Xu Shanjia [1776 0810 7468] of University of Science and Technology of China, and S.T. Peng [1756 2646 2625] of the New York Institute of Technology]

[English Abstract] The high-order finite-element method was used to determine the eigenvalues of waveguides of arbitrary cross-section. A regional division technique is introduced to facilitate the computer programming. As an illustration of the power and efficiency of the high-order finite element method, the eigenvalues of the dominant and higher-order modes for three different waveguide geometries are computed by the linear and second-order element method. The results show that the accuracy can be improved by a factor of $10-10^3$ over those of the linear element method. Since the high-order finite element method is particularly powerful for the higher-order modes, it is especially suitable for the analysis and design of multimode devices. (Paper received 3 March 1984.)

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CSO: 4009/1039

INFLUENCE OF INTEGER CONVERSION OF PREDICTION VALUE IN DPCM SYSTEMS ON CHANNEL ERROR RESPONSE

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 56-61

[Article by Zhang Chuntian [1728 2504 3944], Tianjin University]

[English Abstract] In DPCM systems for digital picture signals, the non-linearity in the decoders comes principally from the inter conversion of the prediction value. The integer conversion may be able to produce considerable effects on the channel error response of DPCM systems. Because of the nonlinearity, the BIBO stability conditions of the decoder, derived under linear approximations, are not sufficient to ensure a complete decay of channel errors. In this paper, two improved methods of the integer conversion of the prediction value are proposed. Compared to the conventional methods of the integer conversions, the new methods reduce the subjective effect of the channel error pattern in the received pictures. (Paper received 28 April 1984.)

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SELECTION OF RELEVANT EDGE, SUBJECTIVE TEST IN SYNTHETIC HIGH CODING

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 43-49

[Article by Yao Qingdong [1202 1987 2767], Chen Cunchun [7155 1317 2797], and Zhang Shoumiao [4545 1343 5379] of the Zhejiang University]

[English Abstract] The bit rate of synthetic high coding is determined by the content of relevant edges of a picture. In this paper, the edge statistics of four test pictures are given, the masking effect is used to delete nonrelevant edges. From the result of subjective tests, the natural test pictures and RMA test chart can be coded at a rate of 3.25-3.3 bit/pel, and have the same quality as 8 bit/pel PCM pictures. Hence synthetic high coding is a possible method of coding of luminance signals that meets the requirement to encode PAL TV signals into the bit rate of 34 Mbit/s. The Philip resolution chart, which is used to examine the quality of studio facilities, cannot be coded at low bit rate with a good quality because of the high edge content. (Paper received 4 May 1984.)

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CSO: 4009/1039

Communications

REJECTION OF PILOT INTERFERENCE IN CLASS IV PARTIAL RESPONSE SYSTEMS USING TRANSVERSAL EQUALIZERS

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 19-25, 69

[Article by Li Leming [2621 2867 3046] of the Chengdu Institute of Radio Engineering]

[English Abstract] In a data transmission system using class IV partial response signaling, a pilot signal with frequency at the signal spectrum null is sent for timing recovery in the receiver. This pilot becomes an interference in the decision circuit, so it should be rejected. In this paper, it is proved that if there is an adaptive transversal equalizer in the system, the equalizer can also reject the pilot interference. Using this characteristic, the receiver can be simplified. Explicit formulas for optimum tapping coefficient and the minimum mean square error are obtained. (Paper received 28 May 1984.)

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Communications

COMPUTER SIMULATION OF BER PROBLEM IN PSK DIGITAL COMMUNICATION

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 10-18

[Article by Guo Yanying [6751 5888 3853] of the Beijing Institute of Radio Metrology and Measurement]

[English Abstract] B.E.R. (bit error rate) is an important index of the characteristics of the PSK digital communication. Classical theorems have many limitations for solving the B.E.R. problem of this PSK communication. Especially, it cannot estimate the effect of internal noise of PLL (coherent local oscillator) on B.E.R. This paper introduces the Monte-Carlo computer simulation method to determine B.E.R. values of PSK communication. One of its key-link techniques is producing a high quality pseudo-random sequence simulating oscillator phase noise. Significant sampling method must also be used in order to minimize the computing time. Several examples are given to illustrate how the computer simulation is realized. (Paper received 10 July 1984.)

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CSO: 4009/1039

NOVEL ANALYSIS FOR N-PORT WAVE DIGITAL FILTERS

Beijing TONGXIN XUEBAO [JOURNAL OF CHINA INSTITUTE OF COMMUNICATIONS] in Chinese Vol 6 No 4, Oct 85 pp 1-9

[Article by Xiong Tongzhou [3574 0681 5297], He Hucang [0149 6233 0221] of Tongji University and Huang Dawei [7806 1129 5898] of Shanghai Institute of Railway Technology]

[English Abstract] A novel analysis method for N-port wave digital filters is presented. Based on the scattering parameter representation of the generalized N-port adaptor, the frequency domain equation of the filter is first established. Then, the complex interpolation and the discrete Fourier transform technique are utilized to find the transfer function of the filter. (Paper received 25 April 1984.)

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INTRODUCING SIMPLE DEVELOPMENT SYSTEM OF MICROCOMPUTER

Hefei ZHONGGUO KEXUE JISHU DAXUE XUEBAO [JOURNAL OF CHINA UNIVERSITY OF SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 4, Dec 85 pp 471-478

[Article by Guan Shan [7070 1472], Department of System and Management Science, China University of Science and Technology]

[English Abstract] A simple development system is presented for on-line communication with microcomputers and single-board microcomputers. It mainly solves the problem of transmission of object programs in assembly language. The system can pass the object program into the memory of a single-board microcomputer, and can pass a tape file into a microcomputer for disassembly. The system is suitable for any kind of microcomputer with an RS-232C series data interface and a CP/M disk operating system. If a CRT display terminal were to be connected to the system interface, it could carry out the simple communication. (Paper received 16 January 1985.)

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CSO: 4009/1037

Electronics

MICROCOMPUTER-BASED CONTROL OF SINGLE BRIDGE CONVERTER SIMULATORS FOR HVDC TRANSMISSION

Xi'an DIANLI DIANZI JISHU [POWER ELECTRONICS] in Chinese No. 1, 1 Feb 86 pp 34-43

[Article by Wei Xiaoming [7614 1321 6900], Zhao Xinguo [6392 2450 0948], and Zhang Ruichang [1728 3843 2490] of Huabei (North China) Electric Power Institute]

[English Abstract] The design and operation of a microcomputer-based control system of a single bridge converter simulator for HVDC transmission is presented. The converter system, hardware measurement and microcomputer extension are described. Based on the control principle of HVDC, emphasis was put on the program design of the rectifier and inverter regulators with constant direct current, constant firing delay angle and constant extinction angle. Experimental dynamic characteristics of start, stop, and normal operations of this system are also given. The principle of the converter with a microcomputer can be extended to thyristor drive equipment. With a phase-locking loop, the control system will considerably improve the speed and voltage regulating characteristics.

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CSO: 4009/1038

Electronics

PWM LARGE-SCALE IC, ITS APPLICATION IN VARIABLE FREQUENCY VARIABLE SPEED DRIVES OF THREE-PHASE AC MOTORS

Xi'an DIANLI DIANZI JISHU [POWER ELECTRONICS] in Chinese No 1, 1 Feb 86
pp 28-34

[Article by Ding Xuewen [0002 1331 2429] of Northwest Textile Institute of Technology]

[English Abstract] A PWM large-scale IC (HEF4752V) and its application in the speed control system of three-phase AC motors are described. This IC is specially designed for generating PWM signals. When it is combined with an analog control circuit, it is convenient to get various variable frequency, variable speed PWM inverter-AC motor drive systems, uninterruptible power sources, etc. A proposal is presented about this PWM IC in combination with a microprocessor-based control, and problems in practice and their solutions are described.

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INCREASING POWER FACTOR OF SOURCE FOR THYRISTOR CONVERTERS USING LC-FORCED COMMUTATION CIRCUIT WITH FLYBACK DIODE

Xi'an DIANLI DIANZI JISHU [POWER ELECTRONICS] in Chinese No 1, 1 Feb 86 pp 1-8

[Article by Zheng Yaohua [6774 5069 5478] of Zhejiang Institute of Technology]

[English Abstract] An advanced phase-controlled converter using an LC-forced commutation circuit with a flyback diode was developed for increasing the power factor. The operational characteristics of the converter are analyzed and the parameter calculation methods of the main elements are discussed. Analysis and experiment show that the converter has many advantages over other existing converters: its operation is stable; it can give output of reactive power; and it can get energy savings, more electrical capacity gains and higher power factor.

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Infrared Research

RESOLUTION OF ABSORPTION BANDS, STARK SPLITS OF Nd^{3+} IN GLASS BY SELF-DECONVOLUTION METHOD

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 409-412

[English abstract of article by Wang Zhenming [3769 2182 2494] of the
Department of Physics, Suzhou University; and Li Zhengzhi [2621 2973 4160]
of the Department of Physics, Hangzhou University]

[Text] Using the Fourier self-deconvolution method, four absorption bands of Nd^{3+} in one kind of laser glass are dealt with, two of which are located in the near infrared spectral region. The inhomogeneous intrinsic lineshapes are eliminated and a lot of spectral lines are resolved. The stark splits of ${}^4\text{I}_{9/2}$ and ${}^4\text{F}_{3/2}$ energy levels of Nd^{3+} are determined at room temperature.

EFFECT OF PLASMA PARAMETERS ON PROPERTIES OF HYDROGEN IN a-Si:H FILMS,
RELEASE MECHANISM OF HYDROGEN IN a-Si:H FILMS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 413-420

[English abstract of article by Wang Cheng [3769 3397], He Kelun [0149 0344 0243] and Cheng Ruguang [4453 1172 0342] of Shanghai Institute of Ceramics, Chinese Academy of Sciences; and Qi Mingwei [4359 2494 4850] of Shanghai Institute of Metallurgy, Chinese Academy of Sciences]

[Text] The effect of preparation parameters on the nature of hydrogen bonds in a-Si:H films prepared by radio frequency glow-discharge plasma deposition is studied. Also, the release mechanism of hydrogen from a-Si:H films during annealing is discussed. It is found that the nature of the hydrogen bond in a-Si:H films can be controlled by varying the preparation parameters, especially the plasma pressure. A concerted hydrogen model is suggested by the authors to explain the mechanism of the release of hydrogen from a-Si:H films during annealing.

150-ELEMENT BCCPD LINEAR ARRAY IMAGE SENSOR

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 421-427

[English abstract of article by Zhang Zhongtang [1728 1813 1016], Tang Xuexin [3382 1331 2450], Zhang Quan [1728 2938] and Dong Jianming [5516 1696 3046] of Shanghai Institute of Technical Physics, Chinese Academy of Sciences]

[Text] The principle of operation, structure and characteristics of a 150-element buried channel charge-coupled device with a photodiode array (BCCPD) are reported. The relationships of the impurity profile in the inversion layer and the maximum channel potential versus dose, width of SiO_2 and gate bias are analyzed. The characteristics containing transfer efficiency of the device are measured.

GAIN PROPERTIES OF FREE-ELECTRON LASER UNDER ACTIONS OF GRADIENT
MAGNETIC FIELD

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 428-432

[English abstract of article by Zhao Donghuan [6392 2639 3562] and Chen
Jianwen [7115 1696 2429], et al., of Shanghai Institute of Optics and Fine
Mechanics, Chinese Academy of Sciences]

[Text] Gain properties of free-electron lasers are calculated in which a
gradient magnetic field is superposed on a spatially periodic magnetic field
along the axis of the siggler. It is shown that better operating properties
of laser gain are obtained by the use of a gradient magnetic field than of
a uniform magnetic field.

IMPROVEMENT OF RESOLUTION IN FT-IR SPECTROMETER BY USING NEW APODIZATION
FUNCTIONS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 433-438

[English abstract of article by Dong Junyi [5516 7165 6654], et al., of the
Department of Physics, Suzhou University]

[Text] Using a new class of apodization functions, the effects of apodization on resolution in a FT-IR spectrometer are studied. Results show that the degradation of resolution as a result of apodization does not necessarily occur. Given fine apodization functions, the resolution may be better than that of the unapodized while the largest secondary maximum remains at the same level. Experimental results show that the performances of the instrument could be upgraded if the new apodization functions were to be applied to the FT-IR spectrometer.

EFFECTIVE MASS OF ELECTRONS IN CONDUCTION BAND OF $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$ SEMICONDUCTORS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 439-445

[English abstract of article by Chu Junhao [5969 0689 3185] of the
Laboratory for Infrared Physics, Shanghai Institute of Technical Physics,
Chinese Academy of Sciences]

[Text] A formula for calculating the effective mass of electrons at the bottom of the conduction band is derived as $m^*/m_0 = 0.05966 E_g(E_g + 1)/(E_g + 0.667)$, by taking Kane's mode and the energy band parameters obtained from the best fit between theoretical and experimental intrinsic absorption curves for very thin samples of $\text{Hg}_{1-x}\text{Cd}_x\text{Te}$. Then the effective mass of electrons in the conduction band at the wave vector k may be calculated by the expression $(m^*/m_0) = (m_0^*/m_0) \sqrt{1 + 8P^2 k^2 / 3E_g^2}$. The calculated results agree well with the experimental ones.

EFFECT OF SCANNING DRUM, PRISM OF PERFORMANCES OF INFRARED IMAGING SYSTEMS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese
Vol 4 No 6, Dec 85 pp 446-451

[English abstract of article by Yang Yinghuai [2799 2019 2849] of Tianjin
Institute of Technical Physics]

[Text] Through analysis of the moving trace during scanning for a scanning mirror drum and prism, the mathematical expressions are derived of the focus-out for different scanning angles and the effects of change of focus-out on performances of infrared imaging systems.

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CSO: 4009/54

Nuclear Detectors

COMPOUND SEMICONDUCTORS FOR NUCLEAR DETECTORS

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY]
in Chinese Vol 5 No 6, Nov 85 pp 334-337, 333

[Article by Zuo Kaifen [1563 7030 5358] and Liu Jiguo [0491 4949 0948],
Institute of Nuclear Energy Technology, Qinghua University]

[Abstract] Semiconductor nuclear radiation detectors require special materials. Some binary compound semiconductors having Z more than 30 and E_g between 1.3 and 2.6 eV are compared; HgI_2 , $CdTe$ and $CdSe$ may be the best of all. The paper discusses the performance of the detectors made from these three materials; in addition, developmental work on compound semiconductors for nuclear detectors in China is described. Seven figures show gamma spectrum lines measured with a $CdTe$ detector, the pulse amplitude distribution in a mixed field of neutrons and gamma rays as measured by a $CdTe$ detector, gamma rays measured with a HgI_2 detector and its polarization phenomenon, gamma rays measured with a $CdSe$ detector and their measurement dependence on counting efficiency, leakage current and electric field, and stability of the three above-mentioned detector types ($CdSe$, $CdTe$ and HgI_2). The authors are grateful to Liu Qili [0491 0796 4409] and Wu Xumo [0702 4872 2875] for their assistance, and Wang Jialong [3769 0502 7893], Wang Jiuchun [3769 0036 2504] and Zhang Bingzhong [1728 4426 1813] for their investigation of compound semiconductor detectors in China. The paper was received for publication on 5 August 1984.

HIGH-PURITY GERMANIUM NUCLEAR RADIATION DETECTORS

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY]
in Chinese Vol 5 No 6, Nov 85 pp 338-343

[Article by Sun Xueyu [1327 7185 3842], Beijing Nuclear Instrument Plant]

[Abstract] The paper is an overview of high-purity germanium detectors used in X and gamma ray spectrum analysis. It describes the material requirements for detector fabrication and lists parameters of fabrication, structure and property. This kind of detector is compared with silicon X-ray detectors, Ge(Li) gamma ray detectors, and NaI(Tl) gamma ray scintillators. Current developments aim at better quality of materials, larger detector volume, higher detection efficiency and resolving power for gamma ray detectors, as well as better structure and lower electronic noise. Four figures show the geometric shapes of detector response in energy resolving power (of coaxial germanium detectors) versus energy of gamma rays, relationship between absolute efficiency of typical high-purity germanium detectors, and gamma ray energy, as well as gamma ray spectra of the standard source (SRM 4215 C) for germanium and NaI(Tl) detectors. The paper was received for publication on 11 July 1984.

INTERNAL ELECTROMAGNETIC PULSE CAUSED BY PROMPT GAMMA PHOTONS IN CYLINDRICAL CAVITY

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY] in Chinese Vol 5 No 6, Nov 85 pp 344-348

[Article by Wang Taichun [3769 3141 2504] and Wang Yuzhi [3769 3768 5347], Institute of Applied Physics and Computational Mathematics, Beijing]

[Abstract] The equation of continuity and the equations of momentum of primary electrons are derived in two-dimensional cylindrical coordinates. The primary electric current (and the results of electromagnetic pulse caused by it) calculated, respectively, by the Eulerian, Lagrangian and PIC methods is given. Under the condition of weak electric field E ($E \leq 10^4$ V/m), the results found by these methods and the non-self-consistency method are relatively close. Two tables list data of maximum primary currents calculated with different methods, and the maximum values of electric field calculated with three methods. Six figures show a cylindrical cavity, variation curves of primary current for different gamma photon intensities calculated with the Eulerian and Lagrangian methods, and variation curves of gamma photons versus electromagnetic fields. The authors are grateful to Zhou Guangyi [0719 0342 6965] for his assistance. The paper was received for publication on 21 May 1984.

TIME-OF-FLIGHT COUNTER WITH PERPENDICULAR COUPLING

Beijing HEDIANZIXUE YU TANCE JISHU [NUCLEAR ELECTRONICS AND DETECTION TECHNOLOGY]
in Chinese Vol 5 No 6, Nov 85 pp 357-359, 328

[Article by Zheng Zhipeng [6774 1807 7720], Zhu Yucan [4376 3768 3503], Shao Yuying [6730 3022 7727], Lu Junguang [0712 6511 0342], Sun Hansheng [1327 3352 3932], and Deng Shusen [6772 2885 2773], Institute of High Energy Physics, Chinese Academy of Sciences]

[Abstract] A positron-electron (negatron) collider of 4.4 GeV will be built in Beijing; a large detector (called the Beijing spectrometer) will operate in the collider. In the Beijing spectrometer, the time-of-flight (TOF) counter includes cylinder and end cap components to measure the flight time of particles for particle identification and ejection of cosmic rays. With the end cap added, the TOF counter can enhance reception and collect within a smaller angle for an enhanced physical image. A prototype of the end-cap TOF counter used on the Beijing spectrometer was built. The scintillator was perpendicularly coupled via a light guide. In satisfying the mechanical requirements, the small counter has adequate physical properties. The time resolution (root-mean-square deviation) is 150 to 217 ps. Five figures show the structure of TOF counter, distributions of pulse amplitude and time resolving power with respect to positions, a test circuit for time resolving power, and time spectra of different positions. The paper was received for publication on 6 March 1985.

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CSO: 4009/45

EIGENOSCILLATIONS IN A PLASMA COLUMN WITH ELLIPTICAL CROSS-SECTION CLOSE TO ION CYCLOTRON FREQUENCY

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 5 No 4, 15 Dec 85 pp 201-207

[Article by Ding Zhilai [0002 5347 0171], Southwestern Institute of Physics,
Leshan, Sichuan]

[Abstract] Heating with fast magnetofluid waves led to good results in a Tokamak facility. It is necessary to understand eigenoscillations of fast waves in plasma in order to heat with these waves effectively. In exploring the feasibility of heating with fast waves in a Tokamak facility of elliptical cross-section, the paper emphasizes studying eigenoscillations in a plasma column with elliptical cross-section close to the ion cyclotron frequency. The dispersion formulas of plasma waves close to the ion cyclotron frequency are given for both the plasma-filled waveguide and free boundary in elliptical cylindrical coordinates. The eigen modes of fast magnetofluid waves and slow waves for a plasma-filled waveguide with elliptical cross-section were calculated. The results show that fast waves can propagate in the high density region, while slow waves propagate only in the region of low plasma density when $\omega/\omega_{ci} > 1$. Five figures show the elliptical coordinates system, relations (for fast waves) between the plasma density on the one hand, and the wave vector and eigenoscillation frequency on the other; as well as the relations (for slow waves) between the wave vector, on the one hand, and density and frequency, on the other. The author is grateful to Gu Yongnian [5357 3057 1628] and Qin Yunwen [4440 6663 2429] for their assistance. The paper was received for publication on 14 August 1984.

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GENERALIZED VARIATIONAL PRINCIPLE OF MAGNETOHYDRODYNAMICS FOR IDEAL INCOMPRESSIBLE FLUIDS

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS] in Chinese Vol 5 No 4, 15 Dec 85 pp 208-212

[Article by Fang Jinqing [2455 6930 3237], Institute of Atomic Energy, Chinese Academy of Sciences]

[Abstract] The magnetohydrodynamics (MHD) theory has been widely applied in physics but solving MHD equations is difficult and complex. Professor Qian Weichang [6929 0251 7022] developed the variational principle and its generalized form. His approach leads to a way for solving MHD equations. Qian's high-order Lagrangian method considers both linear and quadratic terms of the variational condition. The paper discusses Qian's generalized variational principles in MHD for an ideal incompressible fluid under certain conditions. The author is grateful to Professor Jin Xingnan [6855 2502 0589] for his encouragement. The paper was received for publication on 26 April 1984.

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X-RAY GENERATOR FOR 5-25 keV CALIBRATION

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 5 No 4, 15 Dec 85 pp 213-217

[Article by Gong Dingfu [7895 1353 1133] and Zhu Guoqin [2612 0948 2953],
Southwestern Institute of Physics, Leshan, Sichuan]

[Abstract] A low and medium energy monochromatic X-ray generator was developed. X-ray fluorescence is produced by bremsstrahlung excited atoms and is filtered by the absorption edge. The intensity, purity and the corresponding dose rates at four energy points in the range of 5-25 keV were determined experimentally; thus, the generator can be used in calibration. One table lists data of energy, intensity and dose rate at four energy points. Eight figures show a monochromatic X-ray source, an X-ray generator, its 100 kV circuit, high voltage correction curve, an experimental layout, a block diagram of the electronic measurement circuit, a response curve of energy points, and oscillograms of four energy points. The authors are grateful to the following persons: Xing Hongye [6717 3163 2814] and Liu Xianliang [0491 7359 0081] for their support, Zhang Peishu [1728 1014 1859] for proposing the topic and his assistance in generating bremsstrahlung at high voltage, and Hui Zuxing [1920 4371 5281], Chen Shiqing [7115 0099 3237] and He Fachang [0149 4099 2490] for their assistance in general. The paper was received for publication on 20 March 1984.

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HARD X-RAY MEASUREMENT ON ECR DISCHARGE IN SIMPLE MAGNETIC MIRROR

Chongqing HEJUBIAN YU DENGLIZITI WULI [NUCLEAR FUSION AND PLASMA PHYSICS]
in Chinese Vol 5 No 4, 15 Dec 85 pp 218-223

[Article by Wang Zhengmin [3769 2973 3046], Chen Qixu [7115 0366 2485], Yin Xiejin [1438 0588 6930], Zhang Zemin [4545 3419 3046], Wang Kongjia [3769 1313 0857], Liu Shengxia [0491 0524 0204], Zhang Zemin [4545 3419 3046], Wang Kongjia [3769 1313 0857], Liu Shengxia [0491 0524 0204] and Li Linzhong [2621 2651 1813], Institute of Plasma Physics, Chinese Academy of Sciences]

[Abstract] In the paper, a NaI(Tl) scintillation detector is used to measure waveforms and spectra of hard X-ray in a simple magnetic mirror. The data processing method is described; the temperature and energy of hot electrons are given and experimental results discussed. Six figures show a hot electron ring (HER) experimental setup for X-ray detection, an electronic circuit diagram, X-ray spectrum, and X-ray variations with atmospheric pressure, magnetic field, microwave pulse width and power. The authors are grateful to Yang Size [2799 1835 3419], Ren Zhaoxing [0117 0340 2622], Chen Shixian [7115 0013 6343], Fang Yude [2455 3842 1795] and Zhang Shuqing [1728 2631 3237] for their taking part in the experiments. The paper was received for publication on 29 May 1984.

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CSO: 4009/42

Nuclear Techniques

CUMULATIVE DOSIMETRY OF RADON, ITS DAUGHTER PRODUCTS

Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 9, Dec 85 pp 5-8

[Article by Wang Ruikai [3769 3843 0418], Wang Mingchang [3769 2494 2490], Li Xianjie [2621 0341 2638], and Tian Mengxia [3944 1125 7209], Sixth Research Institute, Nuclear Industry Ministry]

[Abstract] This paper introduces a plastic track detector used to measure cumulative exposure to radon and its daughter products in a mine environment.

According to the maximum energy loss of alpha particles in polycarbonate plastic, the sensitive volume of detection can be increased. First, the plastic foil is corroded and then the authors recorded magnified tree tracks with electrochemical etching; the corresponding exposure was determined from the measured track densities.

The detectors were calibrated in a laboratory radon chamber. The calibration factor was measured and found to be $11 \text{ tracks/cm}^2\text{-WLH}$, depending on equilibrium factor F . The low and upper limits of detectability are 0.5 WLH and 50 WLM, respectively.

One table lists the selection of optimal parameters for electrochemical etching.

Seven figures show an alpha cumulative exposure detector; an arrangement for electrochemical etching; the effect on track diameter due to the pre-etching time and distribution of peak values of electric field intensity; relations between pre-etching time, on the one hand, and stripping thickness, detection efficiency, and incident energy (of alpha particles), on the other; the relationship between range in solid medium and incident energy, as well as the relationship between track density and exposure time.

The authors are grateful to Professor Yang Fujia [2799 4395 1367] of Fudan University for his valuable suggestion. The paper was received for publication on 8 February 1984.

DETERMINATION OF CYCLOTRON BEAM ENERGIES BY TIME-OF-FLIGHT METHOD

Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 9, Dec 85 pp 21-23

[Article by Xiao Genlai [5618 2704 0171], Gui Shouzao [2981 1108 6644], Tian Jiaqi [3944 1367 4388], Liu Jingyi [0491 7234 1837], and Shi Shuanghui [4258 7175 1920], Shanghai Institute of Nuclear Research, Chinese Academy of Sciences]

[Abstract] On being rebuilt, the isochronous cyclotron at the authors' institute has a continuously variable proton energy from 20 to 30 MeV. There are many methods for measuring these beam energies: elastic or non-elastic scattering, and nuclear reaction, among others. With simplicity, reliability, high measurement accuracy, and suitability to a wide energy range, the time-of-flight method was used to measure the beam (proton) energies of the rebuilt cyclotron. The experimental errors are in the range of ± 0.3 percent. The results are 11.78 ± 0.03 , 14.79 ± 0.04 , 19.95 ± 0.06 , 24.90 ± 0.07 , and 29.86 ± 0.09 MeV, respectively.

Three figures show an experimental arrangement for measuring beam energies, a block diagram showing instruments of the measurement system, and a time-of-flight spectrum recorded with a multi-channel pulse analyzer.

The authors are grateful to Chen Moubo [7115 5399 0130], Yao Chongjue [1202 1504 6030], Gao Wenzhao [7559 2429 3564], and other cyclotron operating personnel for their assistance. The paper was received for publication on 20 September 1984.

MEASUREMENT OF RELATIVE NEUTRON SENSITIVITY (K_U) OF PHOTON DOSIMETERS FOR 14.5 MeV NEUTRON

Shanghai HE JISHU [NUCLEAR TECHNIQUES] in Chinese No 9, Dec 85 pp 24-27

[Article by Wen Zhutang [3306 4376 1016], Jiang Lijin [5592 4409 2516], and Zhong Bingnan [6945 3521 0589] of Guangdong Institute of Analysis, Zhang Jimin [1728 4764 2404] and Wang Hongyan [3769 1347 8746] of a branch of Chinese Measurement Academy, and Zhu Zhongmei [2612 0022 2734] and Hua Zhongliang [5478 6945 0081] of P.O. Box 1044, Beijing]

[Abstract] The paper describes the operating principle and method for determining the relative neutron sensitivity (K_U) of the photon dosimeters. With a modified lead attenuation method, the K_U values of 2 cm³ C-CO₂ (FWT, IC-17G), and 3 cm³ Al-Ar (FWT, IC-17A1) chambers were determined to be 0.271 ± 0.021 and 0.132 ± 0.006 , respectively. The K_U of a Geiger-Muller counter (FWT, GM-2(446)) was determined to be 0.173 ± 0.002 .

Comparing these results with other experimental data, one can find that the relative neutron sensitivity (K_U) of the photon dosimeters was not very adequate to the μ/f of photon component. The uncertainty of K_U measured in the lead filtration method was estimated. The neutron and gamma absorbed-doses for ICRV muscle tissues in the same mixed field have been measured by the paired detectors technique.

One figure shows the experimental arrangement. Five tables lists data for the response of weakened beams passing through different thicknesses of lead, and the quotient between response and gamma-ray sensitivity as measured by the detector, the K_U value of a photon dosimeter, an estimate of K_U indeterminacy, relation between K_U and μ/f , and the measurement result of wide beam absorption dosage in a (n, γ) mixed field.

The paper was received for publication on 10 November 1983.

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CSO: 4009/51

THEORETICAL ANALYSIS OF ASYMMETRIC PULSE SHAPES IN SYNCHRONOUSLY PUMPED DYE LASERS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85 pp 1057-1063

[English abstract of article by Bao Xiaoyi [7637 2556 3015] and Guan Xin'an [7070 0207 1344] of the Department of Physics, Nankai University, Tianjin]

[Text] By expanding the gain of the mode-locked equation to the third order, we have solved the equation with the aid of the Lagrange multiplier method and obtained asymmetric pulse shapes in synchronously pumped dye lasers. We can thus give qualitative and quantitative accounts for the asymmetric factor μ .

TWO-PHOTON SPECTRA OF NEUTRAL BARIUM IN HIGH-LYING STATES

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1064-1068

[English abstract of article by Wu Donghong [0702 2639 1347], et al., of the Optics Laboratory, Department of Physics, Jilin University; and Ding Dajun [0002 1129 6511] of the Atomic and Molecular Physics Institute, Jilin University]

[Text] Barium atoms pumped by a dye laser can absorb two photons and transit to high-lying states. By using a heat diode to detect ionization signals, we obtained three even-parity Rydberg series, $6s\ ns^1S_0$ ($n=11\sim46$), $6s\ nd^1D_2$ ($n=9\sim60$) and $6s\ nd^3D_2$ ($n=10\sim28$), as well as five perturbing levels, $5d8s^3D_2$, $5d8s^1D_2$, $5d8s^1D_2$, $5d7d^3F_2$, $5d7d^3P_0$ and $5d7d^1D_2$. The Lu-Fano plot is used in our discussion.

STIMULATED RAMAN SCATTERING WITH CASCADE PUMPING IN HIGH PRESSURE H₂

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1069-1073

[English abstract of article by Lou Qihong [2869 4388 3163] and Wang Zhijiang [3769 0037 3068], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The stimulated Raman scattering pulse from a high-pressure H₂ Raman cell pumped by a XeCl excimer laser was used to pump another short high-pressure H₂ Raman cell. The higher order Stokes lines were enhanced successfully by using this cascade pumping configuration.

ACOUSTO-OPTIC OPTICAL BISTABILITY IN DIFFERENT STATES OF ACOUSTIC FIELD

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85 pp 1074-1081

[English abstract of article by Dong Xiaoyi [5516 1321 5030] and Zhang Xiaojie [1728 1420 3381], et al., of the Modern Institute of Optics, Nankai University]

[Text] Characteristics of A-O optical bistability with different travelling-wave coefficient α and effects of the acoustic field state on the bistability are analyzed. It is pointed out that for A-O bistability to be of practical usefulness the acoustic field should have a specific α coefficient. When $\alpha=1$ (i.e., pure acoustic standing-wave field) the A-O bistability becomes useless. Experimental results are in agreement with theories.

CONTOUR GENERATION USING SPATIAL FILTERING

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1082-1089

[English abstract of article by Li Yinquan [2621 5593 3123] of the Department of Optical Engineering, Huazhong University of Science and Technology, Wuhan; and Gu Quwu [7357 0637 0710] of Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] A coherent optical method for generating contours from stereophotographs by using a grating as a spatial filter is proposed. The relationship between parallax and light amplitude distribution in the spectrum plane, the effect of spatial filtering and the final light amplitude distribution in the image plane are analyzed theoretically. The superposition of the amplitude transmittances of the stereophotographs in the object plane of a $4f$ system, when illuminated with a beam of coherent light, will result in numerous sets of straight interference fringes in the spectrum plane, with each set corresponding to a set of points with the same parallax, i.e., a contour line. When a grating is used to provide spatial filtering, only one set of fringes is allowed to transmit through the grating, while others are blocked off. Then a contour will appear in the image plane of the system. Different grating spacings correspond to different contour positions and a change in the position of the grating will lead to bright or dark contours. Straight and circular contours are obtained by using two experimental models, a slope and a conic. Experimental results with contours in different positions and having different values of brightness are given in the paper. Because it is not necessary to measure parallax point by point, the method has the advantage of quickness. In our experiment, two stereophotographs are superposed on one photosensitive plate incoherently to achieve amplitude addition so as to reduce the requirement on the system.

SOME FACTORS INFLUENCING EFFICIENCIES OF SELF-SUSTAINED DISCHARGE TRANSVERSE-FLOW CO₂ LASERS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85 pp 1097-1103

[English abstract of article by Xu Jihua [1776 4764 5478], Chen Liyin [7115 7787 0692] and Wu Zhongxiang [0702 0022 4382], et al., of the Institute of Mechanics, Chinese Academy of Sciences, Beijing]

[Text] *Theoretical computations and analyses are made of the efficiencies of self-sustained discharge transverse-flow CO₂ lasers. A model of one-dimensional steady flow, quasi-two dimensional discharge and three vibrational relaxing modes is used under various conditions of discharge, flow and cavity position in the flow direction. Efficiencies of the cascade processes (input electrical energy - energy of upper vibrational levels, energy of upper vibrational levels - output laser energy, and input electrical energy - output laser energy) are given as functions of electrode width, gas-flow velocity and cavity position. A theoretical reference is thus provided for properly selecting laser parameters, such as discharge condition, flow parameters and cavity configurations.

COMPUTER MODELING FOR A LEAD VAPOR LASER

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1104-1109

[English abstract of article by Xia Tiejun [1115 6993 0689], Yao Zhixin [1202 1807 2946], et al., of the Department of Physics, Zhejiang University, Hangzhou]

[Text] A computer model has been built to simulate the excitation process of a lead vapor laser. Results obtained from the model agree with those of experiments. The calculation indicates that the main parameter affecting laser output power is the peak electron temperature, while the limitation of repetition rates is related to the initial electron density.

A SIMPLE ANALYTICAL METHOD FOR DETERMINING THE OPTICAL GAP OF AMORPHOUS SILICON FILMS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85 pp 1110-1117

[English abstract of article by Zhu Weijia [2612 4850 0857] of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] For material research and device design of amorphous silicon solar cells, it is necessary to determine the refractive indices, thickness and absorption coefficients of α -Si films. Taking interferences and substrate effects into account, we propose a simple analytical method that allows us to determine the thickness, refractive index and absorption coefficient of a film from the usual transmittance spectrum at normal incidence. As an example, we calculated the optical gap of α -Si:H and α -SiC:H films.

DETERMINATION OF PULSE SHAPE ASYMMETRY IN A CW SYNCHRONOUSLY PUMPED DYE LASER
USING THE METHOD OF SPECTRUM-RESOLVED SHG CORRELATION

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1130-1133

[English abstract of article by Bao Xiaoyi [7637 2556 3015] and Guan Xin'an
[7070 0207 1344], et al., of the Department of Physics, Nankai University,
Tianjin]

[Text] We have determined the pulse shape asymmetry in a synchronously pumped dye laser using the spectrum-resolved SHG correlation method. In this paper we first present the basic principle of spectrum-resolved SHG correlation, then analyze the possibility of determination of the pulse shape asymmetry in a CW synchronously pumped dye laser by this method. The experimental results are in good agreement with the results of our analysis.

NEW ANALYTIC METHOD FOR CALCULATING WAVEGUIDE DISPERSION OF SINGLE-MODE FIBERS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 12, Dec 85
pp 1134-1136

[English abstract of article by Wang Zihua [3769 1311 5478] and Zhang Yilong [1728 0001 7893] of Shanghai Optical Fiber Technology and Modern Communication Research Institute, Shanghai University of Science and Technology]

[Text] A new analytical method is developed for calculating the waveguide dispersion of single-mode fibers by using the field distribution. For step-index single-mode fibers, a waveguide dispersion formula is deduced which is more accurate than that given by Sansonetti.

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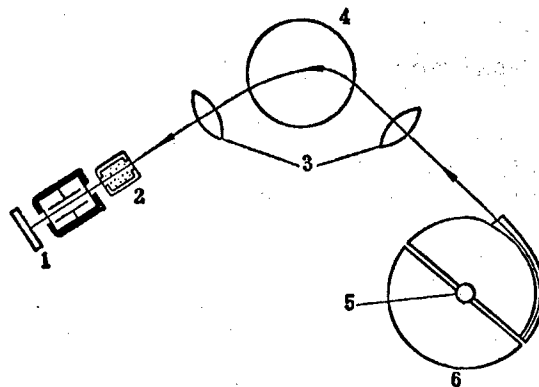
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ACCELERATOR MASS SPECTROMETER

Beijing WULI [PHYSICS] in Chinese Vol 14 No 8, Aug 85 pp 481-486

[Article by Jiang Songsheng [5592 1516 3932], Atomic Energy Institute, Chinese Academy of Sciences]

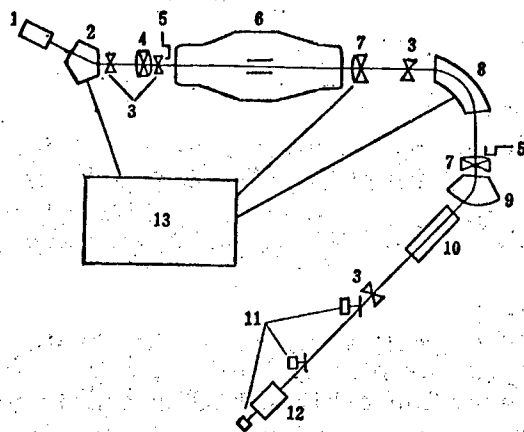
[Abstract] Accelerator mass spectrometry is a new method developed in the late 1970's for analyzing traces of nuclides and for detecting rare particles. Accelerator mass spectrometry can exhibit higher sensitivity than conventional mass spectrometry (by three digit magnitude) and the conventional analytical techniques. An example of ^{14}C in the natural environment is used to explain characteristics (of accelerator mass spectrometry): a small specimen is involved, but a much shorter time is required. The fundamental principle is explained by two (of four) figures showing four selection methods for ions, and variation of energy with dE/dx of ^{14}C and its background components. One of two remaining figures shows a cyclotron mass spectrometer, as follows:



Key:

1. Particle identifying device
2. Range filter
3. Focusing magnetic lens
4. Deflection magnet
5. Ion source
6. Cyclotron

Another figure shows a tandem accelerator mass spectrometer as follows:



Key:

1. Source of negative ions
2. Deflection magnet
3. Grating
4. Electrostatic lens
5. Faraday cylinder
6. Accelerator
7. Magnetic lens
8. 90° magnetic analyzer
9. Switch magnet
10. Electrostatic deflector
11. Flight-of-time deflector
12. Δ E-E detector
13. Computer

PSEUDOPHASE-CONJUGATE PROPERTY OF DOUBLE-BEAD ARRAY

Beijing WULI [PHYSICS] in Chinese Vol 14 No 8, Aug 85 pp 491-492

[Article by Ma Jian [7456 1696] and Tang Wu [0781 2976] of Shanghai Municipal Institute of Laser Technology, and Zhu Fuxiang [2612 1381 4382], Tong Dingwang [4547 7307 2598] and Wang Shaomin [3769 4801 3046] of Physics Department, Hangzhou University]

[Abstract] Since the reports on angle reflection array pseudophase conjugation by V.K. Orlov et al. in SOV. J. QUANT. ELECTR., 8 (1978), p 799, and by H.H. Barrent and S.F. Jacobs, in OPT. LETT., 4 (1979), p 690, progress has been achieved in research on pseudophase conjugation of an optical element array. In HANGZHOU DAXUE XUEBAO (ZIRAN KEXUEBAN) [HANGZHOU UNIVERSITY BULLETIN (NATURAL SCIENCE)], 10 (1984), p 1, by Wang Shaomin, the conditions of an array as pseudophase conjugator are analyzed. Based on this principle, two kinds of pseudophase conjugators are reported in WULI XUEBAO [JOURNAL OF PHYSICS], 32 (1983), p 1354 by Wang Shaomin, et al., and in ZHONGGUO JIGUANG [LASER IN CHINA], 10 (1983), p 191 by Huang Weishi [7806 4850 1395] et al. The double-bead array presented in the paper is a new kind of pseudophase conjugator. Three figures show the double-bead array, compensation properties of parallel light incidence and these properties during non-gauss imaging. The authors are grateful to Xu Xuming [6079 2485 6900], Yao Zongshun [1202 1350 7311] and Wang Yun [3769 5366] for their assistance in experimentation.

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CSO: 4009/44

Physics

CHARACTERISTICS OF GaAs-THIN INSULATOR INTERFACE, METAL-THIN INSULATOR-SEMICONDUCTOR JUNCTION

Beijing WULI [PHYSICS] in Chinese Vol 14 No 10, Oct 85 pp 593-597

[Article by Chen Zhihao [7115 1807 6275] and Wang Weiyuan [3769 3262 3293] of Shanghai Institute of Metallurgy, Chinese Academy of Sciences, and Zhou Mian [0719 0517] of Shanghai Jiaotong University]

[Abstract] Since GaAs has an electron transit rate more than five times higher than Si does, it is expected that GaAs metal-thin insulator-semiconductor field effect transistor (MISFET) can operate at higher frequencies than the Si metal-oxide-semiconductor field effect transistor (MOSFET); likewise, the integrated circuit (IC) of GaAs MISFET can be used at even higher speeds. Over the past decade and more, certain results were arrived at in studying the properties of GaAs-thin insulator interface and MIS junction, referring to WULI, 13-4 (1984), p 212 by Chen Keming [7115 0344 6900] and Chou Lanhua [0092 5695 5478]. The paper presents the following: preparation, components and structure of thin insulator, its optical properties, interface-state density of GaAs-thin insulator, capacitance of GaAs MIS, and transit of charge carriers in GaAs MIS. At the end of the paper, applications of GaAs-thin insulators and MIS structures are mentioned. One table lists property data and preparation methods. Six figures show the depth distribution of components in GaAs self-oxidized film prepared with anode oxidized method, Spicer's unified model, chromatic dispersion of capacitance anomalous frequency in nGaAs MIS system, C-V and I-E curves of DC plasma anode oxidized film of nGaAs, and SBD log I-(1/T) curves of nGaAs.

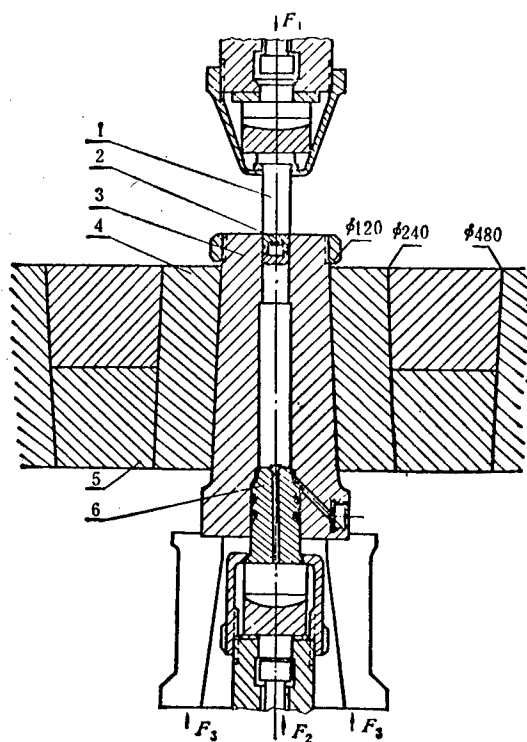
ULTRAHIGH PRESSURE APPARATUS OF LARGE VOLUME WITH LIQUID MEDIA UP TO 30,000 ATM

Beijing WULI [PHYSICS] in Chinese Vol 14 No 10, Oct 85 pp 625-626

[Article by Gao Longsheng [7559 7893 3932] of Geophysics Institute, State Seismic Bureau, and Ge Huancheng [5514 3562 4468] of Jiangsu Provincial Seismic Bureau]

[Abstract] Because more than 99 percent of matter inside the earth is under a pressure in excess of 10 kbar, experiments to understand the earth's internal structure should be conducted under ultrahigh pressure conditions. The experimental object is rock, which is quite inhomogeneous; thus, large test specimens must exhibit a certain representation of experimental results. So a large volume ultrahigh pressure apparatus should be developed. Besides sealing tightness and strength, the apparatus should not have excessive overall dimensions. The paper describes an apparatus developed from a series of small volume ultrahigh pressure apparatuses. The cylindrical working space of the apparatus is $\phi 30 \times 170$ mm for experiments below 20 kbar; the cylindrical working space is $\phi 26 \times 170$ mm for experiments between 20 and 30 kbar. A figure shows the structure of the high pressure container, the core of the ultrahigh pressure apparatus.

Two other figures show the structure of the electrode head and a volume variation curve of a cast bismuth rod. The experimental apparatus was developed through the joint efforts of the Geophysics Institute of the Chinese Academy of Sciences and the Dalong Machinery and Equipment Plant in Shanghai. The authors are grateful to engineers Shi Ziming [2457 1311 2494] and Zhuang Juhua [5445 5468 5478] for their assistance. The apparatus was completed in 1965.



Key:

1. High-pressure piston rod
2. Sealing head
3. Internal high-pressure cavity body
4. Middle hoop
5. Outer hoop
6. Electrode head

PREPARATION OF APPLIED UHF ZnO THIN FILM TRANSDUCERS

Beijing WULI [PHYSICS] in Chinese Vol 14 No 10, Oct 85 pp 627-628

[Article by He Qiguang [0149 0796 0342] of Acoustics Institute, Chinese Academy of Sciences and Deng Tingshang [6772 1353 3864] of the Institute of Physics, Chinese Academy of Sciences]

[Abstract] In studying sound transmission in condensed matter, the acoustic transducer is a necessary device; it is made by first depositing a ZnO thin film onto a time delay rod before honing and polishing the rod. The ZnO thin film transducer (made by the authors) is at the center of a terminal surface of the delay rod, 12 mm in diameter and 10 mm in length. The direct-current plane magnetic control sputtering system made up of magnetic electrodes was used by the authors to deposit the ZnO thin film with a thickness of 3.45 micrometers. The internal and external electrodes (Au/Cr thin film) are made by the planar semiconductor technique, with a thickness between 800 and 1000 angstroms. The authors performed several cold and hot cycle tests with accurate replications of the supersonic echo graph. This proves that the technique used is reliable. One table lists data on depositing conditions of ZnO thin film. Four figures show the DC magnetic control sputtering system, the Smith impedance diagram and amplitude-frequency characteristics of 430 MHz ZnO thin film transducer, and the relationship between temperature and sound attenuation in the quartz monocrystal. The authors are grateful to Wang Chenghao [3076 2110 2493] and Wang Jifang [3769 4480 2455] for their assistance.

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MEASUREMENTS OF SOFT X-RAY FLUCTUATIONS ON HT-6B TOKAMAK DEVICE

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1521-1529

[English abstract of article by Li Linzhong [2621 2651 1813] and Wang Zhengmin [3769 2973 3046] of the Institute of Plasma Physics, Chinese Academy of Sciences

[Text] In this article the construction of a measurement system on the HT-6B Tokamak which is highly sensitive to soft X-ray fluctuation is described and the primary results are presented. When the average electron temperature T_e is less than 100 eV, the wave shapes of typical soft X-ray fluctuations, the disruptive instabilities, the MHD disturbances and some other interesting phenomena are observed.

SCALING THEORY OF ANDERSON LOCALIZATION IN DISORDERED SYSTEMS WITH SPACE MODULATIONS--A REAL SPACE RENORMALIZATION GROUP APPROACH

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85, pp 1530-1538

[English abstract of article by Xiong Shijie [3574 6108 2638] and Cai Jianhua [5591 1696 5478] of the Institute of Solid State Physics, Nanjing University]

[Text] We developed a method of real space renormalization group transformation, suitable for handling a variety of space-modulated disordered systems. With this method, maintaining the relative space-modulation structures unchanged under transformation, we could study the critical properties of Anderson localization of these systems. By solving the RG equations for disordered metallic superlattices with a finite-lattice approximation, the fixed point and critical exponent have been calculated approximately. It is found that space-modulation may change the properties of electronic localization in disordered systems to some extent.

INFLUENCE OF SMALL METALLIC PARTICLE ON TUNNELLING PROPERTIES

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1539-1548

[English abstract of article by Pang Jinzhong [7894 6930 1813] and Gong Changde [7895 2490 1795] of the Department of Physics and Institute of Solid State Physics, Nanjing University]

[Text] The effect of size and temperature on the quasiparticle density of state in small superconductors has been calculated using the functional integral method. The influence of small particles embedded in the oxidic layer of tunnelling junction on the Josephson current has also been investigated. An anomaly exists in the supercurrent. In addition, the quasiparticle currents of the junction have been calculated, and the results obtained are consistent with those of the experiments.

STRESS DEPENDENCE OF DEFECT LEVELS IN SEMICONDUCTORS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1549-1558

[English abstract of article by Li Mingfu [2621 0682 1788] of the Graduate School, University of Science and Technology of China]

[Text] A new criterion for symmetric properties of defect potential in semiconductors is presented. For a degenerate energy level E_s , we introduce the average $\bar{E}_s$ of energy splitting under stress. $\bar{E}_s$ is invariant under Hamiltonian symmetry operation. Therefore, reduction of the stress coefficient tensor of E_s by the group theoretical method is straight forward. For example, for cubic semiconductors, if the defect level E_T has a defect potential of T group symmetry, the uniaxial stress coefficient of $\frac{\partial(\bar{E}_c - \bar{E}_T)}{\partial F}$ or $\frac{\partial(\bar{E}_T - \bar{E}_v)}{\partial F}$ is isotropic and equal to one-third of the corresponding hydrostatic pressure coefficient. The case of defect potential with C_{3v} symmetry is also discussed.

The electron (or hole) emission and capture processes of defect levels under energy splitting are analyzed. The weighted average of emission rate $\bar{e}_n$ and capture rate $\bar{c}_n$ satisfies the following relationship:

$$\bar{e}_n = g_T g_c^{-1} \bar{c}_n N'_{ce} - (\bar{E}_c - \bar{E}_T)/kT$$

By measuring the stress dependence of $\bar{e}_n$, various schemes for determining the symmetry properties of the defect potential are discussed.

The transient processes under defect level splitting are also discussed. When transitions are allowed between the splitting states, the transient is exponential with a single decay time constant $\bar{e}_n^{-1}$. When transitions between different states are forbidden, the transient is decay with multi-exponential time constants. $\bar{e}_n$ is determined by the initial transient slope.

LUMINESCENCE STUDIES OF Er^{3+} IONS IN FLUORIDE, FLUOROPHOSPHATE, PHOSPHATE GLASSES

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85 pp 1582-1594

[English abstract of article by Zheng Haixing [6774 3189 5281], Wu Guangzhao [0702 0342 3564], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] Absorption spectra, emission spectra and excitation spectra of Er^{3+} ions in fluoride glasses, fluorophosphate glasses and phosphate glasses were measured. The influence of glass hosts on the luminescence of Er^{3+} ions is explained. The effects of temperature and ion concentration on the luminescence of Er^{3+} ions in these hosts glasses have been investigated, and discussions are presented on the intrinsic and internal energy transfer or Er^{3+} ions.

THE INFLUENCE OF PHOTO-INDUCED REFRACTIVE INDEX CHANGE ON RAMAN SPECTRA OF $\text{LiNbO}_3\text{:Fe}$ CRYSTALS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1595-1602

[English abstract of article by Liu Simin [0491 1835 2404] and Huang Zhiming [7806 1807 2494], et al., of the Department of Physics, Nankai University; and Xu Liangying [1776 5328 3841] of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] Following our previous work, the influence of the photo-induced refractive index change on Raman spectra of LiNbO_3 crystals doped with 0.07 percent Fe is further studied. Anomalous phenomena appeared in $x(zx)z$ and $y(zy)z$ geometry. This can be explained as the result of the interaction between the polarization electrical field of an extraordinary phonon and the strong space charge field formed after the photo-induced refractive index change in the crystals.

SURFACE ENHANCED RAMAN SCATTERING FROM BENZOIC ACID, SALICYLIC ACID,
P-HYDROXYBENZOIC ACID IN Ag COLLOIDS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1603-1612

[English abstract of article by Zhang Pengxiang [1728 7720 5046] and Gao
Xiaoping [7559 1420 1627], et al., of the Institute of Physics, Chinese
Academy of Sciences]

[Text] The authors studied surface enhanced Raman scattering (SERS) from benzoic acid (BA), salicylic acid (SA) and P-hydroxybenzoic acid (PHBA) in silver sols. The enhanced Raman spectra are recorded and analyzed. The three molecules all contain $\nu(\text{C-CO}_2^-)$ vibration and two of them (SA and PHBA) contain $\nu(\text{C-OH})$ vibration, albeit located at different positions. Using these findings, we analyzed the dependence of the enhancement factor on the distance and orientation of the vibration dipoles relative to the surface and also compared them with the pure electromagnetic model for SERS. An apparent discrepancy was revealed, and possible origins are discussed. We also discuss the influence of the coagulation of silver particles on the enhancement factors and point out ways of optimizing the enhancement in silver colloid.

THE EFFECT OF Ta ON BEHAVIOR OF PHONONS IN SUPERCONDUCTORS OF C-15 V_2Hf ,
 $V_2(Zr_{0.5}Hf_{0.5})$

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 12, Dec 85
pp 1653-1657

[English abstract of article by Li Jizhou [2621 7139 0719], et al., of the Institute of Atomic Energy, Chinese Academy of Sciences; Zhou Li [0719 4539], et al., of the General Research Institute of Nonferrous Metals; and Yin Daole [1438 6670 2867] of the Department of Physics, Beijing University]

[Text] Inelastic neutron scattering spectra from C-15 phase superconducting alloys V_2Hf , V_2Ta , $V_2Hf_{0.8}Ta_{0.2}$, $V_2Zr_{0.5}Hf_{0.5}$ and $V_2Zr_{0.5}Hf_{0.33}Ta_{0.17}$ were measured by the neutron time-of-flight method, and their relative phonon densities of state were evaluated. The present results show that the phonon frequencies soften with the increase of the superconducting transition temperature T_c and harden with a decrease of T_c , which is in agreement with our previous results. This means that for these superconductors the elastic softening plays a role in enhancing T_c to some extent. It seems that between V_2Zr or V_2Hf and $V_2(Zr_{0.5}Hf_{0.5})$ there exists an essential difference that makes T_c increase and the phonon frequencies soften for the former, while T_c decreases and the phonon frequencies harden slightly for the latter after small amounts of Nb or Ta have been added. This can be considered a result of the hybridization of conduction bands, studied by means of the LMTO (linear combination of muffin-tin orbitals) method.

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STUDY OF MAGNETIC PROPERTIES (SPIN REORIENTATION PHASE TRANSITIONS) IN
 $\text{Sm}_2(\text{TM})_{17}$ ALLOYS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1385-1395

[English abstract of article by Lin Hong [2651 5725] and Zhong Wending [6988 2429 1353] of the Department of Physics, Beijing University]

[Text] The magnetic properties of pseudobinary $\text{Sm}_2(\text{FeNiCoM})_{17}$ alloys in which M are nonmagnetic elements have been studied. The sample consists of a disordered hexagonal 2:17 phase (TbCu_7 -structure) coexisting with FeNi. Anomalous magnetic properties along the c-axis (easy magnetization direction) have been observed. Below room temperature, the magnetization and reverse magnetization curves exhibit obvious jumps. The magnetic fields corresponding to jumps H_r increase with the decrease in temperature. The hysteresis loops show wasp-waisted characteristics. The curve of magnetization vs temperature has a maximum, while the corresponding transition temperature T_t decreases with the increasing magnetic field. During cooling, the thermal magnetic hysteresis phenomena have been found at some values of the magnetic field. On the basal plane (hard magnetization direction) and at higher Co concentrations (> 18 at percent), the alloys show normal ferromagnetic behavior. Most of the phenomena observed can be explained in terms of the spin reorientation phase transition leading to non-collinear spin arrangements. The reversal of spin direction must cross over an energy barrier, the height of which is $U = 9.2 \times 10^{-15}$ erg. The calculated values of magnetization are in good agreement with the observed ones.

FORMATION OF HARD BUBBLES BY SINGLE-PULSE BIAS FIELD

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1396-1406

[English abstract of article by Han Baoshan [7281 1405 0810] and Xi Wei [1153 5898] of the Institute of Physics, Chinese Academy of Sciences; Tang Guide [0781 6311 1795] and Nie Xiangfu [5119 0686 1381] of the Department of Physics, Hebei Teacher's University]

[Text] The formation of hard bubbles by a single-pulse bias field in epitaxial garnet films was investigated in some detail. It was verified by experiments and calculations that, in general, VBL in hard bubble walls are not generated in the same manner that one Bloch line pair is produced per pulse. The dependence of the hardening of soft domain segments on their movements was revealed by means of double exposure photography. Two kinds of favorite movements for hard bubble formation were discovered and the physical meaning of the "demarcation field for soft and hard bubble formation" $H[b]$ was elucidated.

THERMODYNAMIC PROPERTIES OF THE ONE-DIMENSIONAL EXTENDED HUBBARD MODEL (I).
 $U > 0$

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1422-1432

[English abstract of article by Xu Hui [1776 1979] of the Department of Mathematics and Physics, Central-South Institute of Mining and Metallurgy, Changsha; and Zhang Kaiyi [1728 7030 5030], Department of Physics, Northeast University of Technology, Shenyang]

[Text] A perturbation expansion for the thermodynamic potential is performed to the third order by the HTSE method. Entropy, internal energy, specific heat and magnetic susceptibility of the one-dimensional extended Hubbard model are computed as functions of temperature, electron density and t , U , W . Thermodynamics can be discussed in two temperature regions. The high T -region corresponds to an increase in the number of double occupied states. The low T -region corresponds to the distribution of the electron spin. The effect of t on thermodynamic properties is obvious.

THERMODYNAMIC PROPERTIES OF THE ONE-DIMENSIONAL EXTENDED HUBBARD MODEL (II).
 $U < 0$

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1433-1441

[English abstract of article by Xu Hui [1776 1979] of the Department of Mathematics and Physics, Central-South Institute of Mining and Metallurgy, Changsha; and Zhang Kaiyi [1728 7030 5030] of the Department of Physics, Northeast University of Technology, Shenyang]

[Text] Entropy, internal energy, specific heat and magnetic susceptibility of the one-dimensional negative- U extended Hubbard model are computed. An analytical solution of magnetic susceptibility in the strong-coupling ($|U| \rightarrow \infty$) limit is obtained. Thermodynamic properties of the system can be discussed in two temperature regions. The high T -region corresponds to a decrease in the number of double-occupied states. The low T -region corresponds to the distribution of the electron charge. The effect of W on thermodynamic properties is obvious.

NEW GENERAL METHOD OF X-RAY DIFFRACTION QUANTITATIVE PHASE ANALYSIS
WITHOUT STANDARDS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1451-1460

[English abstract of article by Guo Changlin [6753 1603 7207] and Yao Gongda [1202 0361 1129] of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] In this paper, a new general method of X-ray quantitative phase analysis without standards is presented. The limit conditions that the phase composition of each of the reference samples and the analysis sample must be equal in Zevin's method are no longer required. When the analysis sample contains n_0 phases, each of the reference samples could contain fewer or more phases than n_0 . Therefore, our new method is more general. The quantitative methods in cases of both known and unknown mass absorption coefficients are discussed. Practical quantitative analyses have proved that the new method is quite explicit and applicable, giving precise and satisfactory quantitative analysis results as well.

MULTIPHASE DOPING METHOD IN QUANTITATIVE X-RAY DIFFRACTION PHASE ANALYSIS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 34 No 11, Nov 85
pp 1461-1468

[English abstract of article by Yao Gongda [1202 0361 1129] and Guo Changlin [6753 1603 7202] of Shanghai Institute of Ceramics, Chinese Academy of Sciences]

[Text] The pure doping samples of a single phase are necessary for the common doping methods in quantitative X-ray diffraction phase analysis. In this paper the new multiphase doping method in X-ray quantitative analysis is presented. If the analysis sample contains n phases, $(n-1)$ suitable multiphase reference doping samples are required to determine the amounts of each phase in the analysis sample, but each doping sample can not contain more than $(n-1)$ phases. This method can also be applied to determine only the amounts of several of the phases in the analysis sample. Practical quantitative analyses have proved that the new method is quite applicable and gives precise and satisfactory quantitative analysis results.

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CSO: 4009/46

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